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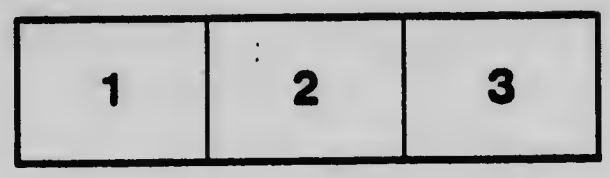

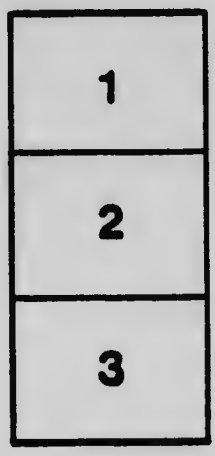

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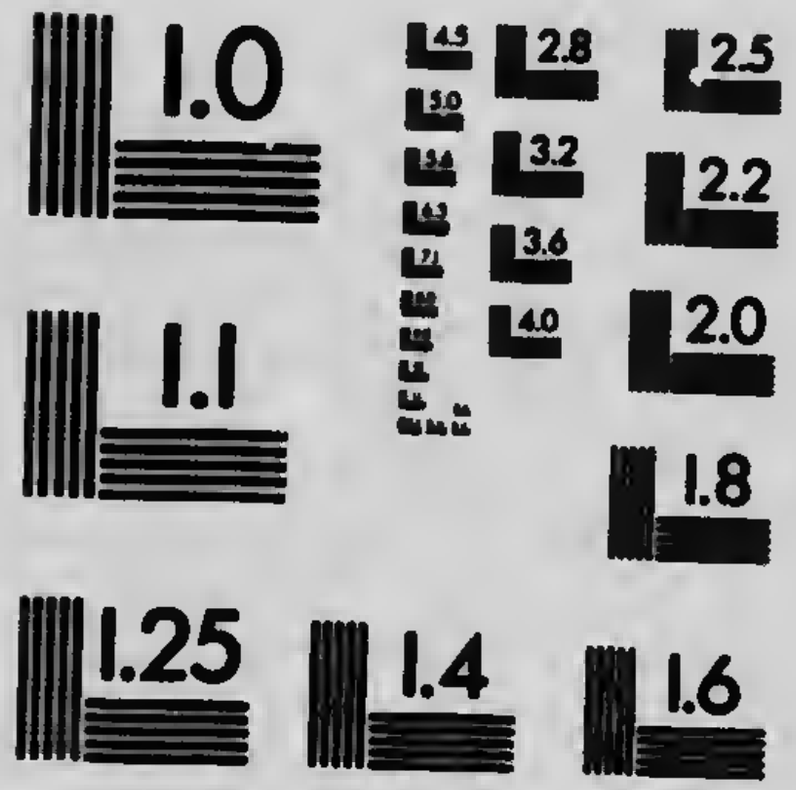

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Rapid
Business Calculation

BY

McINTOSH & WARNER

DIRECTIONS

Remove one lesson at a time, as instructed by teacher. Do not tear off nor examine succeeding lessons until directed by your teacher.

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LESSON 1

Addition

Rapid addition is the first requisite in rapid calculation. You can learn to add rapidly if you set about it properly. The secret of rapid addition lies mainly in the ability to group figures with facility. In reading the words of a sentence, we do not look at the individual letters, but rather at groups of letters which make words; so, in attempting to add columns rapidly, we should not think of the individual figures, but of the results of groups of figures. The ability to group numbers readily may be acquired by intelligent, persistent practice.

Drill on the following:

2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	5	7	8	6	9	3	5	8	7	2	9	4	7	9	8	7	3	5	8

The figure 2 is to be added to the figures in the line below in the following manner:

Place the blunt end of a pencil below the left figure and move towards the right. As you come to each figure in the row, name the sum; as 6, 7, 9, 10, etc. When you reach the right side of the row, come back over the list in the same manner. Go over the list several times in order to acquire fluency in naming the sums. When you have practised the above drill for five minutes, work the drills on the back of this sheet.

An *Even Number* is a number of which 2 is an exact divisor. An even number ends in 0, 2, 4, 6 or 8; as 10, 32, 64, 76, 88.

An *Odd Number* is a number of which 2 is not an exact divisor. An odd number ends in 1, 3, 5, 7, or 9; as 11, 23, 35, 67, 89.

DRILL 1

Date
Time

Name
Seat No.

(1)
2 1 1 2 1 2
1 2 2 1 1 2
2 1 1 2 2 1
1 2 2 1 2 1
2 1 1 2 2 2
1 2 2 1 1 2
2 1 2 1 2 1
1 2 1 2 1 2
2 1 2 2 2 2
1 2 1 2 1 2

(2)
1 2 1 2 1 2
2 2 2 1 2 2
1 2 1 2 1 1
1 1 2 1 2 2
2 2 1 2 1 1
2 1 2 2 1 2
1 2 1 1 2 2
2 1 2 1 2 1
1 2 1 2 1 1
2 2 2 1 2 2

(3)
2 2 2 2 2 2
1 2 1 1 2 1
2 1 2 1 1 1
2 2 1 2 2 2
1 1 2 1 1 2
2 2 1 2 1 1
2 1 2 1 1 2
1 2 1 2 2 2
2 2 2 1 1 2
1 2 1 2 2 1

(4)
1 1 2 1 1 1
2 2 1 2 2 1
2 1 2 1 1 2
1 1 2 2 2 2
2 1 2 1 1 2
2 2 2 2 2 2
1 2 1 2 2 1
2 1 2 2 1 1
2 2 1 1 2 2
1 1 2 2 2 2

(5)
2 1 2 1 2 2
1 2 2 1 1 1
2 1 1 2 2 1
2 2 2 1 1 2
1 2 1 2 2 2
2 1 2 1 1 2
1 2 2 2 2 2
1 1 1 1 2 1
2 1 1 2 1 2
1 2 2 1 2 2

(6)
1 1 2 1 1 2
2 2 1 2 2 1
1 1 1 1 2 1
2 2 1 2 1 2
1 2 1 1 1 2
2 1 2 2 2 2
1 2 2 1 1 2
2 1 2 2 2 1
2 2 1 2 1 2
2 2 2 1 2 2

Subtract

(7) 29287634
16969882

(8) 72642973
64297388

(9) 96254367
69849878

(10) 62492671
49827899

(11) 97324869
54987284

(12) 23292464
19576837

(13) Find the sum of all the even numbers from 4 to 48 inclusive. Ans.....

(14) Find the sum of all the odd numbers from 7 to 51 inclusives Ans.....

(15) From $642.71 subtract the sum of $121.22, $221.21 and $112.22 Ans.....
Aim to get 100%

LESSON 2

Drill on the following:

2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	5	4	3	2		9	8	7	1	8	6	5	4	6	8	4	7	8	9

(1) Use the blunt end of your pencil, placing it at the left side under the first group, and move it slowly to the right, naming the sums of the groups; as 8, 7, 6, 5, etc. Then come back over the list. Do this several times until you can go from left to right and right to left without stumbling. Practise for three minutes in this way.

(2) Imagine the figures in the top row to be 12. Follow the suggestions in preceding paragraph, starting at the left side and naming the sums of the groups; as 18, 17, 16, 15, 14, etc. Read from left to right and then from right to left. Spend five minutes on this drill.

Subtraction

When the combinations in addition have been thoroughly learned, the process of subtraction is a very simple one. This consists in being able to discern at a glance the number which will combine with the one given to produce the other. For instance, what number will combine with 2 to make 8? or with 12 to make 18?

Drill on the following:

9	6	2	8	9	7	6	5	4	8	7	2	1	4	8	9	2	3	7	2
2	7	8	3	4	6	9	7	8	3	8	9	2	7	3	5	4	9	3	6

Draw your pencil along slowly from right side to left, calling out the differences this time; as 6, 3, 4, 7, 3, 5, etc., treating the question as one complete subtraction question. Read from right to left several times until you can read smoothly and accurately.

DRILL 2

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
22121	11211	21211	21112	11211
12122	21222	12222	12211	22122
21212	12112	11121	21222	11212
22122	21221	22112	12112	22121
11212	12112	21221	21221	12212
21222	21221	22112	12112	22122
12222	12112	12122	22212	12111
21212	21221	21211	11122	21222
12212	12212	12122	21211	22111
22111	12112	21212	21122	11221
11221	21221	12121	12121	22122
21212	12122	21211	22222	11211
22221	21211	12122	11212	22122
12122	22122	21211	22122	11211
12211	11211	12122	11212	22122

Subtract:

(6)	(7)	(8)
492637821	826911402	412103262
169824987	698374976	198765439

(9)	(10)	(11)
623278451	612912104	649212141
589983876	198769769	298786968

(12) The gross weights and tares of 4 tubs of Lard are as follows: 72-14, 73-15, 69-12, 70-13 pounds. Find the net weight. Ans. .....

Note: The gross weight in pounds is written to the left of the hyphen and the tare in pounds to the right of the hyphen.

(13) The gross weights and tares of 6 barrels of Sugar are as follows: 320-19, 322-20, 325-22, 324-23, 326-24, 323-21. Find the net weight. Ans. .....

(14) W. Brook's total resources are $42,636.85; his liabilities are $12,962.25. What is he worth? Ans. .....

(15) A. has $950, which is $215 more than I have, and I have $175 more than B. How much have we together? Ans. .....

Accuracy first, then speed

LESSON 3

Drill for a few minutes on the following:

2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	9	6	2	9	8	7	6	9	8	6	1	4	8	7	9	4	7	6	8

(1) Name the sums of the various groups, moving your pencil back and forth from side to side. Let the eye take in the group as a whole, instead of thinking of the two distinct figures that make the group; as 6, 11, 8, 4, 11, etc., from the left side.

(2) Imagine the figures in the top row to be 22. Start at the left side and run your pencil to the right, naming the sums; as 26, 31, 28, 24, 31, 30, etc. Go back and forth several times until you can call off the sums regularly and accurately. Similarly, use 32, 42, etc., as the top number.

SUBTRACTION DRILL

6	3	7	4	6	2	4	9	8	7	6	2	9	7	6	5	4	2	8
3	8	9	2	4	9	3	8	9	6	9	3	3	6	8	4	7	9	2

(1) Drill faithfully on the above subtraction exercise, starting at the *right* side and naming the differences; as 6, 3, 6, 0, 8, 0, 9, etc. Draw your pencil along and try to name the figures accurately and fluently. Go over and over the drill until you can read it as easily as a line of printed matter.

(2) Subtract by 3's from 57 to 3; from 120 to 30.

(3) Subtract by 4's from 60 to 0; from 124 to 20.

DRILL 3

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
21212	12121	21221	11211	21222
12122	22122	12112	21222	11211
21212	21121	21221	12121	21122
22212	12212	12122	11211	12111
21212	21122	21221	22122	21212
11222	12211	22122	11211	12122
22111	21222	11211	21122	11211
11212	12112	21112	12212	12122
21222	11221	22211	21221	21211
12112	22112	21221	22112	12122
21221	12212	12122	11222	21222
12212	11222	11211	22112	12121
22122	21211	22122	11221	21221
11211	12122	11211	22112	22112
21122	21211	22122	12112	12221
12211	22222	12211	21221	21112
21122	11121	21122	12122	12221
12212	21211	12121	11211	21212
21122	12221	22212	21222	12222
12121	11122	12122	11211	21121

Subtract:

(6) 9212112128	(7) 6398761204	(8) 4621021347
2987654989	4969870938	2987548678
(9) 4232126342	(10) 2389624874	(11) 6748269346
1498764867	1962879389	4986973989

(12) A merchant's sales during a given time amounted to $68,497. Assuming that the cost of the goods sold was $58,912, what was his gain? Ans. .....

(13) A has $1,525 less than C, and $3,225 more than B; C has $18,750. If D's money is equal to the difference between C's and B's, how much has he? Ans. .....

(14) Balance in Bank Sept. 1st, $648.70. Deposit Sept. 10, $264.65. Cheques from Sept. 1st to Sept. 30th: $172.64, $36.75, $64.85, $8.44. What is the balance in the Bank Oct. 1st? Ans. .....

Aim to get 100%

LESSON 4

Drill on rapid addition:

1	2	1	2	2	1	1	2	1	2	1	2	1	2	1	2	1	2
2	1	2	1	1	2	2	1	2	1	2	1	1	1	2	1	1	2
1	2	1	1	2	1	1	2	1	2	1	2	2	2	1	2	2	1
2	1	2	2	1	2	2	1	2	1	2	1	1	1	2	1	1	2
1	2	1	1	2	1	1	2	1	2	1	2	2	2	1	2	1	2
2	1	2	2	1	2	2	1	2	1	2	1	2	1	2	1	2	2
2	1	2	2	1	2	2	1	2	1	1	1	1	2	1	1	2	2
1	2	1	1	2	1	1	2	1	2	1	2	1	1	2	2	1	1
1	2	1	2	2	1	1	2	1	2	1	2	2	1	2	2	1	1
2	1	2	1	1	2	2	1	2	1	2	1	1	2	1	1	2	2
1	2	1	2	2	1	1	2	1	2	1	2	2	1	2	2	1	1
2	1	2	1	1	2	2	1	2	1	2	1	1	2	1	1	2	2
1	2	1	2	2	1	1	2	1	2	1	2	2	1	2	2	1	1
2	1	2	1	1	2	2	1	2	1	2	1	1	2	1	1	2	2
1	2	1	2	2	1	2	2	1	2	1	2	2	1	2	2	1	1
2	1	2	1	1	2	1	1	2	1	2	1	1	2	1	1	2	2
1	2	1	2	2	1	2	2	1	2	1	2	2	1	1	2	1	1
2	1	2	1	1	2	1	1	2	1	2	1	1	2	2	1	2	2
1	2	1	2	2	1	2	2	1	2	1	2	2	1	1	2	1	1
2	1	2	1	1	2	1	1	2	1	2	1	1	2	2	1	2	2

(1) Treat the above as a complete question in addition. Add the columns from the right side and place the results at the bottom. Go over your work *ten* times in order to get practice in reading columns. See if you can add the complete question in 3 minutes.

(2) Drill on horizontal addition. Start on the top line and add from left to right and then from right to left. Do the same with the other lines of the question.

DRILL 4

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
21212	12121	21212	12121	22121
12122	21212	12122	22122	11212
21211	12122	21212	12211	21222
22122	21211	12112	22122	11211
12121	12122	21221	12121	22122
21212	21211	12112	22212	12212
12112	12122	12222	11211	21122
22212	12211	21121	22122	12211
11221	21212	22212	12111	21211
22112	12212	12122	21222	12222
11221	21122	21211	12112	21212
21211	12211	12112	21221	22122
12222	21212	21221	12122	11211
11211	12122	21112	21211	22122
22122	21211	22122	21122	21212
12121	12122	12121	12211	12111
22122	21212	21121	21221	21221
12122	12122	12212	12122	22112
21212	21221	11122	21212	12212
12122	12122	21211	12122	21121
21212	21211	12121	21211	22212
12122	12122	21122	12222	12122
21211	21211	21212	11212	21211
12122	12122	12122	21222	12222
21211	21222	22212	12121	11211
22122	12112	11221	21212	22122
12121	21212	22112	12121	11211
22122	12122	11221	21212	21222
21211	21211	22122	11211	12121
12122	22122	12121	21122	22122

Find the sum by adding horizontally:

(6) 212122 + 222122 + 112211 + 121222 + 212 + 22212 =

(7) 12121 + 22 + 21212 + 122 + 2122 + 112 + 222 + 12121 =

(8) 212121 + 211 + 1212212 + 112 + 12 + 22 + 121 + 12212 =

(9) 121 + 21212 + 112112 + 222 + 11 + 21 + 221 + 11212 =

(10) 2122 + 12 + 2112 + 22211 2 + 22 + 12 + 121 + 21222 =

(11) From $212.12 + $2.22 + $122.11 take $112.11 + $2.12 =

(12) From $1122.22 + $212.11 + $2.22 take $2.21 + $122.21 =

(13) From $2121.11 + $121.21 + $12.21 take $21.22 + $211.12 =

(14) From $112.21 + $212.11 + $1221.11 take $22.12 + $222.12 =

(15) From $222.22 + $121.21 + $2121.21 take $121.12 + $212.22 =

LESSON 5

Drill ten minutes on the following:

1	2	1	2	2	1	2	1	2	1	2	1	2	2	1	2	1	2	1	2
2	1	2	1	2	2	1	2	1	2	1	2	1	1	2	1	2	1	2	2
1	2	1	2	2	1	2	2	2	1	2	1	2	2	1	2	1	2	1	1
2	1	2	1	1	2	1	2	1	2	1	2	1	1	2	1	2	1	2	2
1	2	1	2	1	1	2	1	1	2	2	1	2	2	1	2	1	2	2	1
2	1	2	1	2	2	1	2	1	1	1	2	1	2	2	1	2	1	2	1
1	2	2	1	2	1	2	1	2	2	2	1	2	1	2	1	2	2	1	2
2	1	2	2	1	2	1	2	1	1	2	1	1	2	1	2	1	2	2	2
1	2	1	2	2	1	2	2	2	1	1	2	2	1	2	1	2	1	1	1
1	2	2	1	1	2	1	1	1	2	2	1	2	1	1	2	1	2	2	2
1	1	1	2	1	2	2	1	1	1	2	2	1	2	2	1	2	1	1	2
2	2	1	2	2	1	1	2	1	2	1	2	2	2	1	1	2	2	2	2
1	1	2	1	1	2	2	1	2	1	2	1	2	1	2	2	1	1	1	2
2	2	1	2	2	1	1	2	2	2	1	2	1	2	1	1	2	2	2	1
1	1	2	1	2	2	1	2	1	1	2	1	2	2	1	2	1	2	1	2
2	2	1	2	1	2	1	2	2	2	1	2	2	1	2	1	2	2	2	2
1	2	2	1	2	1	2	1	2	1	2	1	2	2	1	2	2	1	2	2
2	1	1	2	1	2	1	2	1	1	2	2	1	1	2	1	1	2	1	2
2	2	1	2	2	1	2	2	2	1	1	2	2	1	1	2	2	1	2	2
1	1	2	1	2	2	1	1	1	2	1	1	2	2	2	1	2	2	1	2

(1) After drilling on the above for 10 minutes, time yourself and see if you can add the above question in 3 minutes. Practise faithfully and you will assuredly acquire the speed.

(2) Practise horizontal addition for 3 minutes. Start on the top line and read from left to right and then from right to left.

(3) Subtract by 5's from 75 to 25; from 55 to 0.

(4) Subtract by 6's from 72 to 24; from 54 to 0.

(5) Subtract by 7's from 84 to 21; from 98 to 0.

DRILL 5

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
212122	122122	212221	121211	2121
121212	212211	121212	212122	1221
212121	121222	212122	121212	2112
122212	212112	122211	212122	1221
212112	121221	212112	112211	1212
122212	212112	122122	221122	2111
112121	122111	212122	122211	1212
221212	212212	111211	121222	1112
121112	122111	121222	212112	1221
212211	211222	112112	121222	2112
121222	122112	121221	221112	1122
112112	212121	212112	122212	2111
212221	222212	121221	221121	1222
121212	121222	212112	121221	1112
112112	112112	211122	221212	2122
221211	211211	122211	212121	1112
112222	121122	212112	122111	2121
211211	212211	121211	111212	1211
122122	121212	212211	212121	2122
112112	212221	121222	221211	1211
221221	121212	112112	121112	1122
112121	111222	212122	212212	1211
221122	212112	221212	122121	2121
212211	222211	112121	211211	1212
122122	112121	221222	122122	1112
212211	121221	122121	111211	2121
122121	212112	212212	212112	1112
211222	121221	121222	121221	2111
122121	212112	112112	212112	2222
212212	122221	211221	121221	1212

Add the following horizontally:

(6) 2121+122121+211+121+212121+21= .....

(7) 12212+221+121212+11+22212+221= .....

(8) $221.12+$2.12+$121.11+$2,121.12+$112.11= .....

(9) $1,122.12+$1.12+$212.22+$22.12+$122.22= .....

(10) $221.11+$22.11+$121.12+$2,122.22+$1.22= .....

(11) From $21,221.22+$222.11 take $221.11+$2,121.22= .....

(12) From $1,211.21+$212.22+$22.22 take $111.12+$2.22= .....

(13) From $21,211.12+$122.11+$2.12 take $212.22+$22.12= .....

(14) From $222.12+$122.12+$2,111.12 take $22.12+$112.12= .....

Aim to get 100%

LESSON 6

Multiplication

The ability to multiply rapidly depends upon a thorough knowledge of the multiplication tables, combined with an ability to add rapidly. Knowledge of the multiplication tables means ability to use a row of figures and read, without any hesitation, the products by any number from at least two to twelve. Systematic practice along well-planned lines will make you rapid and accurate in a very few months.

4	2	7	8	9	7	6	5	3	2	4	7	8	6	3	9	3	4	8	6
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

(1) Start at the left side and multiply each figure by 2; as 8, 4, 14, 16, 18, etc. You may use the blunt end of your pencil, starting under the first 2 at the left and moving it slowly to the right. Name the products as you slide your pencil to the right. After coming to the end of the row, come back over the list. Drill for five minutes, naming your products accurately and regularly.

(2) Start at the right side and multiply as in ordinary multiplication, adding the carrying figure, if there is one; as 12, 17, 9, 6, 18, 7, etc. Go over the drill several times until you can name the products smoothly and accurately.

Division

2)4	8	9	6	2	4	8	3	6	4	8	9	1	2	6	8	4	7	9	4

(1) Drill for three minutes on the short division exercise, naming the figures regularly; as 2, 4, 4, 8, etc.

(2) Try again, increasing your speed, but keeping up a regular rate. Practise earnestly.

DRILL 6

Date *Name*

Time *Seat No.*

Extend and add products:

(1)		(2)		(3)	
122×2—	.....	212×2—	.....	2321×2—	.....
323×2—	.....	232×2—	.....	3233×2—	.....
442×2—	.....	344×2—	.....	4261×2—	.....
535×2—	.....	453×2—	.....	6342×2—	.....
426×2—	.....	642×2—	.....	7237×2—	.....
(4)		**(5)**		**(6)**	
212×2—	.....	346×2—	.....	2122×2—	.....
323×2—	.....	722×2—	.....	3233×2—	.....
342×2—	.....	233×2—	.....	2443×2—	.....
254×2—	.....	443×2—	.....	5532×2—	.....
651×2—	.....	532×2—	.....	5366×2—	.....
375×2—	.....	366×2—	.....	4573×2—	.....
(7)		**(8)**		**(9)**	
682×2—	.....	773×2—	.....	4712×2—	.....
549×2—	.....	896×2—	.....	8324×2—	.....
927×2—	.....	991×2—	.....	1967×2—	.....
876×2—	.....	348×2—	.....	9234×2—	.....
933×2—	.....	962×2—	.....	3649×2—	.....
489×2—	.....	877×2—	.....	7763×2—	.....

Divide and add quotients:

(10)		(11)	
84624÷2—	.....	89434÷2—	.....
92838÷2—	.....	67372÷2—	.....
46964÷2—	.....	93758÷2—	.....
38492÷2—	.....	54764÷2—	.....
42186÷2—	.....	85692÷2—	.....
(12)		**(13)**	
87642÷2—	.....	364826÷2—	.....
92764÷2—	.....	926874÷2—	.....
33982÷2—	.....	493112÷2—	.....
49236÷2—	.....	961466÷2—	.....
11692÷2—	.....	116872÷2—	.....
74286÷2—	.....	109436÷2—	.....
37496÷2—	.....	846924÷2—	.....
14764÷2—	.....	372552÷2—	.....
39872÷2—	.....	489672÷2—	.....
57284÷2—	.....	118994÷2—	.....

Accuracy first, then speed

LESSON 7

Multiplication Drill:

6	4	8	9	6	7	3	2	9	8	4	6	7	9	4	8	4	2	7	4
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

(1) Multiply the top figures by 2, starting at the left side and naming the products at a good rate; as 12, 8, 16, 18, etc. Now read the products from the right side to the left; as 8, 14, 4, 8, 16, etc.

(2) Start at the right side and multiply by 2, adding the carrying figure, if any; as 8, 14, 5, 8, 16, 9, etc. Drill for three minutes from right to left, increasing your speed consistent with accuracy and regularity.

Division Drill:

2)8	4	9	6	3	2	8	7	6	4	9	8	2	7	6	4	2	1	3	8

(1) Drill for a few minutes on the above short division exercise; as 4, 2, 4, 8, 1, 6, etc.

(2) After going over the figures slowly and regularly, increase your speed until you can run the drill through quickly and smoothly.

Short Method

To multiply any number by 11.
Example:—Find the product of 72×11.

(a) Full operation:

$$\begin{array}{r} 72 \\ 11 \\ \hline 72 \\ 72 \\ \hline 792 \end{array}$$

(b) Short method:

Write 2 in the place of the units of the product. 2+7=9. Write 9 in the place of the tens of the product. Bring down 7 for the place of the hundreds of the product. The complete product is therefore 792.

DRILL 7

Date *Name*
Time *Seat No.*

Multiply and then add the products:

(1)	(2)	(3)
442×2=	453×2=	243×2= .....
535×2=	642×2=	454×2= .....
426×2=	475×2=	166×2= .....
757×2=	838×2=	57?×2= .....
385×2=	943×2=	858×2= .....
(4)	(5)	(6)
545×2=	342×2=	325×2= .....
516×2=	254×2=	665×2= .....
757×2=	651×2=	737×2= .....
485×2=	375×2=	584×2= .....
979×2=	848×2=	499×2= .....
756×2=	997×2=	147×2= .....
(7)	(8)	(9)
443×2=	553×2=	432×2= .....
532×2=	536×2=	535×2= .....
366×2=	457×2=	645×2= .....
573×2=	285×2=	774×2= .....
858×2=	574×2=	452×2= .....
749×2=	941×2=	395×2= .....

Divide and add quotients:

(10)	(11)
484642÷2=	984644÷2= .....
896894÷2=	117342÷2= .....
676332÷2=	963196÷2= .....
211986÷2=	129874÷2= .....
374216÷2=	368292÷2= .....
291212÷2=	473794÷2= .....

Multiply and add products:

(12)	(13)	(14)
36×11=	24×11=	75×11= .....
42×11=	36×11=	38×11= .....
26×11=	44×11=	52×11= .....
38×11=	52×11=	61×11= .....
94×11=	67×11=	79×11= .....
64×11=	33×11=	49×11= .....
35×11=	39×11=	68×11= .....

Aim to get 100%

LESSON 8

Drill on Multiplication by 2:

4	2	6	8	4	7	6	3	9	2	4	8	2	9	8
6	4	7	6	3	8	4	8	7	6	3	7	4	8	2
9	2	4	7	8	7	6	9	3	8	4	9	8	9	3
5	6	7	4	7	6	3	2	9	9	8	7	6	5	4

(1) Multiply each of the figures in the first line by 2, starting at the left side; as 8, 4, 12, 16, 8, 14, etc. Then read back from the right side; as 16, 18, 4, 16, 8, etc. Go over this line *four* times and then drill on the second, third and fourth lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Start at the right side and multiply by 2; as 16, 19, 5, 16, 9, etc. Go over each of the other lines in a similar way.

Division Drill:

2)4	6	4	9	8	7	1	3	2	9	6	7	4	7	8	3	4	7	2	8

Spend three minutes on the short division drill.

Short Method

To multiply any number by 11.
Find the product of 195×11.

(a) Full operation:

195
11

195
195

2145

(b) Contracted operation:

Write 5 as the units figure in the product, 5+9=14. Write 4 as the second figure in the product and carry 1. 9+1+1=11. Write 1 as the third figure in the product and carry 1. 1+1=2. Write 2 as the fourth figure in the product, thus obtaining 2145.

Rule.—Write the units figure, the sum of the units and tens, the sum of the tens and hundreds, etc., also the left-hand figure, carrying when necessary.

DRILL 8

Date *Name*
Time *Seat No.*

Extend and add products:

(1)
5463 X 2 =
6372 X 2 =
7847 X 2 =
8133 X 2 =
9364 X 2 =
2563 X 2 = _____

(2)
535 X 2 =
645 X 2 =
774 X 2 =
452 X 2 =
395 X 2 =
689 X 2 = _____

(3)
4536 X 2 =
7457 X 2 =
5285 X 2 =
9574 X 2 =
8941 X 2 =
3789 X 2 = _____

(4)
4573 X 2 =
2858 X 2 =
5749 X 2 =
9414 X 2 =
8678 X 2 = _____

(5)
366 X 2 =
573 X 2 =
858 X 2 =
749 X 2 =
414 X 2 = _____

(6)
3254 X 2 =
6651 X 2 =
7375 X 2 =
5848 X 2 =
4997 X 2 = _____

(7)
6516 X 2 =
3757 X 2 =
8485 X 2 =
9979 X 2 =
4756 X 2 =
8139 X 2 = _____

(8)
574 X 2 =
858 X 2 =
799 X 2 =
569 X 2 =
396 X 2 =
459 X 2 = _____

(9)
2583 X 2 =
3994 X 2 =
4697 X 2 =
2963 X 2 =
3597 X 2 =
2689 X 2 = _____

Divide and add quotients:

(10)
9464 ÷ 2 =
6748 ÷ 2 =
9166 ÷ 2 =
8744 ÷ 2 =
1164 ÷ 2 =
4212 ÷ 2 = _____

(11)
7482 ÷ 2 =
9764 ÷ 2 =
1144 ÷ 2 =
7374 ÷ 2 =
9172 ÷ 2 =
8932 ÷ 2 = _____

(12)
4782 ÷ 2 =
1138 ÷ 2 =
7398 ÷ 2 =
1154 ÷ 2 =
3984 ÷ 2 =
9674 ÷ 2 = _____

Extend and add products:

(13)
2425 X 11 =
3639 X 11 =
2847 X 11 =
2639 X 11 =
1472 X 11 =
2767 X 11 = _____

(14)
2935 X 11 =
6482 X 11 =
3967 X 11 =
5243 X 11 =
7268 X 11 =
8498 X 11 = _____

(15)
2123 X 11 =
3424 X 11 =
2676 X 11 =
3148 X 11 =
2679 X 11 =
6735 X 11 = _____

LESSON 9

Drill on Multiplication by 2:

9	6	4	8	7	6	3	2	7	4	8	2	9	7	5	6
4	2	7	6	4	7	8	3	9	7	6	5	4	3	8	8
9	2	1	5	7	8	6	4	7	8	9	6	5	6	3	2
7	5	4	2	9	8	7	6	3	2	8	5	4	8	7	6
4	9	2	7	6	5	4	3	8	9	7	6	5	4	6	8

(1) Start with the first line and multiply each figure by 2, reading from left to right and then from right to left; as 18, 12, 8, 16, 14, 12, etc. Drill on each line in a similar way.

(2) Start at the right side of the line and multiply by 2, adding carrying figure, if any; as 12, 11, 15, 19, 5, etc. Drill on every line thoroughly, increasing your speed gradually.

Short Method

To multiply by 21, 31, 41, 51, etc.

Example: Multiply 846 by 41.

846	6×1	$=6$
41	6×4	$+4=28$ carry 2
	$4\times4+2$ (carried)	$+8=26$ carry 2
34686	$8\times4+2$ (carried)	$=34$

Note:—First place the units figure of the multiplicand as the units figure of the product. Then multiply by 4, and in addition to the ordinary number to be carried, add the figure to the left of the figure multiplied.

DRILL 9

Date *Name*

Time *Seat No.*

Multiply and then add the products:

(1)	(2)	(3)
256×2=	734×2=	975×2= .....
198×2=	672×2=	635×2= .....
736×2=	549×2=	973×2= .....
589×2=	873×2=	789×2= .....
464×2=	568×2=	934×2= .....
678×2=	745×2=	669×2= .....
395×2=	752×2=	584×2= .....

(4)	(5)	(6)
546×2=	965×2=	564×2= .....
585×2=	654×2=	794×2= .....
418×2=	698×2=	849×2= .....
875×2=	624×2=	396×2= .....
497×2=	735×2=	965×2= .....
547×2=	983×2=	569×2= .....
356×2=	899×2=	962×2= .....
945×2=	756×2=	473×2= .....

(7)	(8)	(9)
639×2=	989×2=	746×2= .....
896×2=	235×2=	923×2= .....
356×2=	759×2=	754×2= .....
596×2=	894×2=	993×2= .....
947×2=	854×2=	775×2= .....
549×2=	778×2=	849×2= .....
788×2=	389×2=	777×2= .....
897×2=	754×2=	649×2= .....
543×2=	469×2=	875×2= .....
698×2=	978×2=	899×2= .....

Divide and add quotients:

(10)	(11)
964876÷2=	849628÷2= .....
736742÷2=	793894÷2= .....
117964÷2=	119762÷2= .....
143772÷2=	496384÷2= .....
472968÷2=	389772÷2= .....

Multiply and add products:

(12)	(13)	(14)
146×21=	264×31=	954×41= .....
237×21=	592×31=	752×31= .....
462×21=	684×31=	247×21= .....
583×21=	543×31=	754×51= .....
462×21=	217×31=	642×71= .....
573×21=	589×31=	427×61= .....

LESSON 10

Drill on Multiplication by 2:

4	9	6	8	7	8	9	3	2	6
5	2	7	9	6	3	4	8	7	5
9	3	2	5	8	4	7	6	2	9
3	9	8	7	6	5	6	9	7	5
4	2	9	8	3	7	5	8	6	9
5	4	8	7	5	9	6	9	8	4
2	1	8	9	6	7	3	2	7	8
6	9	3	2	4	2	9	7	6	3
7	5	4	8	9	7	6	5	7	6
3	8	7	6	5	4	3	8	2	9

(1) Drill on the first line, multiplying each figure by 2, reading from left to right and then from right to left; as 8, 18, 12, 16, etc. Drill on the other lines in a similar way.

(2) Start at the right side of the first line and multiply by 2, adding carrying figure, if any; as 12, 5, 6, 18, 17, 15, etc. Drill on the other lines slowly and accurately.

(3) Go over the lines again, multiplying by 2 and adding carrying figure. Increase your speed, going as fast as you can, consistent with accuracy and regularity.

Short Method

To multiply by 51.

Examples: $84 \times 51 = 84$

$42 = \frac{1}{2}$ of 84

4284

$75 \times 51 = 75$

$375 = \frac{1}{2}$ of 75

3825

Rule.—Take one-half the number, write it two places to the left and add. In odd numbers, the half over should be considered 5. See illustration.

DRILL 10

Date *Name*

Time *Seat No.*

Multiply and then add the products:

(1)	(2)	(3)
356×2=	759×2=	583×2= .....
596×2=	894×2=	543×2= .....
947×2=	854×2=	137×2= .....
549×2=	778×2=	466×2= .....
788×2=	389×2=	744×2= .....
897×2=	754×2=	698×2= .....
543×2=	469×2=	789×2= .....
698×2=	978×2=	752×2= .....
785×2=	659×2=	998×2= .....
594×2=	475×2=	589×2= .....

(4)	(5)	(6)
354×2=	444×2=	649×2= .....
413×2=	247×2=	783×2= .....
446×2=	896×2=	675×2= .....
474×2=	567×2=	684×2= .....
969×2=	647×2=	539×2= .....
678×2=	769×2=	795×2= .....
475×2=	375×2=	416×2= .....
699×2=	959×2=	979×2= .....
758×2=	757×2=	837×2= .....
598×2=	327×2=	754×2= .....

Divide and add quotients:

(7)	(8)	(9)
4936÷2=	3994÷2=	5792÷2= .....
4892÷2=	1138÷2=	4896÷2= .....
9376÷2=	9372÷2=	9374÷2= .....
5392÷2=	7374÷2=	4772÷2= .....
4772÷2=	5976÷2=	7996÷2= .....
3136÷2=	3772÷2=	3572÷2= .....
7792÷2=	1114÷2=	9334÷2= .....
1176÷2=	9978÷2=	7592÷2= .....

Multiply and add products:

(10)	(11)	(12)
72×51=	62×51=	364×51= .....
34×51=	75×51=	248×51= .....
68×51=	39×51=	525×51= .....
42×51=	52×51=	432×51= .....
26×51=	33×51=	645×51= .....
94×51=	56×51=	827×51= .....

Accuracy first, then speed.

LESSON 11

3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
6	8	2	9	7	3	5	4	1	8	7	9	7	6	4	5	4	7	9	8

The figure 3 is to be added to the figures in the line below in the following manner:

(1) Start at the left side, placing the blunt end of your pencil under the first group, and name the sum of each group. Glide your pencil to the right, slowly but regularly, naming the totals; as 9, 11, 5, 12, 10, 6, etc. After naming the sums from left to right, start at the right side and read toward the left. Do this several times. Do not hesitate.

(2) Start at the right side, adding the groups and adding the carrying figure this time. Drill for three minutes or longer until you can name the sums without any hesitancy.

Subtraction

Drill on the following subtraction exercise:

7	2	6	4	8	6	7	3	2	9	7	6	4	6	9	8	3	5	7	8
3	6	8	8	6	3	9	2	7	5	4	8	6	7	4	9	2	8	3	9

Place your pencil under the 9 at the right side and then move it along slowly to the left, calling out the differences; as 9, 3, 7, 0, 9, 4, etc. Drill for five minutes on the subtraction exercise.

DRILL 11

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
1322	3231	3221	1322	2212	2123
3212	2123	1312	3131	1232	2322
2231	2312	3333	3333	3123	1231
3322	3222	2122	2212	2223	2233
1113	1133	1331	2133	1333	3332
1323	3232	2312	3231	2323	3231
3211	2113	1323	1132	1132	1323
2113	1133	1321	2132	1332	3323
3222	2222	3132	2313	2222	2222
3123	1231	2312	1231	2312	3123
2231	2311	2131	2213	3113	1132
1321	3213	2122	3212	2132	1321
2132	1323	2331	3233	3232	2323
3322	3222	2123	3212	2222	2221
1323	3232	3231	1323	2321	3332

Subtract:

(7) 926987654	(8) 426928532	(9) 637584327
369298977	197876975	298737849
(10) 367214031	(11) 543678276	(12) 942637642
198756277	297889348	278593878

(13) A grocer's shop is worth $4,265 and his goods are worth $2,688 less than the shop. What is the value of both? Ans. .....

(14) A man bought four farms. For the first he paid $5,875; for the second, $4,925; for the third, $725 more than the first, and for the fourth $1,225 more than the second. What did the four farms cost him? Ans. .....

(15) In a certain city there are 247,628 Canadians, 24,658 Irish, 3,694 French, 6,974 English, and 4,698 of other nationalities. What is the population of the city? Ans. .....

Aim to get 100%

LESSON 12

3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
7	9	8	3	4	9	1	6	7	9	3	5	2	6	9	5	2	7	6	4

(1) Drill on the above combinations, starting at the left side, and naming the *sums*; as 10, 12, 11, 6, 7, 12, etc. Drill from right to left without carrying at first, and then go over the work again and again until you can read the sums fluently.

(2) Start at the right side this time, naming the sums of the groups and adding the carrying figure, if any; as 7, 9, 10, 6, 8, 12, 10, etc. Go over the list six times.

(3) Consider the top figure 13 and add from left to right and then from right to left, without carrying; as 20, 22, 21, 16, etc. Spend five minutes on this form of drill.

Subtraction

6	4	2	3	7	6	5	4	3	2	6	8	7	5	6	9	3	2	7	5
2	7	1	8	4	9	3	2	7	8	9	7	9	3	9	4	7	6	4	8

(1) Draw the blunt end of your pencil from right to left, naming the differences; as 7, 2, 6, 5, 4, etc. Go over the drill several times until you can name the differences smoothly and readily. Practise the drill three minutes.

(2) Subtract by 3's from 72 to 0; from 96 to 21; from 100 to 1.

DRILL 12

Date
Time

Name
Seat No.

(1)	(2)	(3)	(4)	(5)	(6)
3333	22122	2323	1313	3323	3311
2122	2133	1212	2212	2311	3232
1331	3231	3133	3323	2222	3131
2312	1132	2321	1331	3231	2332
1323	2132	1333	2331	1323	2321
1321	2313	3211	2333	3211	2211
3132	1231	1132	2211	3333	2313
2312	2213	1323	1333	2131	3222
2191	3212	2132	3122	3132	2132
2122	3233	3213	1321	1333	2323
2331	3212	1332	3131	2331	2111
2123	1323	2113	3233	2113	1133
3231	2132	3222	1321	3331	2211
1321	1321	2333	3211	2313	3213
3213	3233	1131	3322	1333	1312
2333	1232	3123	2223	3131	3233
2323	2132	1332	3131	2322	1321
1321	1332	1221	2223	2113	1223
3323	3231	2332	3131	3331	2313
2312	3323	1233	3232	2133	3131
3233	3322	3131	1333	3122	3231
3222	1213	2323	3113	2323	2322

Subtract

(7) 427692852 − 29688769 4

(8) 932104211 − 47837695 4

(9) 492134212 − 27985976 3

(10) 378542693 − 19972884 8

(11) 623142121 − 29765843 7

(12) 523711212 − 29785493 9

(13) Find the total distance around a rectangular field 1629 feet long and 1574 feet wide? Ans.

(14) What number must be added to 89627 to give a result of 226202? Ans.

(15) What number must be subtracted from 86023 to leave 19362 as a remainder? Ans.

(14) I owe $1635.00 to A, B, C, and D. If I owe A $365, B $572, and C $438, how much do I owe D? Ans.

LESSON 13

Drill for a few minutes on the following:

3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	9	8	7	6	5	4	9	7	6	8	7	6	5	8	9	6	2	7	2

(1) Name the sums of the various groups, moving your pencil back and forth from left to right and from right to left. Let the eye take in each group instantaneously; as 5, 12, 11, 10, 9, 8, etc.

(2) Imagine the figures in the top row to be 23. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 25, 32, 31, 30, 29, 28, etc. Go over the list several times until you can call the sums smoothly and accurately. Similarly, 33, 43, 53, etc., may be used as the top number.

Subtraction Drill

2	6	3	4	7	2	6	9	2	5	4	3	6	7	2	4	3	2	6	4
9	8	5	2	6	8	3	4	8	6	9	2	9	8	3	9	2	5	3	8

(1) Drill for a few minutes on the above subtraction exercise, starting at the *right* side and naming the differences; as 6, 2, 7, 0, 5, 8, etc. Draw your pencil along slowly at first, increasing your speed after a few minutes' drill.

(2) Subtract by 3's from 72 to 0; from 125 to 2.

(3) Subtract by 4's from 80 to 0; from 132 to 16.

DRILL 13

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
12312	31232	13131	31223	12332
31223	13313	21322	13132	33233
23112	32121	32133	21321	21123
31333	33313	13211	33122	32321
23123	23132	32133	12331	12332
32332	31322	23312	31223	32113
13233	13233	31233	12332	13231
32122	31131	13322	13131	33113
13331	23323	31233	32113	23223
31213	13132	23211	21332	13113
23131	31322	31332	33231	23321
31333	13233	13213	22123	32132
12131	31322	23231	31233	13213
33312	33211	31211	13321	32332
12323	22323	33233	21313	13213
31112	33231	13321	32133	32323
13321	13133	32113	13321	13123
32113	21332	23323	31131	31311
13232	32123	12311	33323	12332
32123	13321	33233	12333	32131

Subtract:

(6)	(7)	(8)
5621420322	7326521432	6723284264
2875637819	2987618749	2896735878

(9)	(10)	(11)
2365432724	5372624271	8263214265
1983765469	2786918727	2938546899

(12) A. Link's total assets are $12,654.35; his liabilities are $3,962.87. What is his present worth? Ans. .....

(13) B. Egan lost $684.38 the first year; gained $436.45 the second year, when his present worth was $6,421.18. What was his capital at the beginning? Ans. .....

(14) Balance in Bank Oct. 1st, $936.71. Deposit Oct. 15, $318.75. Cheques from Oct. 1 to Oct. 31st: $42.87, $136.44, $9.75, $234.55. What is the balance in the Bank Nov. 1st? Ans. .....

Aim to get 100%

LESSON 14

Drill on rapid addition:

3	2	1	2	3	1	3	1	2	3	2	1	3	2	1	2	3	2
2	3	2	3	1	2	1	2	3	1	3	2	1	3	3	1	2	3
3	1	3	1	2	3	2	1	3	3	2	1	2	2	2	3	3	2
1	2	2	3	1	2	3	2	1	2	3	3	1	3	3	2	1	3
3	1	3	2	3	1	2	3	2	3	1	2	3	2	1	3	3	2
1	3	2	1	2	3	2	1	3	1	3	3	2	1	3	2	2	1
3	2	3	2	1	2	3	2	1	3	2	2	3	3	2	3	3	3
2	3	2	3	2	3	1	3	2	2	3	3	1	2	3	2	2	3
3	1	1	2	1	2	3	2	1	3	2	1	3	1	2	3	3	2
2	3	2	1	3	1	3	1	3	2	3	2	1	3	1	2	3	1
1	2	3	2	1	3	2	3	1	3	1	3	2	1	3	1	2	3
3	1	2	1	3	2	1	2	3	1	2	2	3	2	1	3	1	2
1	3	3	2	1	3	2	3	1	3	1	3	1	3	2	1	3	3
1	2	2	3	2	1	3	2	3	2	1	2	3	2	3	2	1	1
3	2	1	2	3	2	2	3	2	3	3	1	1	3	1	3	2	3
2	2	3	1	1	3	1	1	2	3	1	3	2	2	3	1	1	3
1	1	2	3	2	1	2	3	1	2	3	2	1	1	1	2	3	2
2	3	2	1	3	3	1	2	3	1	2	3	2	3	2	1	2	3
1	2	3	2	1	1	3	3	1	2	3	1	3	1	3	2	1	1
3	3	3	1	2	2	1	2	2	1	2	3	1	2	2	3	2	2

(1) Add each column, beginning at the right side. Do not carry at first and do not write any results at the bottom. Start at the left side and read the columns again. Practise reading the columns for five minutes or more.

(2) Drill on horizontal addition. Start with the top line and add from right to left and then from left to right. Do you get the same result? Follow the other lines of the question, in the same way.

(3) Treat the above question now as an addition question and get the sum. Drill until you can add the question in *three* minutes, without an error.

DRILL 14

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
23231	12321	32132	32123	13233
12323	23133	12321	12311	231[illegible]
23211	13213	32123	32123	[illegible]
32133	21322	12331	12331	13252
23211	32131	23122	23223	23311
32322	23232	31321	13112	31233
23212	12323	23213	31232	13321
31333	31231	12321	33213	23213
23231	23122	33213	12312	31233
21322	31231	12321	33232	12312
32123	23112	33132	13211	23232
23311	32323	21321	23322	12321
12232	12311	12332	31232	32123
32133	11132	31213	12323	13331
23212	21312	23211	31211	23232
32133	31123	12323	12323	32123
12321	23231	31231	33213	12321
31232	12321	23122	12322	32123
23122	23123	32321	31231	13321
31323	12312	22233	12323	23123
12131	31323	12321	31213	12332
23213	12321	31213	12321	23123
32323	31133	12331	33123	31233
23212	23212	32113	12321	23123
32133	31233	12321	23323	31233
23211	12322	32133	12313	13321
21332	31231	31122	31223	23123
12323	21323	23332	12332	31332
23212	13132	21232	32312	23123
31233	23313	12321	23223	12331

Find the sum by adding horizontally:

(6) 23132+32133+23211+32313+23233= .....

(7) 12323+23321+33133+31323+31322= .....

(8) 231+3232+32+23232+213+21+323= .....

(9) 313+21+23231+312+3132+33+232= .....

(10) From \$321.23+\$3.22+\$232.12 take \$32.33+\$2.32= .....

(11) From \$233.12+\$23.32+\$22.33 take \$23.11+\$33.23= .....

(12) From \$3,212.32+\$2,323.12 take \$1,123.12+\$1,213.13= .....

(13) From \$2,321.12+\$3,212.33 take \$232.13+\$313.22= .....

(14) From \$3,232.33+\$2,322.11 take \$312.33+\$232.13= .....

Accuracy first, then speed

LESSON 15

Drill *ten* minutes on the following:

Drill ten minutes on the following:

3 2 3 2 3 2 1 3 2 3 2 3. 2 2 3 2 3 3 2 3
2 3 2 1 2 3 2 2 3 2 3 2 3 3 2 3 2 1 3 2
3 2 1 3 2 3 1 2 1 3 2 3 2 1 3 2 3 2 1 2
3 1 3 2 3 2 3 3 2 3 3 2 3 2 2 3 2 1 3 3
2 3 2 3 2 1 2 3 2 1 2 3 2 3 3 2 3 2 1 1
1 3 1 3 1 3 2 2 2 3 2 1 3 2 3 1 2 3 3 2
2 3 2 3 2 1 3 2 3 2 3 2 3 3 1 2 3 2 1 3
3 1 3 2 2 3 2 1 2 3 3 3 2 3 1 2 3 2 3
1 3 2 3 3 1 3 2 3 1 2 3 1 3 2 2 3 3 1 3
2 3 3 1 2 2 3 3 1 2 3 2 3 1 2 1 2 2 1 3
2 1 3 3 3 1 2 3 2 3 2 1 3 3 2 3 1 3 1 1
3 2 1 3 2 3 2 1 2 1 1 3 2 3 2 2 3 1 2 3
2 3 2 3 1 3 3 2 1 3 3 2 1 2 3 2 1 2 1 1
2 1 3 2 2 2 1 3 2 1 3 2 3 3 1 3 2 1 3 3
3 2 1 3 3 1 3 2 1 3 2 3 2 3 2 3 1 2 1 3
2 1 3 2 1 2 3 2 3 3 1 3 3 2 3 2 3 1 3 1
3 1 2 3 3 1 3 1 2 3 2 3 2 1 3 1 2 3 2 3
2 3 3 2 1 3 2 1 3 2 3 1 3 2 1 2 3 2 1 3
3 2 3 2 3 1 2 3 3 2 2 3 1 2 3 2 1 3 2 2
2 3 2 3 2 3 1 3 2 3 3 1 2 3 2 3 2 1 3 3

(1) Try to add the above question in 3 minutes. If you fail to do so the first time, try again. Is the result correct? Accuracy first, then speed.

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right. Did you get the same result?

(3) Subtract by 3's from 48 to 0; from 96 to 18.

(4) Subtract by 4's from 72 to 8; from 120 to 0.

(5) Subtract by 8's from 64 to 0; from 160 to 32.

(6) Subtract by 9's from 72 to 0; from 171 to 27.

DRILL 15

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
232332	321232	232132	312132	3123
123231	232123	321321	213213	2331
321212	312132	233212	123123	3121
312323	231212	312333	312231	3233
231212	323232	231312	231211	1212
123232	231212	123231	312331	3123
213123	321312	232132	123123	1231
122312	123233	133212	312133	3233
231232	312311	321313	123211	1321
123123	232133	123232	321321	2332
132333	213212	231231	123233	1233
231231	331213	332133	212121	1321
312321	123131	231231	313323	3213
232123	312131	332133	123121	2312
123232	323312	131311	312323	3323
212312	123123	232122	123123	1232
323213	312312	212333	131331	1333
123232	123213	132123	232121	2312
212123	321312	312321	312313	2112
313133	212312	123232	123123	2233
123213	123233	321211	312131	3231
232123	312112	123232	132312	1232
321213	123212	212333	213213	2212
212323	312331	231212	123123	3213
313212	123213	312313	133133	1312
323213	321223	123213	312123	3131
121231	123212	121323	123213	2121
233123	312313	323121	312121	3232
213212	123213	122323	123212	1313
321323	232131	321313	312123	2123

Add the following horizontally:

(6) 313213+212131+312331+213233+123312= .....

(7) 212123+123123+133112+312122+231213= .....

(8) $312.32+$213.23+$2.23+$313.12+$2,312.22= .....

(9) $31.23+$333.21+$212.12+$13.12+$2.13+$13.33= .....

(10) $3,131.31+$231.12+$323.13+$3,231.12+$232.31= .....

(11) From $3,212.13+$232.12+$232.12 take $3,121.32= .....

(12) From $312.33+$2,123.11+$3.12 take $23.13+$323.31= .....

(13) From $3,121.31+$212.33+$31.12 take $3.13+$232.12= .....

(14) From $1,312.21+$313.21+$23.11 take $3.33+$1,313.12= .....

Aim to get 100%

LESSON 16

Multiplication

In order to use figures rapidly, re.diness in multiplication is absolutely necessary. The drills at the top of the pages give opportunity for systematic practice. Practise faithfully. Keep your eye on the row and concentrate. Name results accurately and rapidly.

9	3	6	7	4	8	7	2	3	5	2	7	6	9	8	3	5	7	8	6
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(1) Multiply each figure by 3, starting at the left side; as 27, 9, 18, 21, 12, 24, etc. Use the blunt end of your pencil, placing it under the first three at the left side and then moving it slowly to the right. Name the products as you move the pencil along. Practise in a similar way by starting at the right side and moving the pencil to the left. For the first few minutes, do not add the carrying figures.

(2) Start at the right side and multiply as in ordinary multiplication, adding the carrying figure, if there is one; as 18, 25, 23, 17, 10, 25, etc. Practise this method three or five minutes until you are sure of the results.

Division

3)9	6	4	5	6	3	2	9	8	7	6	5	4	3	2	8	9	7	2	6

(1) Drill on short division by three, naming the figures smoothly and regularly; as 3, 2, 1, 5, 2, 1, etc.

(2) Increase your speed. Practice for three minutes at a higher rate of speed. Be accurate.

DRILL 16

Date **Name**
Time **Seat No.**

Extend and add products:

(1)
234 x 3 =
521 x 3 =
442 x 3 =
325 x 3 =
126 x 3 = _____

(2)
219 x 3 =
326 x 3 =
412 x 3 =
529 x 3 =
264 x 3 = _____

(3)
2326 x 3 =
3264 x 3 =
2982 x 3 =
3267 x 3 =
4289 x 3 = _____

(4)
213 x 3 =
926 x 3 =
524 x 3 =
792 x 3 =
926 x 3 =
437 x 3 = _____

(5)
764 x 3 =
298 x 3 =
387 x 3 =
482 x 3 =
673 x 3 =
926 x 3 = _____

(6)
3723 x 3 =
4264 x 3 =
6729 x 3 =
5648 x 3 =
2689 x 3 =
4212 x 3 = _____

(7)
426 x 3 =
269 x 3 =
584 x 3 =
672 x 3 =
854 x 3 =
789 x 3 = _____

(8)
673 x 3 =
896 x 3 =
787 x 3 =
492 x 3 =
877 x 3 =
926 x 3 = _____

(9)
3721 x 3 =
8247 x 3 =
7364 x 3 =
2876 x 3 =
8924 x 3 =
7299 x 3 = _____

Divide and add quotients:

(10)
96288 ÷ 3 =
45834 ÷ 3 =
76329 ÷ 3 =
54783 ÷ 3 =
83964 ÷ 3 =
94587 ÷ 3 = _____

(11)
744 ÷ 3 =
699 ÷ 3 =
477 ÷ 3 =
591 ÷ 3 =
489 ÷ 3 =
579 ÷ 3 = _____

(12)
5472 ÷ 3 =
8492 ÷ 3 =
65778 ÷ 3 =
74784 ÷ 3 =
53178 ÷ 3 =
49122 ÷ 3 = _____

(13)
83247 ÷ 3 =
72732 ÷ 3 =
97548 ÷ 3 =
77493 ÷ 3 =
64737 ÷ 3 =
85278 ÷ 3 =
73542 ÷ 3 =
54795 ÷ 3 =
77688 ÷ 3 =
85677 ÷ 3 = _____

(14)
684 ÷ 3 =
531 ÷ 3 =
492 ÷ 3 =
549 ÷ 3 =
693 ÷ 3 =
516 ÷ 3 =
477 ÷ 3 =
498 ÷ 3 =
582 ÷ 3 =
744 ÷ 3 = _____

(15)
92367 ÷ 3 =
75846 ÷ 3 =
87294 ÷ 3 =
56388 ÷ 3 =
74877 ÷ 3 =
57987 ÷ 3 =
74232 ÷ 3 =
85458 ÷ 3 =
93876 ÷ 3 =
85647 ÷ 3 = _____

LESSON 17

Multiplication Drill:

4	8	2	6	7	3	5	4	2	7	8	5	6	4	9	2	3	5	8	7
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

(1) Multiply the figures in the top line by 3, starting at the left side and naming the products at a regular rate of speed; as 12, 24, 6, 18, 21, 9, 15, etc. Next, read the products from the right side to the left; as 21, 24, 15, 9, 6, 27, etc. Practise *three* minutes.

(2) Start at the right side and multiply by 3, adding the carrying figure, if any; as 21, 26, 17, 10, 7, 27, 14, etc. Go over the line several times until you can name the results without any hesitancy. Practise *three* minutes on this plan.

Division Drill

3)9	4	7	6	5	8	2	6	7	9	3	5	4	2	8	7	9	3	7	6

(1) Drill for *three* minutes on the above short division exercise; as 3, 1, 5, 8, 8, 6, etc.

(2) Practise the short division exercise several times, until you have materially increased your speed. Do not write the results, simply name the figures.

Short Method

To multiply by a number a little less than 100, 1,000, etc.:

The complement of a number is the difference between that number and 1 in the next higher order. The complement of 7 is 3; of 96 is 4, etc.

Example.—$2345 \times 997 =$?

Solution.—To 2345 annex three ciphers and you will have 2345000. Next take 3, the complement of 997, and multiply 2345 by 3 or 7035. 2345000—7035= 2337965, the product.

Rule:—Annex to the multiplicand as many ciphers as there are figures in the multiplier and from this result subtract the product of the multiplicand by the complement of the multiplier.

DRILL 17

Date *Name*

Time *Seat No.*

Multiply and then add the products:

(1)

563×3= .....
428×3= .....
657×3= .....
523×3= .....
375×3= .....

(2)

632×3= .....
543×3= .....
724×3= .....
584×3= .....
793×3= .....

(3)

2327×3= .....
4268×3= .....
5782×3= .....
6294×3= .....
5732×3= .....

(4)

626×3= .....
573×3= .....
629×3= .....
838×3= .....
549×3= .....
727×3= .....

(5)

854×3= .....
737×3= .....
926×3= .....
754×3= .....
826×3= .....
989×3= .....

(6)

4326×3= .....
2674×3= .....
5285×3= .....
7593×3= .....
2989×3= .....
3799×3= .....

(7)

923×3= .....
575×3= .....
294×3= .....
726×3= .....
848×3= .....
969×3= .....

(8)

657×3= .....
792×3= .....
854×3= .....
692×3= .....
754×3= .....
828×3= .....

(9)

937×3= .....
859×3= .....
296×3= .....
754×3= .....
926×3= .....
897×3= .....

Divide and add quotients:

(10)

654828÷3= .....
947589÷3= .....
479358÷3= .....
743796÷3= .....
556872÷3= .....
785478÷3= .....

(11)

854352÷3= .....
769869÷3= .....
548775÷3= .....
754989÷3= .....
985476÷3= .....
779859÷3= .....

Multiply and add products:

(12)

8492×98= .....
7678×97= .....
4939×95= .....
6858×94= .....
5484×93= .....
4788×92= .....
6924×96= .....
8498×94= .....

(13)

2324×195= .....
4267×296= .....
8542×392= .....
3498×497= .....
6275×593= .....
2789×694= .....
4788×396= .....
8928×897= .....

Aim to get 100%

LESSON 18

Drill on Multiplication by 3:

8	2	6	5	4	3	2	7	9	8	7	4	2	6	7
5	8	7	1	2	9	7	2	7	6	3	7	8	2	9
3	5	8	6	9	4	6	8	7	9	8	2	9	7	6
4	9	1	9	2	7	3	5	8	3	2	9	6	2	4

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 3; as 24, 6, 18, 15, 12, etc. Next read back from the right side; as 21, 18, 6, 12, 21, 24, etc. Go over the first line *four* times and then drill on the second, third and fourth lines in the same way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 3, adding the carrying figure, if any; as 21, 20, 8, 12, 22, etc. Drill on the other lines in a similar way. Go over each line several times.

Division Drill

3)8	4	7	6	7	2	9	6	7	5	4	3	2	7	8	4	7	5	2	8

Spend from three to five minutes on the short division drill. Do not write the results, but name them.

Short Method

To multiply by a number a little more than 100, 1,000, etc.

The supplement or excess of a number is the difference between that number and 1 in the next lower order. The supplement of 103 is 3; of 1006 is 6, etc.

Example.—$456 \times 102 = ?$

Solution.—Multiply 456 by 100 and you have 45600. The supplement of 102 is 2, hence multiply 456 by 2 and add the result to 45600. $45600 + 912 = 46512$, the product.

Rule:—Annex to the multiplicand as many ciphers as there are figures in the multiplier, less one, and to this result add the product of the multiplicand and the supplement of the multiplier. The result will be the product.

DRILL 18

Date *Name*

Time *Seat No.*

Multiply and then add products:

(1)	(2)	(3)
2478×3=	4265×3=	3498×3= .....
6249×3=	3727×3=	2897×3= .....
5487×3=	5649×3=	4788×3= .....
6249×3=	8267×3=	2969×3= .....
5416×3=	4988×3=	3498×3= .....
7829×3=	6775×3=	2764×3= .....

(4)	(5)	(6)
2763×3=	2939×3=	2926×3= .....
3497×3=	2648×3=	3297×3= .....
2684×3=	3657×3=	2859×3= .....
2593×3=	3589×3=	3768×3= .....
3692×3=	2694×3=	2899×3= .....
2499×3=	2787×3=	2587×3= .....

(7)	(8)	(9)
4628×3=	4269×3=	2756×3= .....
3792×3=	3788×3=	3298×3= .....
2876×3=	5692×3=	3827×3= .....
3757×3=	6289×3=	2754×3= .....
2989×3=	7584×3=	2697×3= .....
3737×3=	9267×3=	3489×3= .....

Divide and add quotients:

(10)	(11))	(12)
8448÷3=	7464÷3=	5877÷3= .....
9873÷3=	5988÷3=	9765÷3= .....
7452÷3=	8694÷3=	8277÷3= .....
5298÷3=	7329÷3=	5484÷3= .....
4782÷3=	8952÷3=	6894÷3= .....
8739÷3=	4797÷3=	7359÷3= .....

Multiply and add products:

(13)	(14)
242×102=	1584×1003= .....
375×104=	1672×1002= .....
582×105=	2485×1006= .....
697×108=	1896×1005= .....
487×103=	2787×1004= .....
652×102=	3275×1007= .....
588×107=	4737×1008= .....
669×106=	2694×1009= .....

Accuracy first, then speed.

LESSON 19

Drill on Multiplication by 3:

4	9	6	7	3	2	8	5	4	7	2	9	6	3	8	6
3	6	7	8	5	4	6	8	9	3	4	2	9	8	6	9
2	9	8	5	4	3	2	6	8	2	9	6	8	4	7	8
8	6	2	9	7	6	3	8	4	6	2	9	3	7	8	2
9	2	8	7	6	3	7	5	6	8	9	6	7	5	4	8

(1) Multiply each figure in the first line by 3, reading from left to right and then from right to left; as 12, 27, 18, 21, etc. Do not write the products on paper, simply name them. Drill on the other lines in a similar way. Watch smoothness and regularity.

(2) Start at the right side of the first line and multiply by 3, adding carrying figure, if any; as 18, 25, 11, 19, 28, etc. Go over each line *four* times, endeavoring to increase your speed as you practise.

Short Method

To multiply any number by a small multiplier whose units figure is 9:

Example.—637× 69= ?

637× 70=44590

44590—637=43953

Much time may be saved by multiplying by the next higher number, and from the result subtracting the multiplicand.

To Multiply by any Number of 9's

Example.—4568×9999= ?

Solution.—To 4568, the multiplicand, annex four 0's and you will have 45680000. Then 45680000—4568=45675432, the product.

Rule:—Annex to the multiplicand as many ciphers as there are 9's in the multiplier. From this result, subtract the multiplicand and the number thus obtained will be the product.

DRILL 19

Date *Name*

Time *Seat No.*

Multiply and then add products:

(1)	(2)	(3)
654×3=	288×3=	297×3= .....
267×3=	692×3=	498×3= .....
524×3=	585×3=	696×3= .....
678×3=	896×3=	874×3= .....
926×3=	769×3=	927×3= .....
147×3=	487×3=	488×3= .....
287×3=	296×3=	696×3= .....

(4)	(5)	(6)
482×3=	752×3=	769×3= .....
966×3=	298×3=	854×3= .....
854×3=	685×3=	926×3= .....
297×3=	966×3=	768×3= .....
765×3=	489×3=	496×3= .....
489×3=	767×3=	858×3= .....
765×3=	985×3=	489×3= .....
926×3=	778×3=	968×3= .....

(7)	(8)	(9)
239×3=	567×3=	326×3= .....
488×3=	675×3=	623×3= .....
672×3=	885×3=	875×3= .....
963×3=	588×3=	785×3= .....
485×3=	969×3=	587×3= .....
296×3=	699×3=	924×3= .....
962×3=	996×3=	492×3= .....
473×3=	473×3=	249×3= .....
734×3=	374×3=	676×3= .....
287×3=	743×3=	766×3= .....

Divide and add quotients:

(10)	(11)
4876329÷3=	4926582÷3= .....
7654977÷3=	8573898÷3= .....
6893586÷3=	4897644÷3= .....
4787697÷3=	5686989÷3= .....
6938979÷3=	8548974÷3= .....

Multiply and add products:

(12)	(13)
263×29=	468×49= .....
374×39=	536×69= .....
587×29=	832×79= .....
282×39=	678×59= .....
385×29=	893×89= .....
578×39=	499×99= .....

LESSON 20

Drill on Multiplication by 3:

4	8	7	6	5	6	3	4	8	2	7	2	9	6	8
6	2	8	9	7	8	5	6	9	7	6	3	4	8	7
2	9	7	6	3	4	8	7	6	5	2	6	7	3	5
4	8	6	9	5	7	3	6	7	8	9	5	4	8	2
6	7	3	4	8	2	9	5	4	7	6	3	9	2	9
8	5	4	3	2	7	6	2	8	5	4	2	7	6	7
2	9	6	4	8	5	7	3	2	8	5	4	8	2	9
6	7	2	6	7	3	8	5	4	2	9	8	7	6	3
4	2	6	8	3	2	7	2	9	8	6	3	4	8	5
2	9	8	2	6	3	4	3	2	7	8	5	2	7	9

(1) Drill on the 1st line, multiplying each figure by 3, reading from left to right and then from right to left; as 12, 24, 21, 18, 15, 18, 9, etc. Do not write the figures, simply name the products. Draw your pencil along the line and name products regularly. Go over the other lines in a similar way.

(2) Start at the right side of the 1st line and multiply by 3, adding carrying figure, if any; as 24, 20, 29, 8, 21, 8, etc. Drill on each line in this way *three* times. Increase your speed as you acquire facility in naming correct products.

Short Method

To multiply any number consisting of two or three figures and ending in 5, by itself.

Example.—Multiply 75 by 75.

Solution.—$7\times(7+1)=56$; annex 25, and the complete product will be 5625. You will note that you simply multiply the tens order by itself increased by 1 and annex 25 in order to get the product.

DRILL 20

Date *Name*
Time *Seat No.*

Extend and add products:

(1)
248 x 3 =
367 x 3 =
282 x 3 =
349 x 3 =
624 x 3 =
763 x 3 =
567 x 3 =
489 x 3 =
575 x 3 =
869 x 3 = _____

(2)
472 x 3 =
589 x 3 =
674 x 3 =
496 x 3 =
475 x 3 =
828 x 3 =
973 x 3 =
548 x 3 =
762 x 3 =
869 x 3 = _____

(3)
564 x 3 =
872 x 3 =
594 x 3 =
826 x 3 =
793 x 3 =
854 x 3 =
962 x 3 =
859 x 3 =
768 x 3 =
499 x 3 = _____

(4)
296 x 3 =
378 x 3 =
498 x 3 =
377 x 3 =
492 x 3 =
575 x 3 =
477 x 3 =
399 x 3 =
478 x 3 =
878 x 3 = _____

(5)
369 x 3 =
472 x 3 =
584 x 3 =
769 x 3 =
646 x 3 =
827 x 3 =
696 x 3 =
474 x 3 =
827 x 3 =
794 x 3 = _____

(6)
498 x 3 =
287 x 3 =
399 x 3 =
574 x 3 =
827 x 3 =
975 x 3 =
849 x 3 =
737 x 3 =
489 x 3 =
887 x 3 = _____

(7)
25 x 25 =
35 x 35 =
15 x 15 =
55 x 55 =
45 x 45 =
75 x 75 = _____

(8)
65 x 65 =
85 x 85 =
95 x 95 =
35 x 35 =
75 x 75 =
25 x 25 = _____

(9)
125 x 125 =
105 x 105 =
115 x 115 =
135 x 135 =
145 x 145 =
155 x 155 = _____

Divide and add quotients:

(10)
6948 ÷ 3 =
5769 ÷ 3 =
4788 ÷ 3 =
7284 ÷ 3 =
5892 ÷ 3 =
4962 ÷ 3 =
8946 ÷ 3 =
4878 ÷ 3 = _____

(11)
7698 ÷ 3 =
1989 ÷ 3 =
9498 ÷ 3 =
7689 ÷ 3 =
1797 ÷ 3 =
5469 ÷ 3 =
4971 ÷ 3 =
7488 ÷ 3 = _____

(12)
4377 ÷ 3 =
2898 ÷ 3 =
5949 ÷ 3 =
6873 ÷ 3 =
1977 ÷ 3 =
5682 ÷ 3 =
4971 ÷ 3 =
8547 ÷ 3 = _____

LESSON 21

4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
6	4	7	8	9	3	2	7	8	5	3	6	8	7	9	2	4	3	6	7

Drill faithfully for 10 minutes on the above figures, in the following manner:

(1) Name the sums of the groups, beginning at the left side. Use the blunt end of your pencil, place it under the 6 and then move the pencil to the right, naming the results as you glide the pencil along. Read back to the left side of the page. Read across and back five times at least.

(2) Start at the right side and name the sums of the groups, adding the carrying figure, if any. Run over the list *five* times in this way.

Trade Discounts

Trade Discounts are reductions from the fixed or list prices of articles.

It is customary for manufacturers and wholesale dealers to have fixed price lists for their goods. Trade discounts are usually made to make it unnecessary to change the price lists from time to time as the market changes. As the market varies, instead of issuing new catalogues or changing their price lists, merchants raise or lower their rates of discount.

Examples:

(1) The list price of a piano is $650. What is the net price if a discount series of 10% and 10% is allowed?

(2) List price is $324.75. Discounts are 10% and 10%. Find the net price.

Solution to (1):

$650.00
65.00=10% or 1/10

585.00
58.50=10% or 1/10

$526.50=Net price

Solution to (2):

$324.75
32.48=10% of $324.75

292.27
29.23=10% of $292.27

$263.04=Net price

Note:—To get 10% of a number, simply move the decimal point one place to the left. Five mills or more will be counted a full cent. See illustration.

DRILL 21

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
4123	2344	4224	2424	3434	4244
2341	4123	3242	4242	4343	3424
4232	2344	2344	3434	2244	2332
2433	4234	4323	4343	4343	4213
1234	2342	2442	2242	2424	3412
4321	4323	3241	3434	4141	2314
2244	2424	2424	2242	2343	4423
4322	4234	3242	4244	4242	2342
2442	2333	4244	3433	2424	4212
1234	4212	2433	2344	3131	2442
3424	2424	4124	2424	2424	4124
4212	3342	2444	3343	4141	3244
3424	2424	2332	2424	2424	2323
2313	3242	4212	3232	3232	4124
4242	2424	2444	4242	4141	2432

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 10% and 10%, find the net price in each case.

(7)	(8)	(9)	(10)	(11)	(12)
$465.41					
$	$	$	$	$	$

Subtract:

(13)	(14)	(15)
784236742	467324321	364267282
297654876	298765487	179874839

(16)	(17)	(18)
627482632	327242322	423262132
278928497	148767484	234784267

(19) I deposit cheques of face value as follows: $3.40, $22.30, $4.42, $12.24, $4.12 and $112.20. What is my total deposit? Ans. .....

(20) My bank balance on Sept. 1st was $2,432.24. During September, I made the following deposits: Sept. 5, $244.30; Sept. 15, $148.50; Sept. 20, $335.55. The following cheques were issued and presented for payment: $316.72, $43.55, $216.44 and $7.85. What is the balance in the bank Sept. 30th? Ans. ....

LESSON 22

4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2	4	7	6	7	8	7	6	3	4	2	7	8	2	6	7	3	2	6	9

(1) Add 4 to each of the lower figures, beginning at the left side and reading to the right; as 6, 8, 11, 10, 11, 12, etc. Do not write the sums, but simply name them. Read from the right side to the left, omitting carrying. Spend *three* minutes drilling in this way. Be earnest.

(2) Read from right to left, adding the carrying figure: as 13, 11, 7, 7, 11, etc. Go over the list *six* times.

(3) Consider the top number 14 instead of 4, and add combinations, beginning at the left side; as 16, 18, 21, 20, 21, 22, etc. Read back and forth several times in this way, until you can name the results easily and regularly.

(4) Use 24, 34, 44, etc., as the top number instead of 4 and name the sums of the groups. Daily drill on combinations will bring fluency in reading columns of figures. Practise faithfully.

Proving Addition

The simplest way to prove addition is to add the columns in reverse order. If the columns have been added from bottom to top, prove by adding from top to bottom.

Where very long columns are to be added, or where work is subject to interruptions, it is advisable to add each column by itself without carrying from one column to another. By this method, you may add columns from right to left and from left to right (See illustration). If the results are the same, the answer may be taken as correct.

	7485	
21	2917	
34	3524	25
25	4781	25
25	5968	34
		21
24675	24675	24675

DRILL 22

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
2424	4124	2442	3434	2324	4244
3232	2441	1234	2323	3244	3424
4242	3232	4212	4242	4213	2342
3323	4214	2422	2424	2341	3424
4213	2323	4424	1233	4234	2342
2442	1414	2343	4321	3341	4123
1224	2242	4244	2124	2423	2442
2342	3224	3323	3433	4242	3224
4124	4412	4242	2323	2431	2441
2323	2424	2424	4141	4123	4124
4124	3232	3343	2424	2342	3242
1414	4324	2424	3233	4124	4124
2323	2441	4242	4423	3242	3244
4141	3224	1441	2442	3424	4123
2323	4213	2323	3243	4132	2442
4132	2442	4242	4134	2442	3224
2344	4124	3434	2342	4124	4123
4124	2242	2121	4224	3323	2441
2323	4124	4242	3241	4241	2334
4242	2242	2424	2434	3434	4123
2424	3123	3233	4142	2323	2342
3342	4244	4344	2424	4243	4123

Prove your answers correct by carrying out the instructions given on the reverse side of this sheet, under the heading, "Proving Addition." Take a separate slip of paper and write the totals of each column, adding from left to right and from right to left.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 10% and 10% (Illustrations in Lesson 21).

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

(13) A merchant's income in 1918 was as follows: Salary $2,000, rent of house $360, and interest on funds in a savings bank, $45. His expenditures were: Butcher's bill $174, baker's $75, grocer's $268, insurance and taxes $98.74, and other expenses $192.35. How much did he save during that year?

Ans. .....

(14) From one hundred and twenty-seven million, six thousand and four, take ninety-nine million, two hundred and eight thousand six hundred and nine. Ans. .....

Accuracy first, then speed

LESSON 23

Drill for a few minutes on the following:

4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2	4	8	7	6	7	9	6	3	2	4	7	8	7	6	9	2	4	7	8

(1) Name the sums of the various groups, moving your pen back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that make up the group. Do not say: 2 and 4 are 6, but name the result at once, as 6. Beginning at the left side, we have the following results:—6, 8, 12, 11, 10, 11, 13, etc.

(2) Imagine the figures in the top row to be 24. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 26, 28, 32, 31, 30, etc. Go over the list several times until you can name the sums smoothly and regularly. Similarly, add 34, 44, 54, etc., as the top number.

Subtraction Drill

9	6	4	3	2	7	2	3	1	2	3	4	2	3	2	6	7	2
2	9	6	8	5	4	7	6	2	7	4	8	3	5	7	2	9	8

(1) Drill for a few minutes on the above subtraction exercise, starting at the *right* side and naming the differences; as 4, 7, 3, 5, 7, 8, etc. Draw your pencil along slowly at first and after a few practices, increase your speed.

(2) Subtract by 4's from 72 to 0; from 100 to 12.

(3) Subtract by 4's from 144 to 60; from 156 to 72.

DRILL 23

Date
Time

Name
Seat No.

(1)	(2)	(3)	(4)	(5)
42341	23423	42424	34233	23421
29424	42342	23342	42424	42324
34123	23423	42433	34234	24234
29442	42141	24244	23423	43242
14294	24234	42342	42342	34324
23423	32423	24234	24234	23432
42342	41294	32423	41231	42234
34234	32423	41234	24342	24244
23432	24294	23423	33424	32324
42123	41323	24242	24233	41312
23441	23424	41324	42342	21233
41294	34232	24342	23423	44324
29423	42131	41234	42232	23424
41234	24242	24342	24242	41232
24242	41324	42242	43324	23423
32424	24242	34424	24242	42142
24242	32131	23342	23323	32323
42424	43423	42324	42242	24242
23234	23242	24232	24324	42422
34244	42123	42344	42123	23244

Prove your answers correct by carrying out the instructions given in Lesson 22, for proving addition. Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 10% and 10% (Illustrations in Lesson 21).

(6) $ _____ $ _____

(7) $ _____ $ _____

(8) $ _____ $ _____

(9) $ _____ $ _____

(10) $ _____ $ _____

(11) 34262432 − 15978396 = _____ × 2

(12) 42763242 − 27897628 = _____ × 2

(13) 42732634 − 27987848 = _____ × 2

(14) 42323423 − 24437689 = _____ × 3

(15) 54232434 − 27876549 = _____ × 3

(16) 42763242 − 23896757 = _____ × 3

LESSON 24

Drill on rapid addition:

2	3	4	3	2	4	2	4	3	2	1	3	2	4	3	4	2	3
4	2	3	4	2	3	4	2	2	4	2	4	4	2	1	2	4	2
2	4	2	3	4	2	3	4	4	1	2	2	4	4	3	3	3	4
4	2	3	1	2	3	4	2	1	2	3	4	2	3	4	2	4	2
2	3	4	3	4	4	3	4	2	4	2	3	4	2	1	4	2	4
3	2	2	4	2	3	4	2	4	1	2	2	3	4	3	2	3	2
2	4	3	2	4	2	2	3	3	2	4	1	4	2	2	3	2	4
4	2	2	4	2	4	4	2	3	3	2	4	2	4	3	2	3	3
3	2	4	2	3	2	2	4	2	1	3	1	4	2	4	4	2	1
2	3	2	4	1	2	1	2	4	2	4	2	4	3	2	2	4	4
4	2	4	2	4	3	4	4	2	3	3	4	2	4	3	4	2	3
2	4	3	3	1	2	3	4	2	1	1	3	2	3	4	3	4	2
3	2	4	2	4	4	2	2	4	4	3	2	4	4	2	4	3	4
4	3	2	4	3	2	1	4	2	3	4	3	2	3	4	2	4	1
2	4	3	2	2	1	2	1	4	1	2	4	3	2	3	3	4	4
4	1	2	3	4	3	4	2	3	2	4	2	4	2	4	4	3	2
3	4	3	4	2	4	2	4	2	4	2	2	3	4	2	3	4	4
2	3	2	3	1	2	3	1	4	1	3	3	4	2	3	3	2	1
4	2	4	2	4	3	2	4	2	3	2	3	4	3	2	4	3	2
3	3	2	4	2	3	4	2	4	2	1	2	2	4	3	2	4	4

(1) Add each column, beginning at the right side. Do not carry at first and do not write any results at the bottom. Start at the left side and add the columns again. Practise reading the columns for five minutes.

(2) Drill on horizontal addition. Start with the top line and add from left to right and then from right to left. Are the results the same? Practise horizontal addition on the other lines of the question, in the same way.

(3) Let the above block of figures, eighteen figures wide and twenty figures deep, represent an addition question. Get the sum, writing the results as you add. Drill on the question, adding and re-adding, until you can add the complete question in 3 minutes.

DRILL 24

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
32424	23423	42344	34242	23424
24232	42344	24233	42324	42331
42342	24232	42342	23442	42144
24234	42344	34233	42323	23421
24324	34233	23421	24234	42134
23414	42342	42324	41241	34212
24234	24324	23422	23423	42323
32442	41211	42114	42342	23442
43224	34344	34232	34224	42324
24423	23421	42343	32342	24341
42342	42344	23423	44322	23422
23423	32233	42343	23244	42132
42342	43423	32444	24321	24424
24243	24232	21231	42134	32323
43422	43421	34324	34212	43434
24242	34212	23423	42144	24221
42324	23423	42131	34233	22434
24242	42342	24223	22344	34224
32424	34233	42334	24232	14212
43242	24244	23423	42123	23134
24324	23323	42341	41432	14232
23312	42344	24234	24123	41244
34244	23234	32423	32432	34322
23424	42323	42133	23243	23442
42341	24234	24212	42324	24123
34243	23324	32423	24232	41244
42424	42232	43212	42324	32421
34234	23422	24324	23421	42342
23244	42342	41223	42324	23443
42323	23423	23442	32423	12324

Prove your answers correct in each of the five questions.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 10% and 10% (Illustrations in Lesson 21).

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

Find the sum by adding horizontally:

(11) $423.31+$2.23+$431.42+$4.22+$242.22= $.....

(12) $2,342.24+$44.21+$323.22+$3.32+$423.34= $.....

LESSON 25

Drill *ten* minutes on the following:

2	3	4	2	3	1	4	2	4	3	2	1	3	4	2	4	1	2	3	2
3	2	3	4	2	3	2	4	2	4	3	2	1	3	4	2	3	4	2	4
1	2	4	2	4	2	3	2	4	1	1	3	2	1	3	4	2	3	4	2
3	4	2	3	2	3	2	4	2	3	4	2	1	3	4	2	3	2	3	3
2	3	4	2	3	2	1	2	3	2	1	3	4	2	3	1	4	3	2	4
1	2	3	3	4	1	3	4	2	3	4	2	3	3	4	3	2	4	3	2
4	1	2	3	2	3	2	3	4	2	1	3	2	2	3	2	4	2	4	4
2	3	4	2	4	2	1	2	2	3	4	2	4	3	2	4	3	3	2	2
3	2	2	3	4	3	2	3	1	2	3	4	2	2	1	2	4	2	3	3
4	3	3	2	1	2	3	4	2	3	2	3	4	3	2	4	2	3	4	3
2	4	4	2	3	4	2	3	4	2	3	4	3	2	1	3	4	2	3	1
3	2	1	1	2	3	1	1	2	3	3	2	4	3	2	1	2	3	1	2
4	3	2	3	4	2	3	2	1	1	2	3	2	2	3	4	3	2	2	4
2	4	3	2	2	4	2	2	4	2	3	2	3	1	2	3	4	3	3	2
4	1	2	1	3	2	4	2	4	1	1	3	4	3	1	2	2	4	4	1
3	3	4	2	4	1	2	1	2	3	3	4	2	4	3	1	3	2	2	4
2	3	3	4	3	2	3	2	4	1	2	1	3	2	4	2	2	3	3	2
4	2	1	2	3	4	4	3	2	3	4	2	4	3	2	2	4	2	3	4
2	3	2	3	2	3	2	4	1	2	3	4	2	4	3	2	2	3	4	1
4	2	4	2	4	3	3	2	3	4	1	2	3	2	4	4	3	2	3	2

(1) After drilling 10 minutes on reading the above columns, try to add the question in 4 minutes. When reading the columns, do not write the results, but aim to read smoothly and regularly. After ten minutes' preparatory practice, treat the question as an addition question and write the results in pencil. There are 400 figures in the question. After getting the correct result, say in 4 minutes, try to increase your speed to 3 minutes. It can be done.

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right. Did you get the same total?

(3) Add by 4's from 16 to 84; from 75 to 155.

(4) Subtract by 4's from 96 to 0; from 132 to 48.

DRILL 25

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)
234312	342323	421234	322142
423224	234234	234421	234324
234342	421312	421342	412432
421212	234224	234123	234123
234324	341242	412342	412341
423212	324421	243214	223422
234324	232342	324422	342214
412232	423234	432123	413423
234243	242423	243432	342341
412312	212132	412244	234232
234242	423212	243412	412321
412321	234324	323242	234234
234224	421312	231412	423321
321211	234242	342123	234123
432244	411321	413422	412321
213423	234242	342124	231232
432212	322423	234234	423412
234324	442342	412321	234233
411241	234213	432443	421323
234324	421432	244321	123432
412232	234244	123242	321231
324421	142322	431421	442124
232242	424234	344234	231421
421324	232421	212321	34242
234222	413244	434232	321424
421324	234421	242342	124312
232232	341341	412234	412223.
421321	424324	341322	234124
234224	232431	413243	321432
421323	343242	234422	234231
_____	_____	_____	_____

Prove your answers correct in each of the four addition questions and consider each result a list price in dollars and cents. Allowing 10% and 10%, find net price.

(5)$	(6)$	(7)$	(8)$
_____	_____	_____	_____
_____	_____	_____	_____
$	$	$	$

Find the sum by adding horizontally:

(9) 213412+314224+242312+314234+234124— .....

(10) 342+2432+24241+32+4242+323+42— .....

(11) $42.12+$3.44+$232.31+$4.12+$31.24+$4.24— .....

(12) $3,424.14+$242.12+$342.34+$223.22+$4,223.12— .....

(13) From $4,232.42+$234.22 take $34.24+$2,482.13— .....

(14) From $6,434.41+$42.24 take $13.22+$3,342.44— .....

Aim to get 100%

LESSON 26

Multiplication

4	3	6	9	8	2	3	5	4	2	3	4	5	8	6	4	7	9	3	7
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

(1) Name the product of each of the top figures by 4, beginning at the left side; as 16, 12, 24, 36, 32, 8, etc. Run the blunt end of your pencil along and name the products regularly. Start at the right side and name products. Drill for three minutes in this way.

(2) Start at the right side and multiply by 4 as in ordinary multiplication, adding the carrying figure, if any; as 28, 14, 37, 31, 19, etc. Spend three minutes or more on this form of practice. Are you hesitating in naming results? Go over and over the line until you can name the accurate results smoothly. Do not write any figures on the paper.

Division

4)8	5	4	3	8	9	6	7	5	4	3	6	7	5	4	2	7	6	4	8

(1) Drill on short division by 4, naming the figures without any hesitancy; as 2, 1, 3, 5, 9, 7, 4, etc. Go slowly at first. Be accurate.

(2) Increase your speed. Practise *three* minutes on the drill in order that you may read the results quickly and accurately. Do not write any figures on the paper.

DRILL 26

Date *Name*

Time *Seat No.*

Multiply and then add products:

(1)	(2)	(3)
342×4=	426×4=	752×4= .....
873×4=	573×4=	397×4= .....
325×4=	827×4=	528×4= .....
136×4=	593×4=	692×4= .....
246×4=	646×4=	387×4= .....
358×4=	598×4=	599×4= .....

(4)	(5)	(6)
525×4=	823×4=	756×4= .....
377×4=	396×4=	823×4= .....
428×4=	748×4=	977×4= .....
977×4=	926×4=	578×4= .....
892×4=	774×4=	399×4= .....
579×4=	857×4=	858×4= .....

(7)	(8)	(9)
376×4=	923×4=	584×4= .....
584×4=	584×4=	737×4= .....
738×4=	692×4=	927×4= .....
542×4=	737×4=	858×4= .....
367×4=	856×4=	737×4= .....
483×4=	923×4=	696×4= .....

Divide and add quotients:

(10)	(11)
926484÷4=	585496÷4= .....
768572÷4=	792784÷4= .....
937548÷4=	578496÷4= .....
598672÷4=	897656÷4= .....
954868÷4=	754892÷4= .....
747564÷4=	579652÷4= .....

(12)	(13)
567424÷4=	679868÷4= .....
928976÷4=	985472÷4= .....
753684÷4=	756988÷4= .....
549872÷4=	569752÷4= .....
698568÷4=	975856÷4= .....
764852÷4=	758952÷4= .....

(14)	(15)
27842637	92734827
41	41

LESSON 27

Multiplication Drill:

4	9	8	3	6	7	5	4	8	6	7	5	8	3	9	2	6	7	8	4
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

(1) Multiply the figures in the top line by 4, starting at the left side and naming the products at a regular rate of speed; as 16, 36, 32, 12, 24, etc. Next read the products from the right side to the left; as 16, 32, 28, 24, 8, 36, etc. Practise *three* minutes in this way.

(2) Start at the right side and multiply by 4, adding the carrying figure, if any; as 16, 33, 31, 27, 10, etc. Go over and over the line in this way until you can name the correct results without any hesitancy. Practise *three* minutes on this plan.

Division Drill:

4)7	8	4	9	8	3	7	5	4	8	5	9	6	8	5	6	7	5	7	2

(1) Drill *three* minutes on the above short division exercise; as 1, 9, 6, 2, 4, 5, 9, 3, etc.

(2) Go over and over the drill until you have materially increased your speed. Do not write the results on paper, simply name them.

Short Method

To multiply by the "teens"—13 to 19, inclusive:

Long way:

4736
14

18944
4736

66304

In multiplication work, besides the multiplying, there is the adding required in carrying. When multiplying by the "teens", multiply by the units figure and add the figure to the right each time. The second line of the product is simply added to the usual carrying figures. To illustrate: 6×4=24. 3×4+2+6=20. 7×4+2+3=33. 4×4+3+7=26. 2+4=6. Product=66304.

DRILL 27

Date *Name*

Time *Seat No.*

Multiply and then add the products:

(1)

423×4= .....
367×4= .....
582×4= .....
763×4= .....
235×4= .....
467×4= .....

(2)

752×4= .....
823×4= .....
767×4= .....
584×4= .....
792×4= .....
868×4= .....

(3)

964×4= .....
874×4 =.....
769×4= .....
368×4= .....
496×4= .....
878×4= .....

(4)

758×4= .....
962×4= .....
857×4= .....
496×4= .....
848×4= .....
757×4= .....

(5)

379×4= .....
826×4= .....
973×4= .....
857×4= .....
962×4= .....
789×4= .....

(6)

774×4= .....
826×4= .....
696×4= .....
758×4= .....
634×4= .....
989×4= .....

(7)

488×4= .....
397×4= .....
268×4= .....
957×4= .....
847×4= .....
699×4= .....

(8)

366×4= .....
597×4= .....
826×4= .....
763×4= .....
926×4= .....
759×4= .....

(9)

674×4= .....
826×4= .....
579×4= .....
862×4= .....
774×4= .....
927×4= .....

(10)

326×13=.....
472×13=.....
856×13=.....
769×13=.....
426×13=.....
692×13=.....

(11)

482×13= .....
696×13= .....
875×13= .....
962×14= .....
499×13= .....
858×13= .....

(12)

393×13=.....
496×13=.....
672×13=.....
758×13=.....
492×13=.....
824×13=.....

(13)

546×14=.....
498×14=.....
762×14=.....
369×14=.....
826×14=.....
539×14=.....

(14)

399×14= .....
826×14= .....
752×14= .....
868×14= .....
757×14= .....
862×14= .....

(15)

749×14=.....
826×14=.....
737×14=.....
858×14=.....
393×14=.....
679×14=.....

Divide and add quotients:

(16)

876548÷4= .....
927852÷4= .....
754624÷4= .....
497852÷4= .....
769784÷4= .....
578692÷4= .....

(17)

589676÷4= .....
768544÷4÷ .....
876948÷4= .....
696752÷4= .....
754872÷4= .....
549768÷4= .....

Aim to get 100%

LESSON 28

Drill on Multiplication by 4:

7	5	6	4	3	2	8	5	7	9	6	4	8	9	2
4	8	7	6	5	9	3	2	8	4	9	2	7	6	9
5	7	4	8	3	2	7	6	4	9	7	5	7	8	4
7	2	9	6	5	8	4	9	7	6	3	4	9	7	6

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 4; as 28, 20, 24, 16, 12, 8, etc. Next read from the right side to the left; as 8, 36, 32, 16, 24, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 4, adding the carrying figure, if any; as 8, 36, 35, 19, 25, 38, etc. Drill on the other lines in a similar way. Go over each line several times.

Division Drill

4)9	2	4	8	7	6	9	5	2	7	6	4	8	7	9	5	4	6	5	2

Spend from three to five minutes on the short division drill. Do not write the results, but simply name them.

Short Method

Learn thoroughly the "teen" multiplication as illustrated by 14 in Lesson 27. Multiply by 4 in the ordinary way, adding the carrying figure, and also the figure to the right of the one multiplied.

4874	4×4	=16
14	7×4+1+4	=33
68236	8×4+3+7	=42
	4×4+4+8	=28
	2+4	= 6

DRILL 28

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
692×4=	782×4=	549×4= .....
378×4=	496×4=	826×4= .....
596×4=	878×4=	549×4= .....
872×4=	962×4=	367×4= .....
579×4=	498×4=	826×4= .....
872×4=	776×4=	797×4= .....
(4)	**(5)**	**(6)**
598×4=	269×4=	496×4= .....
678×4=	858×4=	294×4= .....
767×4=	769×4=	874×4= .....
858×4=	737×4=	299×4= .....
767×4=	229×4=	876×4= .....
936×4=	887×4=	399×4= .....
(7)	**(8)**	**(9)**
339×4=	584×4=	672×4= .....
299×4=	299×4=	398×4= .....
877×4=	876×4=	688×4= .....
398×4=	929×4=	739×4= .....
599×4=	498×4=	492×4= .....
678×4=	377×4=	856×4= .....
(10)	**(11)**	**(12)**
651×14=	232×14=	354×14= .....
492×14=	349×14=	926×14= .....
375×14=	862×14=	478×14= .....
478×14=	577×14=	626×14= .....
272×14=	826×14=	727×14= .....
389×14=	369×14=	567×14= .....
(13)	**(14)**	**(15)**
352×14=	267×14=	854×14= .....
877×14=	663×14=	672×14= .....
395×14=	597×14=	967×14= .....
654×14=	826×14=	496×14= .....
877×14=	697×14=	873×14= .....
399×14=	325×14=	567×14= .....

Divide and add quotients:

(16)	(17)
926732÷4=	896784÷4= .....
787368÷4=	579864÷4= .....
967548÷4=	789672÷4= .....
754864÷4=	678968÷4= .....
976576÷4=	976748÷4= .....
789652÷4=	756796÷4= .....

LESSON 29

Drill on Multiplication by 4:

8	5	4	7	6	9	8	2	4	7	3	9	4	9	2	8
4	7	8	2	9	3	7	6	5	4	6	2	9	7	6	4
9	3	6	5	4	8	6	9	7	5	3	4	2	6	7	8
4	9	3	6	7	5	4	8	6	9	7	3	8	4	9	2

(1) Multiply each figure in the first line by 4, reading from left to right and then from right to left; as 32, 20, 16, 28, 24, etc. Do not write the products, simply name them. Drill on the other lines in a similar way. Be careful to name results smoothly and regularly.

(2) Start at the right side of the first line and multiply by 4, adding carrying figure, if any; 32, 11, 37, 19, 37, etc. Go over each line *four* times. Try to increase your speed, but not at the sacrifice of accuracy.

(3) When multiplying by 14, you generally have two figures to add—the carrying figure and the figure to the right of the one multiplied. For preparatory drill, start on the third line at the top, at the right side, and multiply each figure by 4. Add the two figures above. To illustrate: 32, 36, 44; 28, 34, 36; 24, 31, 40, etc. Drill from left to right in a similar way and then use the last three lines. This is a valuable exercise in multiplication and addition, so practise faithfully for *five* minutes or more.

Review Short Method by 14

4869	9×4	$=36$
14	$6\times4+3+9$	$=36$
———	$8\times4+3+6$	$=41$
68166	$4\times4+4+8$	$=28$
	$2+4$	$=6$

DRILL 29

Date
Time

Name
Seat No.

Extend and add products:

(1)
2324 x 4=
1462 x 4=
3624 x 4=
2482 x 4=
3264 x 4=
5472 x 4=_____

(2)
3467 x 4=
2684 x 4=
3796 x 4=
4278 x 4=
3796 x 4=
4879 x 4=_____

(3)
3421 x 4=
5637 x 4=
2969 x 4=
4727 x 4=
5687 x 4=
6792 x 4=_____

(4)
4689 x 4=
3775 x 4=
4968 x 4=
7692 x 4=
8269 x 4=
4987 x 4=_____

(5)
3899 x 4=
2787 x 4=
9267 x 4=
4986 x 4=
3767 x 4=
5782 x 4=_____

(6)
7489 x 4=
3796 x 4=
5269 x 4=
3786 x 4=
2989 x 4=
4767 x 4=_____

(7)
3968 x 4=
4267 x 4=
3792 x 4=
5878 x 4=
3696 x 4=
4284 x 4=_____

(8)
3694 x 4=
2974 x 4=
8767 x 4=
5989 x 4=
3767 x 4=
2696 x 4=_____

(9)
5489 x 4=
2973 x 4=
3669 x 4=
4787 x 4=
2696 x 4=
3787 x 4=_____

(10)
2641 x 14=
1362 x 14=
2424 x 14=
3412 x 14=
2646 x 14=
2394 x 14=_____

(11)
2692 x 14=
3487 x 14=
4269 x 14=
2676 x 14=
4292 x 14=
3676 x 14=_____

(12)
2626 x 14=
4262 x 14=
2698 x 14=
3787 x 14=
2969 x 14=
5487 x 14=_____

(13)
2692 x 14=
3787 x 14=
4269 x 14=
3787 x 14=
2969 x 14=
3678 x 14=_____

(14)
5292 x 14=
3876 x 14=
2689 x 14=
4769 x 14=
2896 x 14=
3767 x 14=_____

(15)
2689 x 14=
5277 x 14=
3898 x 14=
2769 x 14=
4698 x 14=
3276 x 14=_____

LESSON 30

Drill on Multiplication by 4:

4	2	8	7	6	3	2	9	2	4	7	3	2	8	4
3	7	2	4	9	6	3	2	4	7	8	2	9	6	7
2	6	7	8	4	7	5	6	9	3	2	7	8	4	2
9	3	4	7	5	6	9	4	7	8	4	6	9	3	6
2	4	7	2	6	9	7	3	6	4	9	7	6	2	5
3	9	6	4	8	6	9	2	4	7	2	6	3	7	4
2	7	5	9	6	8	4	6	2	6	9	3	7	2	6
5	9	2	4	2	3	6	8	5	4	3	6	9	7	5
4	2	8	7	6	2	9	3	2	4	7	8	2	6	9
2	9	5	4	7	8	3	6	9	7	2	6	9	2	4

(1) Drill on the first line, multiplying each figure by 4, reading from left to right and then from right to left; as 16, 8, 32, 28, 24, etc. Draw your pencil along the line and try to name the products regularly. Do not write any results. Go over the other lines in a similar way.

(2) Start at the right side of the first line and multiply by 4, adding carrying figure, if any; as 16, 33, 11, 13, 29, 18, 9, etc. Drill on each line in this way *three* times. Try to increase your speed as you acquire facility in naming correct products.

(3) Group two lines, multiplying the lower figure by 4 and adding the top figure; as 28, 32; 24, 32; 36, 38, etc. Read from right to left and then back. Drill on the other four pairs of lines in a similar way.

(4) Group three lines, multiplying the figure in the third line by 4 and adding the two figures above; as 8, 15, 19; 16, 22, 30; 32, 41, 43, etc. Read from right to left and then back. Drill on the other lines in a similar way. These drills cultivate readiness and accuracy. Work faithfully until you see improvement.

DRILL 30

Date *Name*

Time *Seat No.*

Multiply and then add products:

(1)	(2)	(3)
2642×4=.....	3402×4=.....	4262×4=.....
3796×4=.....	2894×4=.....	3697×4=.....
8262×4=.....	8626×4=.....	4287×4=.....
3695×4=.....	9262×4=.....	3976×4=.....
2787×4=.....	6785×4=.....	2787×4=.....
4269×4=.....	4787×4=.....	3478×4=.....

(4)	(5)	(6)
2696×4=.....	3787×4=.....	5828×4=.....
3787×4=.....	4929×4=.....	4929×4=.....
2689×4=.....	2677×4=.....	3767×4=.....
3474×4=.....	3929×4=.....	4829×4=.....
2898×4=.....	4787×4=.....	3767×4=.....
3676×4=.....	3696×4=.....	2696×4=.....

(7)	(8)	((9)
3426×14=.....	3127×14=.....	4262×14=.....
2789×14=.....	4262×14=.....	3494×14=.....
5272×14=.....	3969×14=.....	2686×14=.....
3494×14=.....	4727×14=.....	3742×14=.....
2676×14=.....	3969×14=.....	5786×14=.....
5694×14=.....	2687×14=.....	3692×14=.....

(10)	(11)	(12)
4727×14=.....	3424×14=.....	2332×14=.....
3464×14=.....	2676×14=.....	2696×14=.....
2986×14=.....	5262×14=.....	4272×14=.....
4727×14=.....	3678×14=.....	3443×14=.....
3286×14=.....	2462×14=.....	2696×14=.....
2776×14=.....	5898×14=.....	5445×14=.....

(13)	(14)	(15)
2696×14=.....	2688×14=.....	4264×14=.....
2774×14=.....	3262×14=.....	3784×14=.....
3664×14=.....	4767×14=.....	6272×14=.....
2778×14=.....	2989×14=.....	3787×14=.....
2696×14=.....	3767×14=.....	5626×14=.....
3478×14=.....	2484×14=.....	3474×14=.....

Accuracy first, then speed

LESSON 31

5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	7	8	4	9	6	5	4	7	8	3	2	7	9	2	6	4	8	3	7

(1) Add 5 to each of the lower figures, beginning at the left side; as 8, 12, 13, 9, 14, ete. Draw the blunt end of your pencil along slowly, naming the sums as the pencil comes under each group. Next read from right to left in a similar way. Practise *three* minutes.

(2) Start at the right side and name the sums of the groups, adding the carrying figure, if any; as 12, 9, 13, 10, 12, 8, etc. Run over the list *five* times.

Proving Addition by Casting out 9's

This method of proof is based on the fact that any number divided by 9 will leave the same remainder as the sum of its digits divided by 9.

Let us illustrate by using 4785.

$$
\begin{aligned}
4785 = \quad & 4000 = 4(1000) = 4(999+1) = 4\times 999+4 \\
& 700 = 7(\ 100) = 7(\ 99+1) = 7\times\ 99+7 \\
& 80 = 8(\ 10) = 8(\ 9+1) = 8\times\ 9+8 \\
& 5 = 5 \qquad = 5 \qquad\quad = \qquad 5
\end{aligned}
$$

From this analysis, it will be seen that 4785 may be written: $4\times999+7\times99+8\times9+4+7+8+5$. When written in this form, it will be seen that the only remainder that can come from a division of the number by 9 will come from a division of $4+7+8+5$ by 9; that is, from a division of the sum of the digits by 9.

Illustration:		Sum of Digits		Casting out 9's leaves
27643	=	22	=	4
54741	=	21	=	3
97814	=	29	=	2
36329	=	23	=	5
92554	=	25	=	7
98929	=	37	=	1
408010		9)13		9)22
		1—4		2—4

Proof:—Cast the 9's out of the addends, also cast the 9's out of the sum. If the excesses agree, the work is correct.

DRILL 31

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
2345	4545	3443	2445	3245	4545
1234	3254	2545	3234	2454	3234
5423	4525	3234	5244	3245	5423
2442	3443	1551	5435	4424	3545
5353	2141	2345	2543	5245	2334
2425	5435	3242	5235	3233	5423
3242	3444	5455	4323	5454	5151
5354	2345	3245	5235	2345	4234
2525	5123	5432	4523	5434	5353
3443	4454	2455	2434	2344	2424
5252	3245	5324	5245	5235	3552
2525	5334	2532	3524	3341	4234
3343	2553	5123	5141	2525	5125
5252	5245	2345	3525	4244	4244
4244	3524	4534	5454	5355	3535

Prove that your answer is correct in each of the six addition questions by casting out 9's. Use a separate piece of paper on which to work your proofs.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 10% and 10%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

(13) A man invests $17,280 as follows: 10% in manufacturing stock, 10% of the remainder in city lots and the balance in a partnership. How much is his interest in the partnership? Ans. .....

(14) The catalogue price of hats is $4.00, subject to discounts of 10% and 10%. How many hats can be bought for $243.00? Ans. .....

(15) I bought 75 carpet sweepers at $6.00 each, less 10% and 10%, and sold them at $6.00 each, less 10%. What was my total profit? Ans. .....

Aim to get 100%

LESSON 32

5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3	4	6	7	8	5	4	9	7	8	2	6	4	9	6	4	3	2	6	7

(1) Add 5 to each of the lower figures, beginning at the left side and reading to the right; as 8, 9, 11, 12, 13, 10, etc. Do not write the sums, but simply name the results. Read from the right side to the left in a similar way. Drill *five* minutes. Are you watching smoothness and regularity?

(2) Read from right to left, adding the carrying figure; as 12, 12, 8, 8, 9, 11, 15, etc. Go over the list *six* times.

(3) Consider the top number 15 instead of 5, and add combinations, beginning at the left side; as 18, 19, 21, 22, 23, etc. Read back and forth several times in this way until you can name the results easily and accurately.

Trade Discounts

Example:—The list price is $243.77. Discounts are 10% and 5%. Find the net price.

Solution:

$243.77
24.38—10% or 1/10

219.39
10.97— 5% or ½ of 10%

$208.42—Net price.

Note:—To get 10% of an amount, simply move the decimal point one place to the left. In our practice, 5 mills or more will be counted a cent. In the above illustration, 10% of $243.77 would be $24.377 or $24.38 to nearest cent; 5% of $219.39 would be ½ of 10% of $219.39. 10%=$21.939, therefore 5%=½ of $21.939 or $10.9695 or $10.97 to nearest cent. For quick calculation, use 5% as ½ of 10%. Watch your short division by 2.

DRILL 32

Date *Name*
Time *Seat No.*

(1)	(2)	(2)	(4)	(5)	(6)
3452	2452	4545	4523	3443	2422
2432	3545	3443	1234	2335	3245
3543	2324	2423	5212	4223	3524
2432	3535	4245	2525	5435	5121
1243	2342	3432	4234	2345	3545
4535	3545	2345	5423	5123	5121
3242	2323	4542	2525	4342	4525
2535	4242	5211	4123	2535	3242
4254	3434	3345	5252	4234	5325
3542	5151	2355	3542	5151	4234
1234	2435	5432	3455	2545	5121
5123	5215	2545	4231	3434	3553
4545	4124	3252	2345	5125	2424
2323	3452	5151	4232	4234	3541
4245	5124	2525	5454	5353	2435
3452	3434	3443	3245	2424	5252
2345	5252	5251	5334	3233	4125
5124	4345	2445	4552	4545	2542

Prove that your answers are correct in questions 1 to 6, by casting out 9's (Illustrated in Lesson 31). Use a separate piece of paper to work the proofs.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 10% and 5%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

(13) One merchant offers to sell neckties for $12.00 a dozen, with discounts of 10% and 10% off; another offers the same grade at $11.00 a dozen, with discounts of 10% and 5%. Which is the better offer, and how much better per dozen? (Take off discounts to nearest cent.) Ans. .....

(14) The catalogue price of hats is $4.00, subject to discounts of 10% and 5%. How many hats can be bought for $427.50? Ans. .....

Accuracy first, then speed

LESSON 33

Drill for a few minutes on the following:

5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
8	6	4	9	8	7	4	3	2	5	9	6	8	5	3	4	7	8	9	7

(1) Name the sums of the various groups, moving your pencil back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that make up the group. Do not say: 3 and 5 are 8, but name the total at once, 8. Beginning at the left side, we have the following results:—8, 11, 9, 14, 13, 12, etc. Drill faithfully. Make every minute count for good results.

(2) Imagine the figures in the top row to be 25. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 28, 31, 29, 34, 33, 32, etc. Go over the list several times until you can name the sums regularly and accurately. Similarly, try adding 35, 45, 55, etc., as the top number.

Complements

The complement of a number is that number which it falls short of being 10, 100, 1000, or some other similar multiple of 10; or, a number is said to be the complement of another when the sum of the two is a unit of the next higher order; thus 3 is the complement of 7; 26 is the complement of 74; 364 is the complement of 636.

The ability to name complements at sight is very useful in the business office in making change.

DRILL 33

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
23452	45234	24342	42345	45235
34245	24532	53525	24221	24342
45324	42341	23453	32442	51212
24532	23455	34522	54212	24545
52452	32324	51235	23554	32121
35245	52342	23442	54235	45345
42531	15125	12345	32131	24521
25425	34242	43212	25215	21433
34534	52323	52543	42324	32452
25232	44525	24324	52135	53245
42545	52452	51231	45212	24532
34252	35245	25425	24531	45212
45324	23421	34234	51212	23442
52135	52345	53125	24535	53245
45234	23452	42521	41242	24531
24532	52125	53125	52535	52315
52431	42534	25234	23443	42131
24523	53424	34321	51232	51555
45212	25252	23252	23545	42134
34545	42525	12345	42324	24545

In questions 1 to 5, prove that your answers are correct, by casting out 9's (Illustrated in Lesson 31). Use a separate piece of paper to work the proofs.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Allowing discounts of 10% and 5%, find net price.

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

Opposite each item, fill in the amount of change which should be received from a $5.00 bill, after making purchases of each of the following amounts:

(11)	(12)	(13)	(14)
$3.25	$2.10	$4.33	$2.35
4.62	3.90	3.67	2.49
3.75	2.24	3.18	1.19
4.12	3.85	2.45	2.29
4.36	2.12	2.88	3.71
3.45	3.48	1.55	2.19
4.15	2.55	1.15	1.49

Aim to get 100%

LESSON 34

Drill on rapid addition:

2	3	4	5	1	2	4	3	2	4	5	2	4	5	3	2	4	5	2	4
4	5	3	2	3	4	2	5	4	1	2	3	3	2	1	5	2	3	4	2
2	4	5	1	5	2	1	3	5	3	4	5	2	4	3	2	5	4	2	3
4	3	2	4	2	3	4	5	2	4	5	2	5	2	4	5	2	3	4	5
5	2	3	2	4	5	2	1	5	3	2	1	2	3	5	4	5	4	3	2
2	4	5	4	5	2	3	2	2	5	4	3	5	2	3	1	2	4	5	2
3	5	4	5	2	5	4	2	5	2	2	5	4	3	2	3	3	1	3	1
2	3	5	2	3	2	5	5	4	3	3	4	5	2	3	2	5	2	4	5
1	2	3	1	4	3	2	4	5	2	2	5	2	5	4	3	2	3	3	2
5	4	2	4	5	4	3	2	2	3	3	4	3	2	2	1	5	1	2	1
3	2	4	2	2	5	4	5	3	1	2	1	5	4	3	2	3	4	5	5
4	3	2	4	5	4	3	2	5	2	5	2	2	3	4	5	2	1	3	4
5	2	3	5	2	5	4	3	2	4	3	5	3	4	5	2	3	4	4	5
4	3	2	4	4	2	3	4	5	2	5	3	4	5	2	3	2	3	2	4
5	2	3	2	5	3	5	4	2	5	4	3	2	3	4	2	5	2	3	2
3	5	4	5	3	4	4	5	3	2	1	1	5	2	3	4	1	3	2	1
2	4	3	2	4	5	2	4	5	4	3	5	3	2	4	5	4	5	2	5
3	2	5	5	2	3	4	3	2	1	4	5	2	3	2	3	3	2	4	2
4	3	2	4	5	4	4	5	4	3	2	2	4	5	4	3	5	3	2	1
2	3	5	5	2	3	3	4	3	2	4	1	2	3	3	5	2	4	3	5

(1) Add each column, beginning at the right side. Do not carry at first and do not write any results at the bottom. Start at the left side and add the columns again. Practise reading the columns for *five* minutes. Try to acquire accuracy, smoothness and speed.

(2) Drill on horizontal addition. Start on the top line, add from left to right and then from right to left. Do you get the same result? Practise horizontal addition on the other lines of the question, in a similar way.

(3) Let the above block of figures, twenty figures wide and twenty deep, represent an addition question. Pencil the sum as you add, writing the figures at the bottom. Add and re-add, running from bottom to top and then from top to bottom, until you can add the complete question in *four* minutes.

DRILL 34

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
23454	34542	24354	24534	24135
34245	21234	43245	52343	42321
24123	54321	34321	24523	23432
41235	32445	54232	45212	42141
34523	23224	45423	34454	23425
41254	52142	24341	23211	42132
23244	34524	25424	32454	15421
54321	53242	34242	23245	24525
23542	12334	25345	12323	32452
54212	54212	42323	45431	23521
23455	23454	54212	23132	54213
42342	54235	23542	45212	23452
53254	42131	21212	31324	45123
45223	24325	54232	24131	34521
23542	43212	24523	31452	23135
54234	54123	53212	23323	45212
23452	35432	24524	45232	24535
42541	42542	52321	32452	32344
12345	32121	24242	24521	23525
53224	54245	35211	32132	21242
24132	23454	42345	45211	52313
41242	34212	23423	23455	21122
52324	23134	45213	41213	42345
23542	52342	32345	34324	21312
53212	23523	41242	52112	45232
42335	54212	34523	31452	24245
34244	32434	23245	32341	32124
23452	23245	42312	12345	54212
13245	42324	23434	54213	32234
42524	34545	54212	23425	52125

Prove your answers correct in each of the five questions above, by adding from top to bottom.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 10% and 5%. (Illustration in Lesson 32.)

(6)$	(7)$	(8)$	(9)$	(10)$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

Find the sum by adding horizontally:

(11) $344.54+$5.25+$232.15+$423.12+$2.54= .....

(12) $2,324.25+$2.45+$4.32+$4,324.15+$3.35= .....

(13) $3.54+$2,424.15+$5.45+$34.22+$4.25= .....

(14) $24.25+$3.16+$54.12+$342.14+$3,424.25= .....

LESSON 35

Drill *ten* minutes on the following:

4	2	3	4	5	2	3	4	5	2	3	4	5	2	1	3	4	5	2	5
2	3	4	5	4	5	2	3	4	3	2	5	3	4	5	2	1	2	3	4
4	2	1	2	2	3	4	5	4	1	4	5	2	3	4	5	3	4	5	2
3	4	5	2	4	2	3	1	2	5	3	2	3	4	2	1	2	3	4	5
4	2	1	5	3	4	5	2	4	4	2	3	2	3	4	5	3	1	2	3
3	4	5	4	5	3	2	3	3	2	1	2	4	5	2	1	2	3	4	5
2	3	4	5	4	5	3	4	5	4	2	3	2	3	4	2	3	2	2	4
4	5	2	3	2	3	4	5	1	5	4	2	1	2	3	4	5	4	1	2
2	4	5	2	4	5	2	3	2	4	1	3	4	5	2	3	2	3	4	4
4	5	2	3	3	4	5	2	3	2	3	2	3	4	5	4	3	2	1	2
3	2	4	5	2	3	3	4	5	2	4	5	2	1	4	5	2	1	3	4
4	5	2	3	4	5	2	3	4	3	2	2	3	5	3	4	5	2	1	2
3	2	4	5	5	2	3	4	2	4	3	2	4	2	3	2	1	3	4	5
4	1	2	3	3	3	4	5	5	5	4	3	2	4	3	4	2	2	2	3
2	3	4	5	4	5	2	3	4	1	2	3	4	5	2	3	1	4	4	1
4	5	2	3	5	2	3	4	5	2	3	4	3	4	5	4	4	3	2	5
3	4	5	2	2	1	2	3	4	3	2	1	4	2	4	2	5	4	3	2
2	3	4	5	2	3	4	5	2	4	5	2	3	4	2	3	2	3	4	5
4	5	2	3	3	5	2	3	4	5	1	3	2	3	3	4	5	2	1	2
2	4	5	2	5	2	3	2	3	4	5	2	3	2	5	2	3	4	2	5

(1) After drilling *ten* minutes on reading the above columns, try to add the question in 4 minutes. When reading the columns, do not write the results, but aim to read smoothly and accurately. After ten minutes' preparatory practice, treat the question as an addition question and write the results in pencil figures. There are 400 figures in the question. After getting the correct result, say in 4 minutes, try to increase your speed.

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right. Do you get the same result?

(3) Add by 5's from 15 to 125; from 85 to 175.

(4) Subtract by 5's from 80 to 0; from 145 to 45.

DRILL 35

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)
234523	345212	342124	345244
421341	432453	523432	234521
234525	245234	145345	321423
245212	512523	234521	425325
523434	423452	145432	352423
245235	235543	232345	234544
523423	342125	413212	245424
124524	321441	542134	324535
345212	542324	234521	212423
213423	235432	313212	521321
521321	212531	423543	234523
123452	325424	245412	345212
541231	244512	312345	312425
234521	321245	423421	543245
254212	451424	541245	234521
521435	324541	414521	245234
245312	232452	345245	524524
451251	513215	412541	332525
235424	421341	541234	235421
342455	332424	512342	341234
425321	523235	345421	521325
532423	431241	234542	423541
455245	542345	523235	345245
345424	212123	412312	232424
312312	434324	543245	523532
542312	523145	234523	235424
124523	245341	312334	434324
214212	541224	523425	523215
344524	245441	325412	235422
525255	322245	432245	452345

Prove your answers correct in each of the four addition questions above, by adding the reverse way—top to bottom. Consider each result a list price in dollars and cents, and after allowing 10% and 5%, find the net price.

(5)	(6)	(7)	(8)
$	$	$	$

Opposite each item, fill in the amount of change which should be received from a $10.00 bill, after making purchases of each of the following amounts:

(9)	(10)	(11)	(12)
$7.25	$3.25	$7.33	$5.40
4.36	4.63	8.52	2.89
8.72	5.72	4.59	3.11
4.95	8.49	1.75	8.71

LESSON 36

Multiplication

5	4	3	2	6	7	8	4	9	3	2	7	6	4	7	3	5	3	6	7
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

(1) Beginning at the left side, name the product of each of the top figures by 5; as 25, 20, 15, 10, 30, 35, etc. Run the blunt end of your pencil along the base of the 5's and name the products regularly. Start at the right side and name products. Drill for *three* minutes.

(2) Start at the right side and multiply by 5 as in ordinary multiplication, adding the carrying figure, if any; as 35, 33, 18, 26, 17, etc. Do not write any results on paper, but make the exercise a lively mental drill. Spend *three* minutes on this form of practice. Go over and over the line until you can name the results accurately and smoothly.

Division

5)6	7	4	5	8	7	2	3	4	5	6	8	9	2	3	4	5	6	7	5

(1) Drill on short division by 5, naming the figures without any hesitancy; as 1, 3, 4, 9, 1, 7, etc. Go slowly at first. Aim to name accurate results, but do not write any figures on the paper.

(2) Go over and over the division drill until you have increased your speed materially. Try to get through without stumbling. Faithful practice will win every time. Stick to it.

DRILL 36

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
424×5=	377×5=	413×5= .....
326×5=	499×5=	527×5= .....
729×5=	378×5=	392×5= .....
478×5=	697×5=	293×5= .....
692×5=	575×5=	932×5= .....
479×5=	293×5=	484×5= .....

(4)	(5)	(6)
367×5=	827×5=	326×5= .....
429×5=	493×5=	474×5= .....
364×5=	672×5=	369×5= .....
528×5=	499×5=	575×5= .....
678×5=	377×5=	495×5= .....
497×5=	289×5=	389×5= .....

(7)	(8)	(9)
925×5=	376×5=	545×5= .....
427×5=	495×5=	639×5= .....
378×5=	387×5=	448×5= .....
495×5=	624×5=	727×5= .....
385×5=	737×5=	939×5= .....
279×5=	287×5=	497×5= .....

Divide and add quotients:

(10)	(11)
696585÷5=	924735÷5= .....
732890÷5=	762325÷5= .....
926345÷5=	928730÷5= .....
787375÷5=	763495÷5= .....
977585÷5=	826320÷5= .....
736925÷5=	937495÷5= .....

(12)	(13)
752465÷5=	748265÷5= .....
348925÷5=	342695÷5= .....
934875÷5=	826340÷5= .....
247325÷5=	237825÷5= .....
782795÷5=	772485÷5= .....
347825÷5=	149820÷5= .....

(14)	(15)
47262484	64732853
51	51

LESSON 37

Multiplication Drill:

3	4	7	8	2	6	7	2	9	3	4	5	4	6	7	8	5	2	4	9
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

(1) Multiply the figures in the top line by 5, starting at the left side and naming the products at a regular rate of speed; as 15, 20, 35, 40, 10, 30, etc. Next, read the products from the right side to the left; as 45, 20, 10, 25, 40, 35, etc. Practise *three* minutes in this way.

(2) Start at the right side and multiply by 5, adding the carrying figure; as 45, 24, 12, 26, etc. Practise *five* minutes on the line in this way, until you can name the results without any hesitancy. Concentrate your thoughts on the exercise. Strive for results.

Division Drill

5)7	6	5	4	3	7	5	8	2	5	3	7	4	5	2	6	4	5	3	5

(1) Drill *three* minutes on the above short division exercise; as 1, 5, 3, 0, 8, 7, 5, etc.

(2) Practise the above division drill several times until you have materially increased your speed. Do not write any results. Make the exercise a quick mental drill.

Short Method

To multiply by 15, or "teen" multiplication.

Long way:

36479
15

182395
36479

547185

Short way:

9×5 =45
$7\times5+4+9$ =43
$4\times5+4+7$ =31
$6\times5+3+4$ =37
$3\times5+3+6$ =24
$2+3$ = 5

Note:—Multiply by 5 in the usual way and add both the carrying figure and the figure to the right of the one multiplied. Add last carrying figure to the last figure in the multiplicand to complete the product.

DRILL 37

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
427×5=	837×5=	763×5= .....
395×5=	493×5=	824×5= .....
426×5=	739×5=	737×5= .....
642×5=	433×5 = ...	649×5= .....
737×5=	763×5=	827×5= .....
493×5=	495×5=	339×5= .....

(4)	(5)	(6)
737×5=	367×5=	437×5= .....
439×5=	826×5=	393×5= .....
827×5=	396×5=	765×5= .....
639×5=	767×5=	493×5= .....
477×5=	395×5=	727×5= .....
823×5=	987×5=	833×5= .....

(7)	(8)	(9)
349×5=	937×5=	737×5= .....
727×5=	789×5=	359×5= .....
495×5=	477×5=	479×5= .....
385×5=	399×5=	927×5= .....
929×5=	729×5=	399×5= .....
837×5=	837×5=	493×5= .....

(10)	(11)	(12)
123×15=	374×15=	549×15= .....
323×15=	529×15=	367×15= .....
432×15=	334×15=	543×15= .....
525×15=	729×15=	425×15= .....
475×15=	477×15=	737×15= .....
325×15=	397×15=	265×15= .....

(13)	(14)	(15)
737×15=	827×15=	737×15= .....
823×15=	393×15=	349×15= .....
349×15=	437×15=	499×15= .....
723×15=	829×15=	377×15= .....
437×15=	735×15=	493×15= .....
395×15=	367×15=	757×15= .....

Divide and add quotients:

(16)	(17)
976545÷5=	587695÷5= .....
787640÷5=	379825÷5= .....
935495÷5=	432750÷5= .....
739355÷5=	783245÷5= .....
927485÷5=	326785÷5= .....
738925÷5=	178695÷5= .....

LESSON 38

Drill on Multiplication by 5:

8	2	7	3	4	5	9	2	7	4	2	8	4	3	7
3	4	2	8	9	2	6	9	3	2	4	7	5	2	4
8	3	7	5	4	3	2	5	4	7	8	2	3	7	5
4	7	8	9	2	7	3	2	7	9	2	5	4	8	3

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 5; as 40, 10, 35, 15, 20, 25, etc. Next read from the right side to the left; as 35, 15, 20, 40, 10, 20, 35, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 5, adding the carrying figure, if any; as 35, 18, 21, 42, 14, etc. Drill on the other lines in a similar way. Go over each line several times.

Division Drill

5)7	5	8	6	3	4	7	2	5	4	3	7	5	9	2	4	9	5	8	6

Spend from three to five minutes on the short division drill. Do not write any figures, but simply name them. Practise until you can name results without faltering.

Making Change

Read with absolute accuracy and as rapidly as possible, the amount of change that should be received by the purchaser in each case, when a 50 cent piece is presented in payment:

12c	33c	42c	4c	30c	42c
15c	9c	25c	14c	4c	33c
24c	22c	35c	34c	36c	16c
19c	17c	8c	6c	18c	38c
26c	28c	11c	21c	29c	7c

DRILL 38

Date *Name*
Time *Seat No.*

Extend and add products:

(1)
693×5= .....
474×5= .....
375×5= .....
826×5= .....
327×5= .....
499×5= .....

(2)
737×5= .....
482×5= .....
378×5= .....
926×5= .....
367×5= .....
423×5= .....

(3)
549×5= .....
367×5= .....
745×5= .....
823×5= .....
933×5= .....
727×5= .....

(4)
493×5= .....
877×5= .....
545×5= .....
727×5= .....
365×5= .....
723×5= .....

(5)
269×5= .....
732×5= .....
477×5= .....
365×5= .....
493×5= .....
725×5= .....

(6)
372×5= .....
493×5= .....
825×5= .....
933×5= .....
726×5= .....
348×5= .....

(7)
339×5= .....
828×5= .....
733×5= .....
499×5= .....
724×5= .....
385×5= .....

(8)
367×5= .....
729×5= .....
838×5= .....
755×5= .....
492×5= .....
877×5= .....

(9)
672×5= .....
499×5= .....
828×5= .....
377×5= .....
497×5= .....
855×5= .....

(10)
252×15= .....
326×15= .....
427×15= .....
372×15= .....
857×15= .....
379×15= .....

(11)
261×15= .....
482×15= .....
936×15= .....
747×15= .....
823×15= .....
399×15= .....

(12)
545×15= .....
737×15= .....
825×15= .....
492×15= .....
367×15= .....
723×15= .....

(13)
457×15= .....
823×15= .....
726×15= .....
493×15= .....
827×15= .....
321×15= .....

(14)
525×15= .....
875×15= .....
499×15= .....
329×15= .....
775×15= .....
838×15= .....

(15)
369×15= .....
426×15= .....
377×15= .....
829×15= .....
473×15= .....
976×15= .....

(16)
5)498637265725
×15

(17)
5)856423726985
×15

(18) If I present a 50 cent piece for each of the following purchases, how much change should I receive?

33c	16c	35c	43c	28c
24c	9c	14c	6c	37c

LESSON 39

Drill on Multiplication by 5:

4	7	8	2	3	6	5	7	4	8	3	9	4	6	7	9
3	2	9	7	8	2	4	5	7	2	6	3	8	5	7	2
7	9	3	4	7	8	5	4	3	8	7	6	2	9	2	8
4	7	9	3	5	4	8	7	6	5	4	3	7	2	9	7

(1) Multiply each figure in the first line by 5, reading from left to right and then from right to left; as 20, 35, 40, 10, 15, 30, etc. Do not write the products, simply name them. Drill on the other lines in a similar way. Be careful to name results accurately and smoothly.

(2) Start at the right side of the first line and multiply by 5, adding carrying figure; as 45, 39, 33, 23, 47, 19, etc. Go over each line *four* times. After practising a few minutes, try to increase your speed. Make the drill sharp and regular.

(3) When multiplying by 15, you have two figures to add, as a general rule —the carrying figure and the figure to the right of the one multiplied. Start on the third line at the top of the page, at the right side and multiply each figure by 5. Add the two figures above. To illustrate: 40, 42, 51; 10, 17, 24; 45, 50, 56, etc. Drill from left to right in a similar way and then use the last three lines. Drill *three* minutes.

Making Change

Read as rapidly as possible and without error, the amount of change that should be received by the purchaser in each case, when a dollar bill is presented in payment:

75c	20c	11c	45c	58c	17c
25c	32c	8c	58c	79c	57c
40c	44c	13c	69c	84c	70c
35c	55c	9c	31c	48c	18c
10c	60c	15c	29c	53c	22c

DRILL 39

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
2135×5=	3246×5=	2688×5=
3262×5=	2367×5=	3789×5=
4325×5=	2492×5=	2377×5=
6732×5=	2878×5=	2689×5=
4285×5=	3797×5=	4775×5=
3727×5=	3688×5=	3279×5=

(4)	(5)	(6)
2674×5=	2697×5=	3487×5=
3898×5=	2375×5=	4299×5=
4262×5=	1989×5=	3787×5=
3157×5=	2676×5=	2689×5=
2383×5=	3487×5=	3277×5=
1797×5=	2677×5=	4789×5=

(7)	(8)	(9)
2132×15=	2699×15=	1675×15=
1378×15=	3272×15=	2367×15=
2789×15=	4389×15=	1268×15=
2349×15=	2673×15=	2675×15=
1696×15=	1979×15=	3348×15=
2689×15=	2483×15=	2169×15=

(10)	(11)	(12)
3495×15=	5217×15=	3264×15=
2689×15=	3789×15=	2977×15=
3144×15=	2663×15=	3781×15=
1267×15=	3775×15=	4292×15=
4389×15=	4389×15=	2779×15=
2167×15=	2677×15=	2898×15=

(13) If I present a dollar bill for each of the following purchases, how much change should I receive? Write the amount opposite each purchase.

45c	90c	55c	89c .....
32c	84c	49c	72c .....
18c	74c	63c	27c .....
21c	47c	26c	39c .....
33c	59c	15c	28c .....
12c	17c	66c	51c .....

Aim to get 100%

LESSON 40

Drill on Multiplication by 5:

3	6	7	4	2	6	7	2	6	8	5	4	3	6	9
4	2	3	7	8	2	6	9	3	2	8	7	2	5	4
2	3	7	4	2	9	8	5	4	7	6	2	8	3	5
4	9	2	7	3	5	4	8	5	2	9	6	3	7	6
2	3	5	4	8	2	7	6	2	9	6	7	2	4	8
7	2	9	3	6	8	5	4	7	2	9	3	7	5	2
5	3	2	4	8	5	3	6	2	9	7	5	4	3	7
8	2	6	5	4	3	2	9	5	4	3	2	8	7	6
5	6	7	4	8	2	6	3	2	7	8	9	2	6	4
3	4	5	8	7	6	4	7	3	5	2	3	6	9	2

(1) Drill on the first line, multiplying each figure by 5, reading from left to right and then from right to left; as 15, 30, 35, 20, 10, 30, etc. Draw your pencil along the line and try to name the results regularly. Go over each line.

(2) Start at the right side of the first line and multiply by 5, adding carrying figure; as 45, 34, 18, 21, 27, 42, etc. Drill on each line in this way *three* times. Try to increase your speed as you acquire facility in naming correct products.

(3) Group two lines, multiplying the lower figure by 5 and adding the top figure; as 20, 29; 25, 31; 10, 13, etc. Read from right to left and then back. Drill on the other four pairs of lines in a similar way.

(4) Group three lines, multiplying the figure in the third line by 5 and adding the two figures above; as 25, 29, 38; 15, 20, 26; 40, 42, 45, etc. Practise *three* minutes on this form of grouping the figures.

Making Change

Read as rapidly as possible and without error, the amount of change that should be received by the purchaser in each case, when a two-dollar bill is presented in payment:

45c	92c	$1.18	$1.15	$1.45	$1.32
84c	16c	1.72	1.39	1.79	1.51

DRILL 40

Date
Time

Name
Seat No.

Extend and add products:

(1)
2942 x 5 =
3263 x 5 =
4123 x 5 =
2293 x 5 =
3125 x 5 =
1294 x 5 = _____

(2)
2344 x 5 =
9156 x 5 =
4235 x 5 =
9675 x 5 =
2787 x 5 =
3297 x 5 = _____

(3)
1287 x 5 =
2234 x 5 =
2675 x 5 =
2497 x 5 =
2676 x 5 =
2345 x 5 = _____

(4)
3244 x 5 =
2676 x 5 =
4327 x 5 =
2676 x 5 =
5925 x 5 =
4127 x 5 = _____

(5)
1677 x 5 =
2494 x 5 =
2367 x 5 =
3434 x 5 =
1676 x 5 =
1929 x 5 = _____

(6)
1373 x 5 =
2637 x 5 =
3457 x 5 =
2697 x 5 =
3485 x 5 =
3787 x 5 = _____

(7)
1234 x 15 =
2325 x 15 =
2474 x 15 =
2877 x 15 =
3262 x 15 =
4323 x 15 = _____

(8)
2534 x 15 =
3275 x 15 =
2636 x 15 =
4365 x 15 =
3787 x 15 =
2349 x 15 = _____

(9)
1267 x 15 =
2345 x 15 =
1689 x 15 =
1343 x 15 =
2474 x 15 =
2939 x 15 = _____

(10)
3235 x 15 =
2676 x 15 =
4537 x 15 =
2443 x 15 =
3676 x 15 =
1272 x 15 = _____

(11)
1289 x 15 =
3727 x 15 =
4339 x 15 =
2686 x 15 =
9239 x 15 =
2679 x 15 = _____

(12)
3343 x 15 =
2673 x 15 =
3484 x 15 =
2879 x 15 =
2637 x 15 =
4595 x 15 = _____

(13)
5) 46983254898 5

_____ x 15

(14)
5) 48769452787 5

_____ x 15

(15)
Write down the amount of change that should be received by the purchaser in each case, when a two dollar bill is presented in payment:

55¢	$1.22	$1.85	$1.19
42¢	1.37	1.34	1.48
89¢	1.59	1.35	1.17
75¢	1.11	1.66	1.45

LESSON 41

6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3	4	8	7	6	5	4	3	2	7	8	9	6	7	3	5	4	2	7	4

(1) Add 6 to each of the lower figures, beginning at the left side; as 9, 10, 14, 13, 12, 11, etc. Draw the blunt end of your pencil along slowly, naming the sums as the pencil comes under each group. Next read from right to left in a similar way. Practise *three* minutes.

(2) Start at the right side and name the sums of the groups, adding the carrying figure; as 10, 14, 9, 10, 12, 10, 14, etc. Drill faithfully by going over the groups *five* times.

Proving Addition by Casting out 11's

	Sum of figures in odd places		Sum of figures in even places		Excess
48426	14	—	10	=	4)
17532	8 (+11)	—	10	=	9)13—2
65958	23	—	10	=	13—2

The excess being 2 in both places, the work is taken to be correct.

Proof:—Begin with the right hand figure and find the sum of the digits in the odd places. Next find the sum of the digits in the even places. Subtract the sum of the figures in the even places from the sum of the figures in the odd places. If the sum of the figures in the even places is the greater, add 11, or a multiple of 11, to the sum of the figures in the odd places and then subtract. The result, if less than 11, is the excess of 11's. If the result is greater than 11, subtract the tens from the units and the remainder is the excess.

Trade Discount

What is the net cost of goods listed at $375.75 and sold at discounts of 5% and 2%?

$375.75
18.79—5%

356.96
7.14—2%

349.82—Net price

Solution:—5% is ½ of 10% of $375.75 or ½ of $37.575 or $18.79 to nearest cent. 2% is ⅕ of 10% of $356.96 or ⅕ of $35.696 or $7.14 to nearest cent.

DRILL 41

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
3456	5656	2345	4352	3454	2546
2345	3454	6236	2456	2662	3462
6234	2625	5462	6345	5436	2356
2465	3465	3245	5656	2645	4243
6266	4523	5665	2434	3262	2626
3462	6234	2354	3564	5326	3442
2346	4565	6161	2323	4264	4664
3452	2332	2442	4264	3254	2556
1235	6246	3256	5324	2342	4262
4261	3454	4324	3246	6232	1321
6346	2626	5462	6324	5456	5461
5234	3545	2635	5624	3424	3266
6266	6256	4252	4256	2646	2453
3455	3454	5665	5462	3233	4264
6124	2662	4356	3456	4364	5345

Prove that your answer is correct in each of the six questions by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2%, find net price.

(7)	(8)	(9)	(10)	(11)	(12)
$	$	$	$	$	$

(13) What will a half-dozen chairs cost at $60.00 a dozen, with discounts of 5% and 2% off?

(14) A clerk receives 2% commission on his cash sales. What does he receive on goods listed at $375.00 and sold at 10% discount?

(15) Prove that your answer is correct to the following addition question, by casting out 11's, opposite the question:

47678 .....
76496 .....
54837 .....
93756 .....
48673 .....
64958 .....

Aim to get 100%

LESSON 42

6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
3	4	8	9	6	7	5	6	2	3	8	7	5	4	6	9	2	3	4	1

(1) Add 6 to each of the lower figures, beginning at the left side and reading to the right; as 9, 10, 14, 15, 12, 13, etc. Do not write the sums, but simply name the results. Read from the right side to the left in a similar way. Drill *three* minutes. Are you watching accuracy and regularity?

(2) Read from right to left, adding the carrying figure; as 13, 11, 10, 9, 15, 13, etc. Go over the list *six* times. Keep your mind on the work.

(3) Consider the top number 16 instead of 6, and add combinations, beginning at the left side; as 19, 20, 24, 25, 22, etc. Read back and forth several times until you can name the results easily and accurately.

Short Methods in Fractions

Shortening work in fractions, as in all other cases, is largely a matter of making the head save the fingers, combined with a resolve to use a scratch pad as seldom as possible. Business fractions are usually of the simplest kind and may very often be used as easily as whole numbers.

By inspection, find the sum of the following:

$$1/8+1/16+1/32+1/4$$

Scan the denominators and find the L.C.M. (Least Common Multiple). You will notice, it is 32. Add as you would whole numbers, changing each fraction to 32nds, mentally, as you read to the right. The reading is as follows: 4, 6, 7, 15, or 15/32.

DRILL 42

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
5326	3456	4564	3445	2646	2463
2462	2345	2346	2664	3434	6246
3245	3462	5262	3212	2632	2334
2636	5254	3656	4364	1234	5462
4234	3624	4131	5261	5656	6213
2646	2456	2454	2345	4234	5462
2323	3624	6362	5326	3412	6321
5646	5256	5456	4261	2341	2335
6234	4624	3652	3456	5464	6123
5462	6362	2462	6543	2556	4234
3255	4423	6356	2231	3245	5656
4262	5235	4132	2456	5362	2464
3454	4262	6256	3213	4526	5261
6262	6356	4364	6456	3264	1345
3456	5464	2654	2325	5326	5262
4121	3636	3412	4326	2464	6456
5464	2464	6262	2342	6246	2634
3456	5232	3456	1234	3456	4266

Prove that your answers are correct in questions 1 to 6 by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

By inspection, find the sums of the following:

(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{3}{7}$	$\frac{1}{15}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{7}$
$\frac{1}{9}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{15}$	$\frac{1}{14}$
$\frac{1}{18}$	$\frac{1}{20}$	$\frac{5}{28}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{28}$
$\frac{1}{3}$	$\frac{5}{10}$	$\frac{1}{7}$	$\frac{7}{8}$	$\frac{1}{16}$	$\frac{1}{6}$	$\frac{8}{8}$	$\frac{2}{7}$

Accuracy first, then speed

LESSON 43

6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
9	6	7	5	4	8	6	7	3	2	7	5	4	3	2	6	8	5	7	4

(1) Name the sums of the various groups, moving your pencil back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that make up the group. Do not say: 9 and 6 are 15, but name the total at once, 15. Beginning at the left side, we have the following results:—15, 12, 13, 11, 10, 14, etc. Drill faithfully. Concentrate on the exercise and you will get better results.

(2) Imagine the figures in the top row to be 26. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 35, 32, 33, 31, 30, 34, 32, etc. Go over the list several times until you can name the sums regularly and accurately. Similarly, try adding 36, 46, 56, etc., as the top number.

To Add Rapidly Any Pair of Fractions

Find the sum of 3/5 and 4/7.

Method:—Fix the denominator of the sum by multiplying the two denominators together, $5\times7=35$. Multiply the numerator of the first fraction by the denominator of the second and the numerator of the second by the denominator of the first—cross-multiply as it were. $3\times7=21$. $4\times5=20$. Add these results, $21+20=41$. The answer is 41/35 or 1 6/35.

There is nothing in this process that is not done in the usual process of addition. Work it by the method you learned at first, and you will see that it is just a matter of sharpening our plan of doing the work.

DRILL 43

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
23145	34623	46264	26426	46246
46266	56246	32456	34642	32623
34523	24362	23642	23456	43215
46254	32142	26264	42624	52482
63465	61326	34354	53462	36225
56246	45632	62626	62346	42462
34651	23466	34212	23565	53625
26425	31245	52321	62452	32454
34156	56321	35214	24635	24536
61624	42634	23523	62324	32462
32456	53423	46212	53461	63241
56242	62366	65343	23546	52626
63266	56244	24562	54213	34125
46544	32645	32651	26342	42634
32465	61234	23424	61234	56262
54623	56426	56232	52345	34651
36462	24652	62421	63124	51436
42346	32466	32642	51656	23244
34623	54242	56256	46234	52326
26462	62436	24564	23426	24625

In questions 1 to 5, prove that your answers are correct by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2%, find net price.

(6)$	(7)$	(8)$	(9)$	(10)
$	$	$	$	$

By inspection, find the sum of:

(11) $\frac{1}{8}+\frac{1}{7}=$..... (15) $\frac{1}{15}+\frac{1}{4}=$..... (19) $\frac{1}{3}+\frac{3}{4}=$..... (23) $\frac{3}{7}+\frac{3}{8}=$.....

(12) $\frac{1}{7}+\frac{1}{3}=$..... (16) $\frac{1}{14}+\frac{1}{3}=$..... (20) $\frac{1}{3}+\frac{2}{3}=$..... (24) $\frac{4}{9}+\frac{3}{7}=$.....

(13) $\frac{1}{9}+\frac{1}{4}=$..... (17) $\frac{1}{21}+\frac{1}{8}=$..... (21) $\frac{5}{6}+\frac{3}{6}=$..... (25) $\frac{4}{7}+\frac{2}{3}=$.....

(14) $\frac{1}{18}+\frac{1}{2}=$..... (18) $\frac{3}{19}+\frac{1}{2}=$..... (22) $\frac{1}{2}+\frac{3}{4}=$..... (26) $\frac{2}{3}+\frac{3}{5}=$.....

Aim to get 100%

LESSON 44

Drill on rapid addition:

2	3	4	5	6	2	1	6	3	2	4	5	3	2	4	5	6	4	2	5
3	6	2	4	5	4	5	2	6	3	2	4	6	3	2	2	4	6	3	6
2	4	6	5	3	3	4	6	5	6	4	2	5	4	6	5	2	3	4	4
4	1	2	6	1	5	6	2	3	1	3	4	2	6	2	1	6	2	3	1
5	4	6	3	2	4	5	4	6	2	5	3	4	2	4	5	4	6	2	6
4	3	2	4	5	3	4	6	2	6	4	5	2	3	2	4	5	2	6	1
2	6	3	2	4	5	6	2	4	5	4	2	6	5	6	3	2	4	5	4
5	4	2	6	1	6	4	3	2	4	3	4	3	2	3	2	6	2	5	6
2	3	4	5	6	5	2	6	6	3	5	6	2	4	2	6	2	3	4	2
4	5	3	2	5	4	5	4	4	6	2	3	3	2	6	5	4	3	2	6
6	2	6	3	4	3	2	6	6	4	5	4	2	6	2	6	2	6	4	2
2	4	5	6	2	5	3	4	4	2	3	6	6	4	5	4	6	1	5	4
3	2	6	1	6	5	6	2	6	5	2	4	3	1	4	3	2	5	6	2
5	4	2	6	3	4	3	5	4	6	3	5	2	3	2	4	5	6	2	5
2	3	5	4	2	6	2	5	3	4	6	2	1	4	5	2	4	5	6	2
6	6	4	3	4	2	5	6	4	1	4	6	2	5	4	5	6	2	3	4
5	2	6	4	6	3	4	2	2	6	3	1	6	2	5	4	5	3	4	1
4	6	2	6	2	6	2	1	3	4	3	4	5	4	6	5	2	6	2	4
5	4	3	2	4	5	3	2	4	2	4	2	1	3	1	3	4	1	5	6
2	6	2	5	6	5	6	3	2	6	5	6	4	6	2	6	2	5	4	2

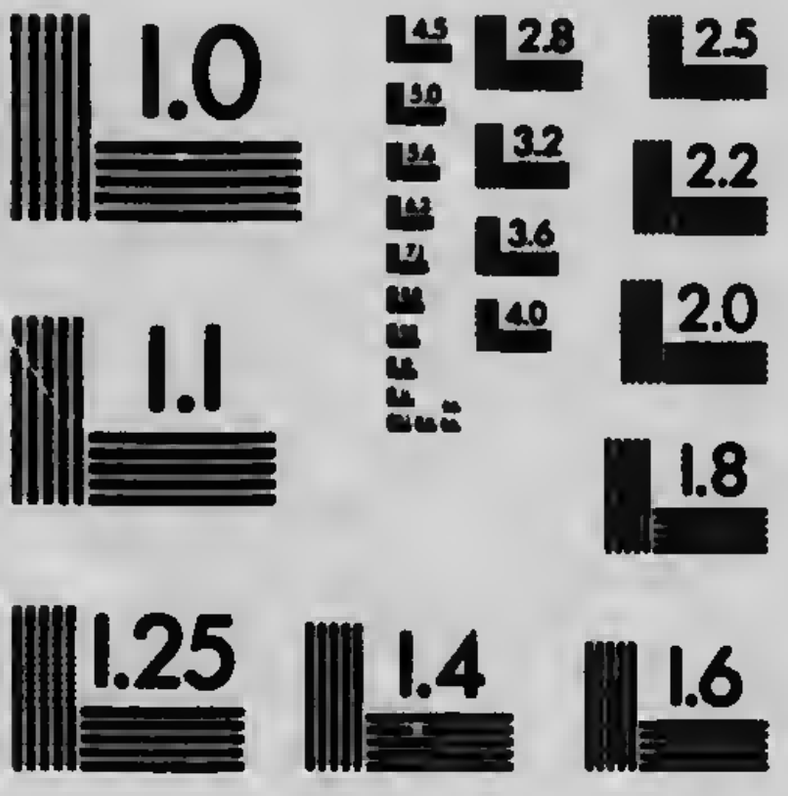
(1) Add each column, beginning at the right side. Do not carry at first and do not write any results. Start at the left side and add the columns again. Practise reading the columns for *three* minutes. Try to acquire accuracy, smoothness and speed.

(2) Drill on horizontal addition. Start on the top line, add from left to right and then from right to left on the same line. Do you get the same result Practise horizontal addition on the other lines of the question, in a similar way.

(3) Let the above block of figures, twenty wide and twenty deep, represent an addition question. Pencil the sum as you add, writing the figures at the bottom. Add and re-add, running from bottom to top and then from top to bottom, until you can add the complete question in *four* minutes.

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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DRILL 44

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
46256	34561	46265	63246	46235
62424	26236	32456	52355	23454
34542	42434	46224	34621	52643
62356	56245	53656	23456	26426
46234	32624	26424	62124	34554
54623	56246	52635	56432	62345
62456	32564	64266	12345	23454
34624	25432	53454	56123	26325
52456	52415	62624	34562	42312
46264	63246	45436	23456	54323
32656	56421	56121	62141	62543
46324	32155	32632	56234	24624
52456	46424	54246	64323	63246
34564	53245	23525	56246	52464
23456	62636	62142	62321	24546
42634	54234	36255	56264	32421
56246	62623	61424	54326	56235
32542	54246	56355	62123	64312
66236	26434	24621	53432	24664
54324	62345	56435	42662	46225
62432	56234	24656	62346	34562
45626	24626	26233	54624	62345
34264	52434	54621	62436	44121
52431	15626	12345	54621	53246
45364	23454	63523	25462	24535
24525	62346	24434	62345	62324
36462	26255	52626	46341	56213
42626	43464	24354	24162	24325
63245	26235	36246	63246	62466
54621	34366	52624	34565	42632

Prove your answers correct in each of the five questions above, by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 5% and 2%.

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

By inspection, find the sum of:

(11) $\frac{1}{8}+\frac{8}{9}=$..... (14) $\frac{5}{8}+\frac{3}{6}=$..... (17) $\frac{4}{11}+\frac{2}{3}=$..... (20) $\frac{1}{6}+\frac{5}{9}=$.....

(12) $\frac{2}{9}+\frac{4}{15}=$..... (15) $\frac{2}{7}+\frac{3}{4}=$..... (18) $\frac{4}{15}+\frac{3}{7}=$..... (21) $\frac{6}{7}+\frac{3}{10}=$.....

(13) $\frac{2}{5}+\frac{7}{11}=$..... (16) $\frac{1}{5}+\frac{3}{7}=$..... (19) $\frac{3}{5}+\frac{2}{3}=$..... (22) $\frac{3}{8}+\frac{6}{7}=$.....

LESSON 45

Drill *ten* minutes on the following:

4	6	2	3	4	5	6	2	3	4	5	2	3	6	4	5	6	2	3	4
6	2	4	6	3	4	2	5	6	2	4	6	2	4	3	4	2	3	2	1
4	6	2	3	4	3	4	2	5	6	2	3	5	6	2	5	6	2	4	5
5	4	3	2	6	3	2	1	2	1	4	2	1	2	3	2	3	4	5	6
2	6	4	3	2	5	4	3	5	2	5	6	2	4	2	3	1	2	3	4
1	5	3	4	1	6	2	4	5	6	3	2	5	6	2	5	6	3	2	1
2	6	5	3	2	3	4	5	2	1	5	4	2	3	5	2	4	5	6	3
6	4	2	2	5	4	2	1	6	6	3	5	6	2	4	3	2	4	5	6
1	2	3	4	2	3	5	4	2	4	5	4	3	2	6	2	3	2	4	4
5	6	4	3	2	5	4	6	3	2	4	5	5	6	2	5	6	3	2	5
4	2	6	5	3	4	2	3	2	1	5	4	2	4	5	6	2	4	5	6
5	6	2	3	2	5	6	2	3	4	3	6	5	2	4	2	4	6	2	4
4	2	5	2	4	3	5	6	4	1	5	2	1	5	1	5	6	2	1	1
6	3	2	5	6	2	3	4	5	6	4	6	2	4	6	3	4	5	5	6
2	4	5	6	4	4	3	2	1	2	3	2	5	4	1	2	3	4	2	5
3	1	2	1	5	4	5	6	2	6	1	5	2	3	6	4	3	2	6	2
4	6	4	2	4	5	6	1	3	4	5	6	3	1	3	5	6	3	4	5
3	2	5	6	5	2	4	5	6	2	4	5	6	2	6	2	3	4	2	6
2	6	4	3	6	3	2	6	4	6	3	4	2	5	3	5	4	2	3	4
4	2	6	4	2	5	6	2	4	5	2	3	4	2	1	4	5	6	2	6

(1) After drilling *ten* minutes on reading the above columns, try to add the question in *four* minutes. When reading the columns, do not write the results, but aim to read smoothly and accurately. After preparatory practice for *five* minutes, treat the question as an addition question and write the results in pencil figures. There are 400 figures in the question. After getting the correct result, say in *four* minutes, try to increase your speed.

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right on the same line. Do you get the same result?

(3) Add by 6's from 18 to 72; from 60 to 144.

(4) Subtract by 6's from 72 to 0; from 180 to 54.

DRILL 45

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(5)	(5)
24645	42654	54264	46234	62356
36264	36245	42626	23456	24562
24546	24534	52434	56234	32425
32121	62324	26212	42624	46262
53262	56211	63456	63456	54623
42534	42356	24212	12345	23545
25262	23542	32636	26423	64212
52345	62323	54262	54362	32545
36225	45634	43621	46231	65424
54332	24524	52466	23456	56235
62454	46232	34561	12345	42623
52636	54626	26125	33212	56213
24524	23545	62341	42342	32546
42311	64234	56212	24236	25424
56236	52456	62346	46325	62351
42652	26211	24561	54232	46212
34264	54626	52342	62325	54323
52623	32454	54266	43214	34545
23542	26123	24634	52432	26232
24266	54236	62462	64646	42545
52342	24562	34246	23454	63424
62425	66234	23461	62141	52646
24662	52436	12345	56234	23424
34556	63423	62434	62545	56212
23424	24151	56246	23464	21345
42345	56425	23454	56231	56213
23466	34656	62342	23156	34356
42121	42432	54121	42342	26231
12345	56224	32462	62431	42626
62156	24646	54212	12356	56244

Prove your answers correct in each of the five addition questions above, by adding the reverse way—top to bottom.

Consider each result a list price in dollars and cents, and after allowing 5% and 2%, find the net price.

(6)$	(7)$	(8)$	(9)$	(10)$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

By inspection, find the sum of:

(11) $\frac{9}{11}+\frac{2}{3}=$..... (13) $\frac{3}{5}+\frac{4}{15}=$..... (15) $\frac{1}{10}+\frac{3}{7}=$..... (17) $\frac{1}{4}+\frac{3}{9}=$.....

(12) $\frac{6}{7}+\frac{2}{3}=$..... (14) $\frac{2}{5}+\frac{7}{11}=$..... (16) $\frac{3}{6}+\frac{1}{3}=$..... (18) $\frac{3}{7}+\frac{2}{9}=$.....

Aim to get 100%

LESSON 46

Multiplication

4	6	2	3	4	5	6	2	7	9	8	3	5	8	7	6	4	7	6	7
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

(1) Beginning at the left side, name the product of each of the top figures by 6; as 24, 36, 12, 18, 24, 30, 36, etc. Run the blunt end of your pencil along the base of the 6's and name the products regularly. Start at the right side and name products. Drill *three* minutes in this way.

(2) Start at the right side and multiply by 6 as in ordinary multiplication, adding the carrying figure; as 42, 40, 46, 28, 38, etc. Do not write any results on paper, but make the exercise a lively mental drill. Spend *three* minutes on this form of practice. Go over and over the line until you can name the results accurately and smoothly.

Division

6)8	4	6	7	9	2	6	9	4	3	2	6	8	4	7	2	8	4	9	6

(1) Drill on short division by 6, naming the figures without any hesitancy; as 1, 4, 1, 1, 3, 2, etc. Go slowly at first. Aim to name accurate results, but do not write any figures on the paper.

(2) Go over and over the division drill until you have increased your speed materially. Try to get through without stumbling. Persistent practice will always win. Persevere!

Short Method

To multiply any two numbers ending in 5. Example (1):—65×45. If the sum of the tens figures gives an even number, the product will end with 25; if an odd number, the product will end with 75. $4\times6+\frac{1}{2}(4+6)=29$. Annex 25 and the answer is 2925.

Example (2):—35×45. $4\times3+\frac{1}{2}(4+3)=15$, dropping the fraction. Annex 75 and the answer is 1575.

DRILL 46

Date *Name*

Time *Seat No.*

Extend and add products:

(1)		(2)		(3)	
426×6=	.....	345×6=	.....	474×6=	.....
354×6=	.....	456×6=	.....	389×6=	.....
462×6=	.....	367×6=	.....	527×6=	.....
575×6=	.....	568×6=	.....	478×6=	.....
[illegible]3×6=	.....	824×6=	.....	327×6=	.....
2[illegible]2×6=	.....	462×6=	.....	723×6=	.....

(4)		(5)		(6)	
542×6=	.....	734×6=	.....	894×6=	.....
673×6=	.....	437×6=	.....	498×6=	.....
736×6=	.....	374×6=	.....	984×6=	.....
367×6=	.....	296×6=	.....	356×6=	.....
424×6=	.....	692×6=	.....	653×6=	.....
24[illegible]6=	.....	962×6=	.....	563×6=	.....

(7)		(8)		(9)	
927×6=	.....	578×6=	.....	456×6=	.....
792×6=	.....	875×6=	.....	654×6=	.....
297×6=	.....	758×6=	.....	464×6=	.....
478×6=	.....	937×6=	.....	929×6=	.....
874×6=	.....	793×6=	.....	292×6=	.....
784×6=	.....	397×6=	.....	992×6=	.....

Divide and add quotients:

(10)		(11)	
687546÷6=	.....	847266÷6=	.....
826944÷6=	.....	923574÷6=	.....
937824÷6=	.....	536982÷6=	.....
749652÷6=	.....	857898÷6=	.....
937488÷6=	.....	475878÷6=	.....
986586÷6=	.....	969486÷6=	.....

Extend and add products:

(12)		(13)		(14)	
25×45=	.....	25×85=	.....	25×65=	.....
35×45=	.....	25×75=	.....	35×95=	.....
45×65=	.....	85×35=	.....	45×95=	.....
45×55=	.....	75×35=	.....	55×95=	.....
55×75=	.....	95×15=	.....	65×75=	.....
55×65=	.....	95×25=	.....	65×95=	.....

LESSON 47

Multiplication Drill:

4	9	2	6	3	4	5	8	7	6	5	4	2	7	8	5	9	4	7	8
6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

(1) Multiply the figures in the top line by 6, starting at the left side and naming the products at a regular rate of speed; as 24, 54, 12, 36, 18, 24, etc. Next, read the products from the right side to the left; as 48, 42, 24, 54, etc. Practise *three* minutes in this way.

(2) Start at the right side and multiply by 6, adding the carrying figure: as 48, 46, 28, 56, etc. Practise *three* minutes in this way, until you can name the results without any hesitancy. Keep your mind on the work. Concentrate for good results.

Division Drill

6)9	6	8	7	5	4	6	9	7	2	8	7	4	2	6	9	6	9	8	4

(1) Drill *three* minutes on the above short division exercise; as 1, 6, 1, 4, 5, 9, etc.

(2) Practise the above division drill several times until you have materially increased your speed. Do not write any results. Make the exercise a lively mental drill.

Short Method

To multiply by 16:

Long way:

4678
16

28068
4678

74848

Short way:

$8\times6 = 48$
$7\times6+4+8 = 54$
$6\times6+5+7 = 48$
$4\times6+4+6 = 34$
$3+4 = 7$

Note.—Multiply by 6 in the usual way and add both the carrying figure and the figure to the right of the one multiplied. Add last carrying figure to the last figure in the multiplicand to complete the product.

DRILL 47

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
427×6=	346×6=	269×6= .....
724×6=	463×6=	629×6= .....
247×6=	643×6=	962×6= .....
589×6=	784×6=	434×6= .....
859×6=	487×6=	343×6= .....
985×6=	874×6=	433×6= .....

(4)	(5)	(6)
274×6=	567×6=	564×6= .....
742×6=	765×6=	645×6= .....
428×6=	675×6=	456×6= .....
824×6=	489×6=	712×6= .....
248×6=	849×6=	217×6= .....
739×6=	948×6=	723×6= .....

(7)	(8)	(9)
724×6=	467×6=	196×6= .....
427×6=	764×6=	691×6= .....
742×6=	647×6=	962×6= .....
938×6=	843×6=	479×6= .....
839×6=	348×6=	749×6= .....
937×6=	468×6=	974×6= .....

(10)	(11)	(12)
132×16=	342×16=	749×16= .....
321×16=	423×16=	479×16= .....
242×16=	572×16=	794×16= .....
423×16=	755×16=	654×16= .....
532×16=	474×16=	564×16= .....
235×16=	742×16=	645×16= .....

(13)	(14)	(15)
364×16=	757×16=	934×16= .....
424×16=	829×16=	439×16= .....
643×16=	982×16=	994×16= .....
242×16=	743×16=	394×16= .....
584×16=	473×16=	399×16= .....
845×16=	774×16=	498×16= .....

Divide and add quotients:

(16)	(17)
856932÷6=	478266÷6= .....
968754÷6=	394872÷6= .....
875694÷6=	459786÷6= .....

LESSON 48

Drill on Multiplication by 6:

7	6	4	3	6	7	8	5	4	2	6	9	8	2	7
3	4	6	7	2	4	9	2	7	6	3	7	4	5	4
9	2	7	3	5	7	2	9	3	7	2	6	7	8	9
2	9	3	7	4	8	3	2	5	6	9	2	4	7	8

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 6; as 42, 36, 24, 18, 36, 42, etc. Next, read from the right side to the left; as 42, 12, 48, 54, 36, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 6, adding the carrying figure; as 42, 16, 49, 58, 41, 16, etc. Drill on the other lines in a similar way. Go over each line several times.

Short Method

To multiply two numbers, one of which is more and the other less than 100, 1000, etc.

Example: Multiply 108 by 94.
Unit of comparison is 100.

108 .....8 supplement
94 .....6 complement

10200
48 product of supplement and complement.

10152

Multiply the sum of the numbers less the unit of comparison by the unit of comparison and from the product, subtract the product of the supplement and the complement.

DRILL 48

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
693×6—	737×6—	549×6—
396×6—	377×6—	459×6—
963×6—	733×6—	594×6—
327×6—	378×6—	945×6—
273×6—	738×6—	367×6—
732×6—	873×6—	763×6—

(4)	(5)	(6)
493×6—	269×6—	493×6—
394×6—	629×6—	394×6—
943×6—	962×6—	439×6—
723×6—	699×6—	934×6—
327×6—	237×6—	726×6—
237×6—	372×6—	627×6—

(7)	(8)	(9)
252×16—	264×16—	369×16—
326×16—	462×16—	639×16—
632×16—	642×16—	963×16—
523×16—	639×16—	478×16—
847×16—	396×16—	874×16—
748×16—	963×16—	488×16—

(10)	(11)	(12)
457×16—	679×16—	887×16—
574×16—	766×16—	787×16—
474×16—	769×16—	788×16—
744×16—	969×16—	854×16—
477×16—	699×16—	458×16—
726×16—	753×16—	884×16—

(13)	(14)	(15)
107×96—	112×92—	1014×995—
104×94—	114×96—	1015×998—
115×88—	115×93—	1045×993—
107×94—	104×87—	1025×989—
109×92—	109×88—	1067×994—

LESSON 49

Drill on Multiplication by 6:

3	6	7	4	9	2	6	7	8	5	4	3	2	6	8	4
4	2	6	7	4	8	3	6	9	4	9	8	7	5	4	2
3	5	4	5	2	4	5	3	2	6	4	7	8	9	2	6
4	7	8	3	5	7	2	6	9	8	5	4	3	5	6	7

(1) Multiply each figure in the first line by 6, reading from left to right and then from right to left; as 18, 36, 42, 24, 54, 12, etc. Do not write the products, simply name them. Drill on the other lines in a similar way. Be careful to name results accurately and smoothly.

(2) Start at the right side of the first line and multiply by 6, adding carrying figure; as 24, 50, 41, 16, 19, 25, etc. Go over each line *four* times. After practising a few minutes, try to increase your speed. Make the drill sharp and regular.

(3) When multiplying by 16, you have two figures to add, as a general rule —the carrying figure and the figure to the right of the one multiplied. Start on the third line at the top of the page, at the right side and multiply each figure by 6. Add the two figures above. To illustrate: 36, 38, 42; 12, 16, 24; 54, 59, 65, etc. Drill from left to right in a similar way and then use the last three lines. Drill *three* minutes.

Short Method

To multiply two numbers, of the same number of figures, over and near 100, 1000, etc.

Multiply 112 by 106.

112
106

218 Sum of numbers
100 Unit of comparison

118 —Difference
72—Product of excesses

11872—Answer

Rule:—From the sum of the numbers, subtract the unit of comparison, and to the right of the result, write the product of the excesses.

Notes

(1) When there are fewer figures in the product of the excesses than ciphers in the unit of comparison, write ciphers in the result to supply the deficiency.

(2) When there are more figures in the product of the excesses than ciphers in the unit of comparison, add the excess on the left hand to the first part of the result.

(3) After some practice, the writing of the complements or the excesses in examples where they are used may be omitted.

DRILL 49

Date *Name*

Time *Sect. No.*

Extend and add products:

(1)	(2)	(3)
2345×6=	3424×6=	2594×6=
4234×6=	3676×6=	2878×6=
2346×6=	3456×6=	2939×6=
2462×6=	3782×6=	2575×6=
2673×6=	3593×6=	2487×6=
2547×6=	3878×6=	2693×6=

(4)	(5)	(6)
3263×6=	4263×6=	6234×6=
3474×6=	4787×6=	6549×6=
3598×6=	4569×6=	6376×6=
3485×6=	4787×6=	6492×6=
3767×6=	4939×6=	6378×6=
3498×6=	4578×6=	6597×6=

(7)	(8)	(9)
2132×16=	3274×16=	4584×16=
2474×16=	3592×16=	4926×16=
2593×16=	3787×16=	4737×16=
2686×16=	3492×16=	4292×16=
2737×16=	3656×16=	4353×16=
2484×16=	3787×16=	4828×16=

(10)	(11)	(12)
5623×16=	6216×16=	7324×16=
5464×16=	6349×16=	7649×16=
5767×16=	6454×16=	8248×16=
5494×16=	6272×16=	9369×16=
5868×16=	6787×16=	9284×16=
5939×16=	6939×16=	9779×16=

(13)	(14)	(15)
112×107=	114×113=	1007×1008=
107×104=	116×108=	1009×1007=
115×106=	112×109=	1065×1012=
112×109=	117×114=	1124×1008=
107×108=	118×112=	1017×1011=

Aim to get 100%

LESSON 50

Drill on Multiplication by 6:

3	4	7	8	2	5	6	9	2	3	4	8	4	9	3
2	6	4	5	8	7	3	4	9	2	6	7	5	4	8
7	2	3	4	7	2	9	6	2	3	5	4	8	9	2
2	8	7	6	5	4	3	2	7	2	6	5	4	2	9
7	6	3	5	4	9	2	7	3	6	7	4	9	8	6
4	7	2	9	3	2	4	5	7	8	2	6	3	2	4

(1) Drill on the first line, multiplying each figure by 6, reading from left to right and then from right to left; as 18, 24, 42, 48, 12, etc. Draw your pencil along the line and try to name the results regularly. Go over each line *twice*.

(2) Start at the right side of the first line and multiply by 6, adding carrying figure; as 18, 55, 29, 50, 29, 20, etc. Drill on each line in this way *three* times. Try to increase your speed. Drive ahead!

(3) Group two lines, multiplying the lower figure by 6 and adding the top figure; as 48, 51; 24, 33; 30, 34, etc. Read from right to left and then back on the same two lines. Drill on the other lines in a similar way.

(4) Group three lines, multiplying the figure in the third line by 6 and adding the two figures above; as 12, 20, 23; 54, 58, 67; 48, 53, 57, etc. Practise *three* minutes on this form of grouping the figures.

Short Method

To multiply two numbers, of the same number of figures, under and near 100, 1000, etc.

Example:—Multiply 94 by 98.

94 ..... 6 complement
98 ..... 2 complement

9212

From either number, subtract the complement of the other, and to the right of the result, write the product of the complements.

DRILL 50

Date *Name*
Time *Seat No.*

Extend and add products:

(1)
2467 x 6=
2689 x 6=
2743 x 6=
2969 x 6=
2787 x 6=
2547 x 6=_____

(2)
3674 x 6=
3725 x 6=
3496 x 6=
3787 x 6=
3578 x 6=
3484 x 6=_____

(3)
4262 x 6=
4393 x 6=
4287 x 6=
4575 x 6=
4897 x 6=
4757 x 6=_____

(4)
5262 x 6=
5345 x 6=
5464 x 6=
5676 x 6=
5824 x 6=
5764 x 6=_____

(5)
6232 x 6=
6545 x 6=
6326 x 6=
6474 x 6=
6787 x 6=
6599 x 6=_____

(6)
7247 x 6=
7382 x 6=
7549 x 6=
7637 x 6=
7584 x 6=
7299 x 6=_____

(7)
1242 x 16=
1348 x 16=
1575 x 16=
1892 x 16=
1772 x 16=
1996 x 16=_____

(8)
2642 x 16=
2589 x 16=
2675 x 16=
2969 x 16=
2878 x 16=
2747 x 16=_____

(9)
3752 x 16=
3492 x 16=
3696 x 16=
3484 x 16=
3797 x 16=
3499 x 16=_____

(10)
4262 x 16=
4375 x 16=
4989 x 16=
4787 x 16=
4353 x 16=
4828 x 16=_____

(11)
5621 x 16=
5484 x 16=
5929 x 16=
5748 x 16=
5326 x 16=
5494 x 16=_____

(12)
6212 x 16=
6788 x 16=
6929 x 16=
6545 x 16=
6899 x 16=
6374 x 16=_____

(13)
98 x 99=
97 x 96=
95 x 94=
94 x 93=
93 x 92=
92 x 91=_____

(14)
88 x 94=
87 x 88=
75 x 95=
85 x 97=
84 x 95=
93 x 88=_____

(15)
998 x 999=
997 x 993=
975 x 988=
991 x 985=
996 x 987=
985 x 975=_____

LESSON 51

7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
4	6	7	3	8	9	5	2	3	4	7	6	5	8	7	9	6	4	3	8

(1) Add 7 to each of the lower figures, beginning at the left side; as 11, 13, 14, 10, 15, 16, etc. Draw the blunt end of your pencil along slowly, naming the sums as the pencil comes under each group. Next read from right to left in a similar way. Practise *three* minutes.

(2) Start at the right side and name the sums of the groups, adding the carrying figure; as 15, 11, 12, 14, 17, 15, etc. Drill faithfully by going over the groups *five* times.

To Subtract Rapidly Any Pair of Fractions

Example:—From 3/5 take 4/7.

Method:—Fix the denominator first by getting the L.C.M. of the denominators. In this case, 5×7 or 35 will be the least common denominator.

Multiply the numerator of the first fraction by the denominator of the second and the numerator of the second by the denominator of the first—cross-multiply as it were. 3×7=21. 4×5=20. Subtract these results, 21—20=1. The answer is 1/35.

Trade Discount

Example:—Goods are listed at $318.55 with discounts of 5% and 2½% off. Find the net price.

$318.55
15.93=5%
302.62
7.57=2½%
$295.05

Solution:—5% is ½ of 10% of $318.55 or ½ of $31.855 or $15.93 to nearest cent. 2½% is ¼ of 10% of $302.62 or ¼ of $30.262 or $7.57 to nearest cent. Always see clearly what 10% of the amount is and then simply take one-quarter of the 10% to obtain 2½%. For quick figuring, many trade discounts used in business can be based on 1%, 10% or 100%.

DRILL 51

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
2467	4774	6547	3457	7726	5647
6734	3426	7234	2673	4673	3262
5462	7362	6753	5246	5747	7342
7237	4256	5432	7375	6274	2765
2546	7371	6477	2667	3727	4277
3472	4735	3256	5474	7266	3646
6732	2677	7247	3626	4726	2754
7475	4234	7735	7151	7457	3567
3647	7321	2566	4672	3724	2471
2731	5674	3673	3456	2673	5664
5426	6767	4257	7137	5436	6777
7132	3454	6724	6742	7267	3456
5647	5566	3675	7331	3671	2673
4726	7732	7233	4267	4727	7126
5274	5273	5657	7133	7266	4764

Prove that your answers are correct in questions 1 to 6 by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2½%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

By inspection, find the value of:

(13) $\frac{1}{8} - 1\frac{1}{2} =$ ..... (16) $\frac{8}{9} - 1\frac{1}{10} =$ ..... (19) $\frac{2}{5} - \frac{3}{5} =$ ..... (22) $\frac{2}{3} - \frac{1}{7} =$ .....

(14) $\frac{3}{7} - \frac{1}{8} =$ ..... (17) $\frac{3}{4} - \frac{1}{5} =$ ..... (20) $\frac{3}{7} - \frac{3}{5} =$ ..... (23) $\frac{2}{3} - 1\frac{1}{11} =$ .....

(15) $\frac{4}{5} - \frac{1}{6} =$ ..... (18) $\frac{1}{2} - \frac{1}{3} =$ ..... (21) $\frac{5}{7} - 1\frac{3}{11} =$ ..... (24) $\frac{4}{5} - 1\frac{2}{11} =$ .....

(25) Prove that your answer is correct to the following addition question, by casting out 9's (See Lesson 31). Show work opposite the question.

4263789	.....
9674265	.....
4267874	.....
7892653	.....
4926877	.....
8789264	.....
6428548	.....

Aim to get 100%

LESSON 52

7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3	4	6	5	7	8	9	2	3	4	6	7	8	5	4	6	9	3	6	8

(1) Add 7 to each of the lower figures, beginning at the left side and reading to the right; as 10, 11, 13, 12, 14, 15, 16, etc. Do not write the sums, but simply name the results. Read from the right side to the left in a similar way. Drill *three* minutes. Are you watching accuracy and regularity? Be encouraged by the fact that you can add now more easily and quickly than two months ago. Push ahead!

(2) Read from right to left, adding the carrying figure; as 15, 14, 11, 17, 14, etc. Go over the list *six* times. Drill faithfully. Concentrate!

(3) Consider the top number 17 instead of 7, and add combinations, beginning at the left side; as 20, 21, 23, 22, 24, 25, 26, etc. Read back and forth several times until you can name the results easily and accurately.

Fractions

Review addition of fractions (See Lesson 42). In the following problems, add the first two fractions, and to the sum add the other fraction:

(*a*) $\frac{1}{2}+\frac{1}{3}+\frac{1}{6}$
(*b*) $\frac{1}{4}+\frac{1}{3}+\frac{5}{12}$
(*c*) $\frac{1}{8}+\frac{1}{3}+\frac{1}{12}$
(*d*) $\frac{1}{4}+\frac{1}{6}+\frac{7}{12}$

By inspection, find the value of:

(*a*) $\frac{1}{6}-\frac{1}{12}$
(*b*) $\frac{3}{4}-\frac{1}{8}$
(*c*) $\frac{1}{2}-\frac{1}{3}$
(*d*) $\frac{1}{8}-\frac{1}{6}$
(*e*) $\frac{5}{7}-\frac{1}{16}$
(*f*) $\frac{3}{7}-\frac{1}{8}$
(*g*) $\frac{1}{2}-\frac{1}{6}$
(*h*) $\frac{3}{4}-\frac{1}{3}$
(*i*) $\frac{5}{6}-\frac{1}{8}$

DRILL 52

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
7267	7676	6556	5765	4674	7277
4374	4263	7473	3274	5467	3674
2756	5737	2637	6357	7255	7136
4345	6472	5746	2673	3672	5425
6727	5646	2354	4527	4727	3672
3454	7237	7261	7142	2676	5437
2676	7554	5737	3675	3443	6746
7237	4664	6273	4721	7272	5654
5656	6757	4566	3665	6243	7271
4774	3265	7325	7217	7477	3646
3262	7213	4736	3654	6236	7237
7337	5472	7267	7212	5656	3466
5474	6767	5672	6737	4262	3774
2646	5225	3267	2474	7377	5647
7273	4664	5472	7237	5264	3271
2637	7371	7366	6374	7127	2762
5475	5767	5677	2667	3746	7347
7236	4674	6742	7424	4674	4264

Prove that your answers are correct in questions 1 to 6 by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2½%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

By inspection, find the sums of:

(13) $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}=$ ..... (15) $\frac{1}{2}+\frac{3}{4}+1\frac{5}{8}=$ ..... (17) $\frac{3}{8}+\frac{1}{4}+\frac{11}{16}=$ .....

(14) $\frac{1}{3}+\frac{1}{6}+\frac{1}{9}=$ ..... (16) $\frac{1}{2}+\frac{2}{3}+\frac{5}{12}=$ ..... (18) $\frac{3}{4}+\frac{3}{8}+\frac{11}{16}=$ .....

By inspection, find the value of:

(19) $\frac{4}{5}-\frac{3}{17}=$ ..... (22) $\frac{1}{2}-\frac{3}{10}=$ ..... (25) $\frac{3}{4}-\frac{3}{8}=$ .....

(20) $\frac{2}{5}-\frac{1}{8}=$ ..... (23) $\frac{3}{4}-\frac{1}{8}=$ ..... (26) $\frac{3}{4}-\frac{1}{10}=$ .....

(21) $\frac{3}{11}-\frac{3}{13}=$ ..... (24) $\frac{3}{4}-\frac{1}{7}=$ ..... (27) $\frac{3}{4}-\frac{4}{11}=$ .....

Accuracy first, then speed

LESSON 53

7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3	6	4	9	6	7	5	4	7	8	7	4	9	6	7	3	5	9	8	6

(1) Name the sums of the various groups, moving your pencil back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that comprise the group. Do not say: 7 and 3 are 10, but name the total at once, 10. Beginning at the left side, we have the following results:—10, 13, 11, 16, 13, 14, etc. Drill faithfully. Make every minute count.

(2) Imagine the figures in the top row to be 27. Start at the left side and run your pencil along to the right, naming the sums as your pencil comes under each group; as 30, 33, 31, 36, 33, etc. Go over the list several times until you can name the sums regularly and accurately. Similarly, try adding 37, 47, 57, etc., as the top number.

Trade Discount

Example: Goods are listed at $473.65, with discounts of 5% and 2½% off. Find net price.

$473.65
23.68=5%
———
449.97
11.25=2½%
———
438.72=Net price

Solution:—5% is ½ of 10% of $473.65 or ½ of $47.365 or $23.68 to nearest cent. 2½% is ¼ of 10% of $449.97 or ¼ of $44.997 or $11.25 to nearest cent. The net price to the buyer would be $438.72. Watch your decimals. Get the amount representing 10%, or the base, fixed in your mind and then you will not write the figures representing 2½% in the wrong position.

DRILL 53

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
46275	47267	56734	67324	77326
62747	34726	24672	52467	43275
73626	72345	73257	25344	62434
56472	63274	65425	67256	56265
37247	27137	37264	34672	73427
26734	75424	34727	56731	26561
57213	26737	62356	47267	73477
72732	54264	73425	32654	26547
56234	37521	36757	73246	73252
72772	26737	42342	24731	67347
67345	64253	67215	27137	24724
54737	72634	54774	74234	26137
67326	56754	26432	56723	72712
46734	67234	45626	42135	34567
54372	47527	54737	26476	26234
62435	63252	26461	34567	54721
57142	42721	54356	26123	67247
42737	57327	72737	54672	24736
12345	26466	47273	26726	47264
67327	42734	23524	73454	24547

In questions 1 to 5, add the reverse way to make sure that your answers are correct.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 2½%, find net price.

(6)$	(7)$	(8)$	(9)$	(10)$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

By inspection, find the value of:

(11) $\frac{3}{5}-\frac{2}{7}=$.....
(12) $\frac{4}{5}-\frac{3}{8}=$.....
(13) $\frac{3}{4}-\frac{1}{5}=$.....
(14) $\frac{5}{8}-\frac{3}{7}=$.....
(15) $32\frac{1}{5}-16\frac{1}{12}=$.....
(16) $62\frac{2}{7}-16\frac{1}{8}=$.....
(17) $27\frac{4}{5}-19\frac{4}{11}=$.....
(18) $121\frac{4}{7}-17\frac{4}{11}=$.....
(19) $124\frac{5}{8}-13\frac{4}{7}=$.....
(20) $64\frac{1}{4}-52\frac{1}{8}=$.....
(21) $83\frac{1}{4}-72\frac{1}{8}=$.....
(22) $89\frac{5}{8}-72\frac{3}{8}=$.....

Aim to get 100%

LESSON 54

Drill on rapid addition:

4	6	7	3	2	5	4	6	7	2	3	2	6	5	7	4	2	4	5	7
6	7	2	6	7	4	7	2	4	3	4	6	7	3	2	6	5	7	2	4
5	4	6	5	4	7	2	5	3	7	5	7	2	7	1	7	3	2	5	6
2	6	7	3	2	2	6	4	2	5	2	3	4	5	4	3	4	5	3	1
4	2	6	7	3	7	5	3	4	1	6	2	5	2	7	4	2	6	4	3
7	2	3	4	6	5	7	2	7	3	4	7	2	3	5	6	7	2	6	7
2	5	7	3	1	4	2	7	3	5	6	2	7	7	4	3	4	5	7	2
4	6	2	7	2	5	4	6	2	7	3	5	2	6	7	6	7	2	6	7
7	3	4	2	7	3	5	4	1	2	4	7	3	5	4	5	2	4	3	4
6	2	7	3	5	7	2	7	7	3	7	2	1	6	6	2	5	7	2	6
4	3	2	6	2	5	4	2	6	2	5	3	7	2	7	3	4	2	7	2
5	2	3	4	1	7	3	4	2	5	4	7	2	3	5	7	3	5	4	7
1	5	7	2	6	3	7	5	4	3	7	2	6	2	4	6	7	2	7	1
2	6	4	3	5	6	2	7	3	7	3	5	4	6	2	5	4	7	2	6
5	4	2	7	2	5	4	3	5	4	7	2	7	7	3	7	2	3	5	4
7	3	5	4	6	2	7	4	6	3	5	4	2	3	5	2	6	4	6	2
4	6	7	3	5	4	2	7	3	7	6	7	3	4	7	3	5	2	4	7
2	5	4	3	7	6	3	5	4	2	7	2	1	2	3	5	2	7	2	6
7	2	3	2	1	5	6	2	7	3	5	6	7	3	1	4	3	2	7	3
5	6	7	7	2	4	5	7	3	7	4	2	6	3	7	5	7	3	4	7

(1) Add each column, beginning at the right side. Do not carry at first and do not write any results. Start at the left side and add the columns again. Practise reading the columns for *five* minutes. Try to acquire accuracy, smoothness and speed.

(2) Drill on horizontal addition. Start at the top line, add from left to right and then from right to left on the same line. Do you get the same result? Practise horizontal addition on the other lines of the question, in a similar way.

(3) Let the above block of figures, twenty wide and twenty deep, represent an addition question. Pencil the sum as you add, writing the figures at the bottom. Add and re-add, running from bottom to top and from top to bottom, until you can add the complete question in *four* minutes.

DRILL 54

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
42637	73426	67245	64577	73467
72463	27374	43674	23426	25633
27324	56732	26735	57432	64725
34772	73147	67243	42564	36456
42345	24653	24572	73245	54637
25634	56247	56731	23726	26541
73451	73654	12546	57247	73266
42376	25432	25432	32572	24734
26745	36757	67267	16434	63445
73452	24534	23454	54673	56723
67213	73215	32645	72434	42673
45326	42673	67231	56723	75437
72432	67244	14567	45672	26566
56727	26537	32645	67213	45623
25472	54723	26436	54364	26567
62543	24526	72345	26735	54673
57271	73272	43624	57242	26562
24356	62754	26734	32574	13427
73247	37425	54327	26245	72346
67356	24636	63542	72635	24674
26725	42767	26735	47526	37213
43672	26543	42656	73213	62546
52436	72357	73246	52547	72732
47265	26734	56731	26434	63545
71324	24563	24673	73216	26734
42567	75246	73127	26537	71324
36472	23762	56734	71213	42672
42734	56473	42567	56364	56723
73247	47247	34723	45673	23542
64625	23654	42574	24567	62377

Prove your answers correct in each of the *five* questions, by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 5% and 2½%.

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

By inspection, find the sum of:

(11) $24\frac{1}{8}+22\frac{1}{7}=$.....
(12) $32\frac{1}{7}+33\frac{1}{3}=$.....
(13) $16\frac{2}{3}+12\frac{1}{6}=$.....
(14) $18\frac{1}{8}+4\frac{1}{4}=$.....
(15) $33\frac{1}{3}+12\frac{2}{7}=$.....
(16) $37\frac{1}{2}+16\frac{1}{3}=$.....
(17) $24\frac{3}{8}+14\frac{1}{7}=$.....
(18) $26\frac{5}{8}+14\frac{1}{8}=$.....
(19) $14\frac{1}{8}+42\frac{1}{7}=$.....

LESSON 55

Drill *ten* minutes on the following:

4	6	2	7	3	2	4	5	6	7	2	3	4	5	6	2	7	6	2	4
7	2	6	3	4	7	2	4	3	2	5	6	2	7	2	3	4	5	6	7
3	5	4	2	6	4	3	2	7	6	3	5	4	2	7	2	6	3	2	5
4	7	2	3	2	5	4	6	3	4	5	7	2	3	4	5	2	7	7	3
2	6	5	4	7	2	3	2	6	5	4	3	7	2	6	3	7	2	3	4
5	4	3	2	6	7	2	6	7	2	3	4	5	6	2	4	3	5	7	2
6	7	2	3	2	5	4	1	2	3	7	2	4	3	5	2	6	3	5	7
2	4	6	2	3	4	7	2	4	6	3	7	2	4	2	4	5	7	2	3
5	6	7	3	4	2	5	6	7	2	4	3	6	7	3	5	6	2	5	7
3	4	2	5	6	7	2	5	6	3	5	6	2	4	7	3	2	6	7	2
6	7	3	4	5	4	6	2	3	5	4	7	3	2	6	2	7	3	4	6
2	4	7	3	2	5	2	4	6	2	7	3	6	2	4	7	1	2	3	4
7	3	1	2	5	4	3	2	5	4	6	2	4	3	2	6	4	7	2	7
6	2	3	4	4	3	7	6	2	7	2	6	2	5	4	3	2	4	6	3
4	7	2	1	5	4	3	2	5	4	3	7	7	2	6	4	6	2	5	6
3	4	6	7	2	7	6	3	4	5	7	2	6	5	4	3	2	4	6	7
7	2	3	4	7	2	5	6	3	2	5	4	2	6	3	7	4	2	5	6
2	7	2	3	4	3	4	7	2	3	4	6	7	2	6	3	7	5	4	2
5	4	7	2	3	4	6	2	5	7	2	3	4	6	5	2	3	2	6	7
4	6	2	5	6	2	6	5	4	3	7	2	6	5	7	3	4	5	4	6

(1) After drilling *ten* minutes on reading the above columns, try to add the question in *four* minutes. When reading the columns at first, do not write the results, but aim to read smoothly and accurately. After preparatory practice for *ten* minutes, treat the question as an addition question and write the results in pencil figures. There are 400 figures in the question. After getting the correct result, say in *four* minutes, try to increase your speed. Can you add the question in three and a half minutes?

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right on the same line. Do you get the same result? If not, try again.

(3) Add by 7's from 21 to 98; from 70 to 140.

(4) Subtract by 7's from 84 to 0; from 140 to 35.

DRILL 55

Date *Name*

Time *Seat No.*

(1)	(2)	(3)		
46732	54672	46723	56745	46456
54267	36723	54367	23456	77232
35423	54264	25436	26732	42713
67356	36723	72542	43256	57345
24725	54372	12437	67324	21564
67312	67237	26524	56754	36426
54236	54323	72352	43426	72354
72763	46732	67235	72678	23567
56435	524[illegible]7	42356	23723	71325
67214	3[illegible]23	34245	54347	32762
26732	25642	72334	26523	54325
54357	32537	26723	54356	67213
26436	26425	54356	72732	56737
54632	32546	26723	25673	24353
67256	72637	72435	43542	72125
43647	54324	46213	67237	46234
26754	67256	23547	23425	75656
67256	34527	71326	62352	23727
43567	72352	12454	43723	54372
54325	24735	32547	67234	72634
67234	67264	26434	52342	35723
25463	23546	72356	67123	12345
43654	72323	24732	54235	67234
26726	56735	63257	67347	24527
37263	42537	34524	12456	32472
54356	26421	67236	23567	56236
62737	54312	74123	67213	24767
47326	67256	23456	42735	32423
73467	24[illegible]8	62347	13567	46237
67256	36547	42723	24672	65723

Prove your answers correct in each of the five addition questions above, by adding the reverse way—top to bottom.

Consider each result a list price in dollars and cents and after allowing discounts of 5% and 2½%, find the net price.

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

By inspection, find the value of:

(11) $24\frac{4}{8}-12\frac{1}{8}=$..... (13) $28\frac{3}{4}-12\frac{1}{4}=$..... (15) $36\frac{3}{4}-11\frac{3}{8}=$.....

(12) $14\frac{1}{1}-2\frac{1}{8}=$..... (14) $37\frac{1}{2}-13\frac{1}{3}=$..... (16) $125\frac{1}{8}-68\frac{1}{8}=$.....

Aim to get 100%

LESSON 56

Multiplication

4	6	5	8	7	4	9	3	2	4	6	9	8	5	7	6	4	7	8	5
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

(1) Beginning at the left side, name the product of each of the figures by 7; as 28, 42, 35, 56, 49, 28, etc. As an aid, run the blunt end of your pencil along the base of the 7's and try to name the products regularly. Start at the right side and name the products. Drill faithfully for *three* minutes.

(2) Start at the right side and multiply by 7, as in ordinary multiplication, adding the carrying figure; as 35, 59, 54, 33, 45, etc. Do not write any results on paper just now, but make the exercise a brisk mental drill. Spend *three* minutes on this form of practice. Go over and over the line until you can name the results with ease and accuracy.

Division

7)8	2	6	7	4	9	5	4	6	8	7	6	3	2	9	8	5	7	4	8

Drill on short division by 7, naming the figures slowly at first, but regularly; as 1, 1, 8, 1, 0, 7, 0, 7, 8, etc. Do not write any results on paper, but spend at least *three* minutes in careful, conscientious practice.

Short Method

To multiply by a number, one part of which is a certain number of times the other part:

Example:—Find the product of 425 multiplied by 568.

425
568
3400
23800
241400

Solution:—425×8=3400. Now, since 56, the other part of the multiplier, is 7 times 8, if we multiply the 8 times the multiplicand, or 3400, by 7, we will have 56 times the multiplicand, or 23800. Adding, we get 241400, the product.

DRILL 56

Date *Name*

Time *Seat No.*

Extend and add products:

(1)

467×7— .....
325×7— .....
426×7— .....
782×7— .....
367×7— .....
524×7— .....

(2)

346×7— .....
567×7— .....
492×7— .....
678×7— .....
396×7— .....
469×7— .....

(3)

247×7— .....
472×7— .....
742×7— .....
365×7— .....
563×7— .....
635×7— .....

(4)

369×7— .....
639×7— .....
963×7— .....
482×7— .....
248×7— .....
842×7— .....

(5)

[illegible]×7— .....
694×7— .....
946×7— .....
367×7— .....
673×7— .....
736×7— .....

(6)

549×7— .....
459×7— .....
954×7— .....
378×7— .....
783×7— .....
387×7— .....

(7)

564×7— .....
645×7— .....
546×7— .....
295×7— .....
592×7— .....
925×7— .....

(8)

365×7— .....
563×7— .....
653×7— .....
428—7× .....
284×7— .....
824×7— .....

(9)

475×7— .....
574×7— .....
745×7— .....
394×7— .....
493×7— .....
934×7— .....

Divide and add quotients:

(10)

846797÷7— .....
929326÷7— .....
837466÷7— .....
937244÷7— .....
978656÷7— .....
847357÷7— .....

(11)

467824÷7— .....
298473÷7— .....
346899÷7— .....
568344÷7— .....
436828÷7— .....
578431÷7— .....

Extend and add products:

(12)

247×124— .....
578×369— .....
794×217— .....
299×427— .....
984×486— .....
275×459— .....

(13)

294×248— .....
212×364— .....
2154×246— .....
1457×488— .....
2157×279— .....
1397×186— .....

LESSON 57

Multiplication Drill:

4	9	6	7	3	2	5	8	7	4	2	3	5	8	7	2	6	4	2	8
7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

(1) Multiply the figures in the top line by 7, starting at the left side and naming the products at a regular rate of speed; as 28, 63, 42, 49, 21, 14, etc. Practise *three* minutes, going from left to right and from right to left.

(2) Start at the right side and multiply by 7, adding the carrying figure; as 56, 19, 29, 44, 18, 50, 61, etc. Practise *three* minutes in this way, until you can name the results without any hesitancy. Concentrate for good results.

Division Drill

7)8	7	2	6	5	4	9	2	3	6	5	4	6	7	8	3	5	4	2	6

Take a quick, sharp drill on the above short division exercise; as 1, 2, 4, 6, 6, 4, 9, etc. Do not write any figures on the paper, but use the drill for a brisk mental exercise. Go over and over several times until you can name the results without stumbling.

Short Method

To multiply by 17:

Long way:

4768
17

33376
4768

81056

Short way:

8×7 =56
6×7+5+8=55
7×7+5+6=60
4×7+6+7=41
4+4= 8

The "teen" multiplication is used very extensively in invoicing. You should be able to make extensions such as the following, at sight: 465 lbs. at 17 cents a lb.; 624 yds. at 17 cents a yard.

DRILL 57

Date *Name*

Time *Seat No.*

Extend and add products:

(1)

352×7= .....
253×7= .....
523×7= .....
465×7= .....
564×7= .....
645×7= .....

(2)

126×7= .....
621×7= .....
261×7= .....
345×7= .....
453×7= .....
534×7= .....

(3)

327×7= .....
273×7= .....
732×7= .....
645×7= .....
456×7= .....
654×7= .....

(4)

273×7= .....
732×7= .....
237×7= .....
468×7= .....
684×7= .....
864×7= .....

(5)

367×7= .....
637×7= .....
736×7= .....
498×7= .....
948×7= .....
849×7= .....

(6)

297×7= .....
792×7= .....
972×7= .....
435×7= .....
354×7= .....
534×7= .....

(7)

235×17=.....
325×17=.....
523×17=.....
462×17=.....
264×17=.....
642×17=.....

365×17= .....
653×17= .....
563×17= .....
487×17= .....
784×17= .....
748×17= .....

(9)

639×17=.....
396×17=.....
936×17=.....
427×17=.....
247×17=.....
742×17=.....

(10)

567×17=.....
657×17=.....
765×17=.....
438×17=.....
348×17=.....
843×17=.....

(11)

359×17= .....
539×17= .....
935×17= .....
478×17= .....
748×17= .....
847×17= .....

(12)

659×17=.....
569×17=.....
965×17=.....
325×17=.....
532×17=.....
355×17=.....

Divide and add quotients:

(13)

8652÷7=.....
9345÷7=.....
8596÷7=.....
9261÷7=.....
8323÷7=.....
9877÷7=.....

(14)

8491÷7= .....
8764÷7= .....
9373÷7= .....
9891÷7= .....
8561÷7= .....
8834÷7= .....

(15)

8267÷7=.....
9695÷7=.....
8897÷7=.....
9261÷7=.....
8596÷7=.....
9835÷7=.....

Aim to get 100%

LESSON 58

Drill on Multiplication by 7:

6	2	4	8	7	9	2	8	5	4	6	3	9	7	2
4	9	8	3	6	5	4	3	2	7	8	9	2	6	5
2	7	3	7	8	9	5	4	6	3	2	7	5	4	8
9	3	7	2	4	3	4	9	8	2	6	5	8	3	7

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 7; as 42, 14, 28, 56, 49, 63, etc. Next, read from the right side to the left; as 14, 49, 63, 21, 42, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 7, adding the carrying figure; as 14, 50, 68, 27, 44, 32, etc. Drill on the other lines in a similar way. Go over each line several times. Persevere and you are sure to win. Make every minute count for good results.

Short Method

To multiply by a number one part of which is a certain number of times the other part.

Example:—Find the product of 4168×432.

4168	Solution:—Multiply 4168 by 4 and the result is 16672. Be careful to place the first figure of the product directly under the 4, as you are really taking 400 times the multiplicand. Now, since 32, the other part of the multiplier, is 8 times 4, take 8 times 16672 and write the first figure of the product directly under the units figure of the multiplier. Adding, we get 1,800,576, the product.
432	
16672	
133376	
1800576	

DRILL 58

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
568×7=	354×7=	427×7= .....
865×7=	543×7=	247×7= .....
685×7=	454×7=	742×7= .....
493×7=	625×7=	398×7= .....
394×7=	526×7=	839×7= .....
943×7=	256×7=	983×7= .....

(4)	(5)	(6)
665×7=	694×7=	473×7= .....
566×7=	496×7=	374×7= .....
656×7=	964×7=	478×7= .....
868×7=	869×7=	743×7= .....
688×7=	698×7=	874×7= .....
877×7=	988×7=	788×7= .....

(7)	(8)	(9)
236×17=.....	264×17=	925×17=.....
346×17=.....	642×17=	259×17=.....
632×17=.....	462×17=	599×17=.....
362×17=.....	375×17=	874×17=.....
426×17=.....	573×17=	478×17=.....
365×17=.....	755×17=	784×17=.....

(10)	(11)	(12)
457×17=.....	969×17=	878×17=.....
754×17=.....	699×17=	788×17=.....
574×17=.....	895×17=	965×17=.....
688×17=.....	598×17=	569×17=.....
866×17=.....	985×17=	695×17=.....
868×17=.....	998×17=	993×17=.....

(13)	(14)
2157×927=	45781×936= .....
1578×936=	57842×848= .....
2147×183=	21975×742= .....
7149×535=	41974×535= .....
47289×436=	17945×749= .....
15971×642=	15795×428= .....

Accuracy first, then speed

LESSON 59

Drill on Multiplication by 7:

4	6	4	3	2	7	8	9	6	5	4	3	2	6	8	5
9	2	3	4	7	8	4	6	7	9	3	7	4	8	6	9
2	3	5	6	4	7	8	2	6	4	7	3	9	2	5	6
4	7	8	2	6	9	3	5	4	8	2	7	6	5	8	7

(1) Multiply each figure in the first line by 7, reading from left to right and then from right to left; as 28, 42, 28, 21, 14, 49, 56, etc. Do not write any figures on the paper, simply name the products. Drill on the other lines in a similar way. Be careful to name results accurately and smoothly.

(2) Start at the right side of the first line and multiply by 7, adding carrying figure; as 35, 59, 47, 18, 22, 30, etc. Go over each line *four* times. After practising a few minutes, try to increase your speed. Make the drill sharp and regular.

(3) When multiplying by 17, you have two figures to add, as a general rule —the carrying figure and the figure to the right of the one multiplied. Start on the third line at the top of the page, at the right side, and multiply each figure by 7. Add to the product, the two figures above. To illustrate: 42, 52, 56; 35, 41, 49; 14, 22, 28, etc. Drill from left to right in a similar way and then use the last three lines. Drill *five* minutes.

Short Method

To multiply by the factors of a number:

Example:—Multiply 95 by 32.

95
8

760
4

3040

Solution:—The factors of 32 are 8 and 4. First multiply by 8 and then multiply by 4.

DRILL 59

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
1245×7=	2342×7=	2679×7=
2326×7=	2676×7=	2354×7=
2437×7=	1896×7=	1696×7=
1347×7=	1767×7=	2369×7=
1676×7=	2478×7=	2543×7=
1427×7=	2649×7=	2787×7=

(4)	(5)	(6)
3464×7=	2676×7=	3584×7=
3672×7=	3484×7=	3696×7=
3256×7=	3262×7=	2989×7=
1672×7=	3575×7=	2747×7=
3579×7=	4262×7=	2696×7=
3428×7=	4787×7=	2585×7=

(7)	(8)	(9)
1263×17=	2342×17=	2696×17=
1672×17=	2656×17=	2474×17=
1456×17=	2434×17=	3646×17=
1234×17=	2595×17=	3575×17=
1354×17=	2878×17=	3767×17=
1267×17=	2359×17=	3494×17=

(10)	(11)	(12)
4323×17=	3567×17=	5634×17=
4784×17=	4284×17=	5432×17=
4294×17=	4979×17=	5676×17=
4385×17=	4763×17=	5235×17=
5248×17=	4327×17=	5787×17=
4989×17=	4982×17=	5979×17=

(13)	(14)	(15)
256×24=	784×36=	2956×35=
438×27=	891×72=	2179×44=
632×36=	794×77=	4754×108=
546×45=	485×85=	2816×256=
487×42=	284×56=	4712×289=
298×49=	562×68=	2175×192=

Aim to get 100%

LESSON 60

Drill on Multiplication by 7:

4	9	2	3	6	5	7	8	2	6	7	9	4	9	8
2	6	4	5	7	8	3	2	7	9	2	6	3	4	5
9	8	7	6	2	3	5	7	3	4	8	2	6	7	3
4	9	2	7	8	2	6	3	4	5	7	6	9	2	7
5	2	7	3	4	8	2	7	2	6	9	3	4	7	8
2	6	9	2	5	7	8	2	6	7	3	9	5	4	7

(1) Drill on the first line, multiplying each figure by 7, reading from left to right and then from right to left; as 28, 63, 14, 21, 42, 35, etc. Draw your pencil along the line and try to name the results regularly. Go over each line *twice*.

(2) Start at the right side of the first line and multiply by 7, adding carrying figure; as 56, 68, 34, 66, 55, etc. Drill on each line in this way, *three* times.

(3) Group two lines, multiplying the lower figure by 7 and adding the top figure; as 43, 37, 25, 51, 21, etc. Read from right to left and then back on the same two lines. Drill on the other lines in a similar way.

(4) Group three lines, multiplying the figure in the third line by 7 and adding the *two* figures above; as 21, 26, 34; 49, 53, 62; 42, 45, 49, etc. Practise *three* minutes on this form of grouping the figures.

Short Method

To multiply by the factors of a number:

Example:—Multiply 4267 by 221.

4267
17

72539
13

943

Solution:—The factors of 221 are 17 and 13. First multiply by 17, the short method, and then multiply that product by 13, short method of "teen" multiplication.

DRILL 60.

Date *Name*
Time *Seat No.*

Extend and add products:

(1)
1234 × 7 =
1348 × 7 =
1672 × 7 =
1348 × 7 =
1565 × 7 =
1434 × 7 = _____

(2)
2435 × 7 =
2676 × 7 =
2347 × 7 =
2535 × 7 =
2464 × 7 =
2789 × 7 = _____

(3)
3245 × 7 =
3467 × 7 =
3278 × 7 =
3547 × 7 =
3676 × 7 =
3424 × 7 = _____

(4)
4525 × 7 =
4626 × 7 =
4838 × 7 =
4929 × 7 =
4325 × 7 =
4262 × 7 = _____

(5)
5262 × 7 =
5484 × 7 =
5929 × 7 =
5373 × 7 =
5484 × 7 =
5326 × 7 = _____

(6)
6424 × 7 =
6373 × 7 =
6585 × 7 =
6263 × 7 =
6878 × 7 =
6494 × 7 = _____

(7)
1212 × 17 =
1484 × 17 =
1595 × 17 =
1646 × 17 =
1323 × 17 =
1676 × 17 = _____

(8)
2484 × 17 =
2676 × 17 =
2939 × 17 =
2474 × 17 =
2787 × 17 =
2595 × 17 = _____

(9)
3474 × 17 =
3767 × 17 =
3585 × 17 =
3676 × 17 =
3424 × 17 =
3787 × 17 = _____

(10)
4124 × 17 =
4782 × 17 =
4373 × 17 =
4585 × 17 =
4292 × 17 =
4376 × 17 = _____

(11)
5823 × 17 =
5927 × 17 =
5268 × 17 =
5437 × 17 =
5289 × 17 =
5376 × 17 = _____

(12)
6269 × 17 =
6372 × 17 =
6484 × 17 =
6289 × 17 =
6474 × 17 =
6898 × 17 = _____

(13)
1264 × 35 =
1486 × 45 =
1897 × 42 =
1648 × 54 =
1575 × 84 =
1296 × 56 = _____

(14)
2632 × 63 =
2578 × 36 =
2798 × 27 =
2367 × 35 =
2488 × 48 =
2695 × 51 = _____

(15)
3727 × 65 =
3847 × 56 =
3292 × 75 =
3684 × 68 =
3589 × 85 =
3695 × 96 = _____

LESSON 61

8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4	6	7	3	4	5	8	9	7	6	3	5	4	9	8	7	6	3	4	7

(1) Add 8 to each of the lower figures, beginning at the left side; as 12, 14, 15, 11, 12, 13, 16, 17, etc. Draw the blunt end of your pencil along slowly, naming the sums as the pencil comes under each group. Next read from right to left in a similar way. Practise *three* minutes.

(2) Start at the right side and name the sums of the groups, adding the carrying figure; as 15, 13, 12, 15, 16, 17, etc. Drill faithfully by going over the groups *five* times.

Fractions

To multiply rapidly two mixed numbers when the integers are alike and the fractions are ½:

Question:—What is 8½ times 8½?

8½
8½
72¼

Solution:—Consider the lower 8½ as a multiplier, and multiply the top 8½ by the first part of it, ½, and then by 8.

1st Step—½ times ½= ¼
2nd Step—½ times 8= 4
3rd Step—8 times ½= 4
4th Step—8 times 8=64

72¼

Note that the second and third steps give us ½ of 8+½ of 8, which is equal to 1 times 8. Then 8 times 8 and 1 times 8 give us 9 times 8 or 72. Add to this the ¼ obtained in the first step and we have the answer, 72¼.

Rule:—Multiply the whole number by the next highest whole number and add ¼ to the product.

Trade Discount

Example:—Goods are listed at $436.35 with discounts of 5% and 3% off. Find the net price.

$436.35
21.82=5%
414.53
12.44=3%
$402.09

Solution:—5% is ½ of 10% of $436.35 or ½ of $43.635 or $21.82 to the nearest cent. 3% is 3 times 1%. By moving the decimal point two places to the left, you have 1% or $4.1453, and 3 times $4.1453 or $12.4359 will be 3%. To the nearest cent, this means $12.44. The net price will be then, $402.09.

DRILL 61

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
2678	4672	6784	2688	4277	7268
4784	8388	2345	5727	8836	8834
8272	5467	8264	8265	2675	5623
4268	2873	3785	4782	4268	6283
3857	5468	2678	6478	3757	5878
2478	3778	4327	3685	2868	3267
8123	2654	5782	4268	3656	5488
2765	8267	8326	8377	4262	7635
4872	3786	4778	2674	8738	4268
8367	8543	3856	8367	2676	7644
2654	2678	2684	2788	5486	3288
7858	7267	2768	8562	2688	7265
2672	5847	8374	3678	3474	4576
2387	8268	4782	7287	2647	8288
8726	7834	6278	4763	8268	3876

In the above questions, add the reverse way to prove that your answers are correct.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 3%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

By inspection, find the value of:

(13)	(21)	(29)
$2\frac{1}{2}\times2\frac{1}{2}=$	$10\frac{1}{2}\times10\frac{1}{2}=$	$18\frac{1}{2}\times18\frac{1}{2}=$ .....
(14)	(22)	(30)
$3\frac{1}{2}\times3\frac{1}{2}=$	$11\frac{1}{2}\times11\frac{1}{2}=$	$19\frac{1}{2}\times19\frac{1}{2}=$ .....
(15)	(23)	(31)
$4\frac{1}{2}\times4\frac{1}{2}=$	$12\frac{1}{2}\times12\frac{1}{2}=$	$20\frac{1}{2}\times20\frac{1}{2}=$ .....
(16)	(24)	(32)
$5\frac{1}{2}\times5\frac{1}{2}=$	$13\frac{1}{2}\times13\frac{1}{2}=$	$21\frac{1}{2}\times21\frac{1}{2}=$ .....
(17)	(25)	(33)
$6\frac{1}{2}\times6\frac{1}{2}=$	$14\frac{1}{2}\times14\frac{1}{2}=$	$22\frac{1}{2}\times22\frac{1}{2}=$ .....
(18)	(26)	(34)
$7\frac{1}{2}\times7\frac{1}{2}=$	$15\frac{1}{2}\times15\frac{1}{2}=$	$23\frac{1}{2}\times23\frac{1}{2}=$ .....
(19)	(27)	(35)
$8\frac{1}{2}\times8\frac{1}{2}=$	$16\frac{1}{2}\times16\frac{1}{2}=$	$24\frac{1}{2}\times24\frac{1}{2}=$ .....
(20)	(28)	(36)
$9\frac{1}{2}\times9\frac{1}{2}=$	$17\frac{1}{2}\times17\frac{1}{2}=$	$25\frac{1}{2}\times25\frac{1}{2}=$ .....

Aim to get 100%

LESSON 62

8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4	7	6	9	3	8	7	9	5	4	2	7	6	8	7	6	9	3	7	6

(1) Add 8 to each of the lower figures, beginning at the left side and reading to the right; as 12, 15, 14, 17, 11, 16, 15, 17, etc. Do not write the sums, but simply name the results. Read from the right side to the left in a similar way. Drill *three* minutes. Are you watching accuracy and regularity?

(2) Read from right to left, adding the carrying figure; as 14, 16, 12, 18, 15, 16, etc. Go over the list *six* times.

(3) Consider the top number 18 instead of 8, and add combinations, beginning at the left side; as 22, 25, 24, 27, 21, 26, 25, etc. Read back and forth several times until you can name the results easily and accurately.

Fractions

To multiply together any two mixed numbers when the fractions are ½:

Question:—Multiply 12½ by 6½.

12½
6½
81¼

Solution:—Consider 6½ as the multiplier and multiply first by ½, and then by 6.

1st Step—½×½= ¼
2nd Step—½×12= 6
3rd Step— 6×½= 3
4th Step— 6×12=72

81¼

Question:—Multiply 11½ by 6½.

11½
6½
74¾

1st Step—½×½= ¼
2nd Step—½×11= 5½ } ½ of (6+11)
3rd Step— 6×½= 3 }
4th Step— 6×11=66

74¾

Rule:—If the sum of the integers is even, write ¼ in the resulting product; if not, write ¾ in the resulting product.

Find one-half of the sum of the integers, and to the result add the product of the integers.

DRILL 62

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
4678	8368	4565	6788	4728	4268
3285	2656	8237	2345	3872	3682
8267	4327	2674	5728	5437	6377
3484	8268	8138	6287	2682	4264
8265	5434	2654	3854	4826	3826
3788	8565	6372	2648	5437	5264
2654	7688	8266	7137	2682	8768
7826	4264	5838	2664	3476	3472
8342	3584	4266	7268	8234	6782
6588	2868	7482	3854	7546	5438
2654	3656	6838	2345	8238	2663
3827	4785	2657	8626	3685	4254
8266	2678	3584	7345	4268	3678
4886	3246	2668	2578	3782	2426
2675	8365	7267	7236	2656	5671
8368	2678	3758	2748	4732	4288
9672	4567	2646	3426	8268	3547
4828	8288	4882	4782	3426	7268

Prove that your answers are correct in questions 1 to 6 by adding the reverse way—from top to bottom.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 3% off, find net price.

(7)	(8)	(9)	(10)	(11)	(12)
$	$	$	$	$	$

By inspection find the value of:

(13)	(19)	(25)
$4\frac{1}{2}\times6\frac{1}{2}=$	$7\frac{1}{2}\times3\frac{1}{2}=$	$9\frac{1}{2}\times6\frac{1}{2}=$ .....
(14)	(20)	(26)
$5\frac{1}{2}\times6\frac{1}{2}=$	$7\frac{1}{2}\times5\frac{1}{2}=$	$10\frac{1}{2}\times9\frac{1}{2}=$ .....
(15)	(21)	(27)
$6\frac{1}{2}\times7\frac{1}{2}=$	$6\frac{1}{2}\times3\frac{1}{2}=$	$11\frac{1}{2}\times9\frac{1}{2}=$ .....
(16)	(22)	(28)
$7\frac{1}{2}\times8\frac{1}{2}=$	$8\frac{1}{2}\times3\frac{1}{2}=$	$11\frac{1}{2}\times10\frac{1}{2}=$ .....
(17)	(23)	(29)
$8\frac{1}{2}\times6\frac{1}{2}=$	$9\frac{1}{2}\times2\frac{1}{2}=$	$12\frac{1}{2}\times9\frac{1}{2}=$ .....
(18)	(24)	(30)
$8\frac{1}{2}\times4\frac{1}{2}=$	$9\frac{1}{2}\times3\frac{1}{2}=$	$12\frac{1}{2}\times10\frac{1}{2}=$ .....

Accuracy first, then [illegible]ed

LESSON 63

8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
4	6	7	5	9	8	3	2	6	5	4	9	8	3	6	7	5	4	3	2

(1) Name the sums of the various groups, moving your pencil regularly back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that comprise the group. Do not say: 8 and 4 are 12, but name the total promptly, 12. Beginning at the left side, we have the following resulta:—12, 14, 15, 13, 17, 16, etc. Drill faithfully.

(2) Imagine the figures in the top row to be 28. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 32, 34, 35, 33, 37, 36, etc. Go over the list several times until you can name the sums regularly and accurately. Similarly, try adding 38, 48, 58, etc., as the top number.

Trade Discount

Example:—Goods are listed at $632.73, with discounts of 20% and 5% off. Find net price.

$632.73
126.55=20%

506.18
25.31= 5%

480.87

Solution:—20% may be based on 10% or 100%. If based on 100%, simply take 1/5 off: if based on 10%, take twice 10%. 10% of $632.73=$63.273, moving the decimal point one place to the left; therefore 20% of $632.73 would be twice $63.273 or $126.546. Five mills or more will be considered a full cent, hence 20% in this case will be $126.55. 5% is ½ of 10% of $506.18 or $25.31 to the nearest cent. Hence the net price=$480.87.

DRILL 63

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)
46234	72683	[illegible]26	47285	72685
58867	48276	[illegible]67	68737	88368
32678	56788	34762	26543	26547
54267	34567	82654	54268	82632
36827	82654	38265	32546	76582
[illegible]238	37268	26747	28684	24767
52636	26834	38565	73542	43678
47826	54272	82654	68268	26542
58232	85437	73726	32477	37688
67348	26885	82437	87256	58264
26782	42436	76842	34567	82756
35678	86262	67258	26784	47825
42582	54688	34572	35826	34678
36756	32456	67288	82674	26732
82347	46285	82674	26488	54267
26826	48377	34567	34567	82654
58372	82654	26544	82674	37266
42782	75826	72856	78235	82654
68268	83474	24768	24678	37826
34675	47828	32854	72834	82782

In questions 1 to 5, add the reverse way to make sure that your answers are correct.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Allowing discounts of 20% and 5%, find net price.

(6)$	(7)$	(8)$	(9)$	(10)$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

By inspection find the value of:

(11)	(17)	(23)
$13\frac{1}{2} \times 12\frac{1}{2} =$	$18\frac{1}{2} \times 4\frac{1}{2} =$	$120\frac{1}{2} \times 4\frac{1}{2} =$ .....
(12)	(18)	(24)
$14\frac{1}{2} \times 10\frac{1}{2} =$	$19\frac{1}{2} \times 3\frac{1}{2} =$	$110\frac{1}{2} \times 8\frac{1}{2} =$ .....
(13)	(19)	(25)
$15\frac{1}{2} \times 9\frac{1}{2} =$	$22\frac{1}{2} \times 4\frac{1}{2} =$	$112\frac{1}{2} \times 8\frac{1}{2} =$ .....
(14)	(20)	(26)
$16\frac{1}{2} \times 8\frac{1}{2} =$	$24\frac{1}{2} \times 6\frac{1}{2} =$	$205\frac{1}{2} \times 7\frac{1}{2} =$ .....
(15)	(21)	(27)
$17\frac{1}{2} \times 12\frac{1}{2} =$	$25\frac{1}{2} \times 7\frac{1}{2} =$	$144\frac{1}{2} \times 10\frac{1}{2} =$ .....
(16)	(22)	(28)
$16\frac{1}{2} \times 10\frac{1}{2} =$	$25\frac{1}{2} \times 12\frac{1}{2} =$	$116\frac{1}{2} \times 5\frac{1}{2} =$ .....

Aim to get 100%

LESSON 64

Drill on rapid addition:

4	6	8	3		7	5	2	4	6	2	7	8	2	5	3	6	4	4	8
8	2	6	4	8	3	2	7	8	2	6	5	4	3	2	6	7	8	2	6
3	7	5	2	6	7	3	4	2	7	8	2	6	7	5	4	3	2	7	8
2	6	4	7	8	2	5	6	3	2	5	8	7	6	3	2	4	8	6	7
8	2	6	8	5	4	3	2	6	5	4	2	8	3	2	4	8	2	7	8
2	6	5	4	2	6	7	8	2	6	7	8	3	7	8	2	6	5	4	2
8	3	8	2	8	7	4	2	5	4	3	2	6	2	7	5	8	3	2	7
4	2	6	7	8	2	5	4	3	2	1	6	7	8	2	7	5	4	8	3
5	7	3	2	6	4	7	2	6	7	5	4	8	3	6	2	7	6	5	4
8	2	6	5	4	3	2	6	7	8	2	6	7	5	4	8	2	3	4	8
6	7	8	2	6	7	8	2	5	4	3	2	6	4	2	6	7	8	2	7
8	2	7	5	4	3	2	6	8	2	6	7	5	8	7	2	6	3	4	5
4	7	2	6	5	4	3	2	6	7	5	4	2	6	3	7	8	2	6	8
7	2	6	8	4	7	6	5	3	2	6	7	3	4	8	6	2	7	8	5
4	3	4	2	6	4	5	8	2	6	7	2	6	7	2	8	5	6	3	8
2	6	4	5	8	2	6	7	3	5	4	8	2	6	7	8	2	3	4	6
4	8	2	6	5	4	3	6	7	8	2	6	4	7	2	6	5	2	6	8
2	6	5	7	8	2	6	7	2	4	3	4	5	8	7	4	8	3	7	5
8	2	6	4	2	3	5	4	7	8	2	6	4	7	8	2	5	6	4	4
2	4	7	8	3	6	7	2	6	5	4	7	3	2	5	4	3	2	7	8

(1) Add each column, beginning at the left side. Do not carry at first and do not write any results. Start at the left side and add the columns again. Practise reading the columns for *five* minutes. Try to acquire accuracy, smoothness and speed.

(2) Drill on horizontal addition. Start at the top line, add from left to right and then from right to left on the same line. Do you get the same result? Practise horizontal addition on the other lines of the question, in a similar way.

(3) Let the above block of figures, twenty wide and twenty deep, represent an addition question. Pencil the sum as you add, writing the figures at the bottom. Add and re-add, running from bottom to top and from top to bottom, until you can add the complete question in *four* minutes.

DRILL 64

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)	Totals
24768	47827	72858	48268	26824	.....	
82673	36548	83472	72682	82656	.....	
56782	25826	67268	34568	47262	.....	
67238	73267	23543	26432	34578	.....	
54672	54826	72372	75688	26827	.....	
82436	26435	56723	48256	37562	.....	
26543	42688	24678	34524	82647	.....	
78267	28543	82342	46548	26588	.....	
82346	28127	75436	25682	83456	.....	
28567	82654	26723	76235	45624	.....	
34826	35462	54237	45646	34868	.....	
52763	75328	62742	26545	26542	.....	
48234	26548	54236	82488	35466	.....	
72788	28636	82762	36254	54256	.....	
26543	48262	75248	25642	26422	.....	
72762	35464	36527	34266	34568	.....	
68237	26546	26834	82456	26825	.....	
82654	35682	74256	37268	43264	.....	
37268	62434	42738	26576	26526	.....	
26437	54266	26534	42654	58433	.....	
28542	78362	62488	38236	26548	.....	
82678	54268	26736	52427	82642	.....	
34567	37688	48242	73264	28836	.....	
26782	24572	82656	26437	54282	.....	
34828	48236	46237	82488	36426	.....	
42672	72677	62848	26534	82632	.....	
38235	48288	26939	73426	54268	.....	
42678	56352	72437	28477	26832	.....	
34762	42678	82842	62733	82638	.....	
52378	88263	78268	28482	54266	.....	

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree? If not, re-add.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing 20% and 5%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

Accuracy first, then speed

LESSON 65

Drill *ten* minutes on the following:

6	7	8	2	6	3	4	7	6	7	8	2	6	5	4	3	2	6	7	8
4	2	7	6	7	8	2	3	4	5	6	3	8	2	7	6	7	8	2	3
5	3	4	7	8	2	6	4	6	8	2	6	7	5	4	2	8	2	5	7
8	2	3	4	6	3	7	8	2	6	5	4	3	2	7	6	2	8	2	6
4	3	6	7	8	7	5	2	3	4	8	2	6	7	5	8	3	4	8	2
7	6	8	2	3	6	8	5	4	3	2	6	8	2	8	7	6	2	3	4
8	2	6	5	4	3	2	6	5	4	6	7	2	8	3	6	5	4	2	8
5	4	3	2	6	5	4	3	2	6	7	2	6	5	4	2	6	7	8	2
4	8	2	6	8	4	6	7	3	2	6	4	2	7	6	5	4	3	2	8
6	7	3	4	7	6	2	5	4	8	2	6	7	3	2	6	7	5	4	2
8	6	7	3	2	5	4	2	6	7	3	2	4	5	6	8	5	4	3	7
2	4	5	8	6	2	3	4	5	6	8	7	6	3	4	2	6	5	4	3
4	3	2	7	5	7	8	2	6	4	3	2	7	6	5	4	3	2	7	6
2	7	3	4	2	6	7	8	2	6	7	3	4	2	6	3	7	5	6	2
5	4	7	2	6	4	3	7	6	8	3	7	2	6	8	2	4	6	7	8
4	6	8	8	3	6	5	4	7	2	5	4	8	2	6	3	8	2	4	7
2	7	3	2	4	5	4	6	2	8	2	3	4	7	2	6	2	8	6	3
4	6	2	7	8	2	6	5	4	3	6	8	2	6	5	4	3	4	5	2
8	2	6	3	2	7	5	6	2	4	8	2	3	2	6	7	4	2	4	8
4	7	2	6	8	5	6	4	8	2	6	7	2	8	5	4	3	8	2	6

(1) After drilling *ten* minutes on reading the above columns, try to add the question in *four* minutes. When reading the columns at first, do not write the results, but simply use the drill as a quick, snappy, mental exercise. Aim to read smoothly and accurately. After preparatory practice for *ten* minutes, treat the question as an addition question and write the results in pencil figures. There are 400 figures in the question. After getting the correct result, say in *four* minutes, try to increase your speed. Can you add the question in three and a half minutes?

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right on the same line. Do your totals agree?

(3) Add by 8's from 24 to 96; from 88 to 176.

(4) Subtract by 8's from 88 to 0; from 160 to 40.

DRILL 65

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)	Totals
46283	72688	56748	82762	67284	.....	
82654	34572	67234	36428	32826	.....	
37265	26834	54672	27372	54682	.....	
42673	52462	82437	56748	48248	.....	
88236	83676	26342	24632	26436	.....	
54325	52434	82677	62427	82673	.....	
82682	26782	36854	83762	24762	.....	
54778	68234	25646	34677	34567	.....	
23456	54673	82752	52432	26738	.....	
82673	26548	34546	67238	67242	.....	
48237	68237	26428	23852	83768	.....	
52826	54826	35656	42678	26542	.....	
73477	26935	48234	83426	37287	.....	
52674	42866	82656	52673	26374	.....	
37268	76548	28434	46248	82654	.....	
24682	28472	54828	82674	26836	.....	
37248	65634	26434	46836	54264	.....	
26523	28543	54686	24672	36578	.....	
58482	65282	32474	67288	25688	.....	
34575	82676	63246	34624	46834	.....	
48266	58434	58363	82472	28472	.....	
34682	26548	24624	36724	67348	.....	
56733	72682	52468	48266	46834	.....	
25648	43255	26542	83654	65268	.....	
26237	48672	87236	23467	26434	.....	
47826	72547	24724	82634	52673	.....	
42675	86234	56242	57236	46237	.....	
37242	54325	67348	82676	63482	.....	
72674	68266	24826	88348	56768	.....	
57267	54824	67234	26472	34556	.....	

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree? If so, your five addition questions have the correct answers; if not, find your error.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing 20% and 5%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

Aim to get 100%

LESSON 66

Multiplication

2	4	6	7	8	3	9	2	7	8	5	4	3	7	2	9	8	6	4	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

(1) Beginning at the left side, name the product of each of the top figures by 8; as 16, 32, 48, 56, 64, etc. To assist the eye, run the blunt end of your pencil along the base of the 8's and try to name the products regularly. Start at the right side and name the products. Drill faithfully for *three* minutes.

(2) Start at the right side and multiply by 8, as in ordinary multiplication, adding the carrying figure; as 56, 37, 51, 69, 78, etc. Do not write any results on paper just now, but make the exercise a lively mental drill. Spend *three* minutes on this form of practise. Go over and over the line until you can name the results with ease and accuracy.

Division

8)9	6	4	3	2	6	7	5	4	3	2	6	8	7	2	5	4	3	2	8

Drill on short division ... ming the figures slowly at first, but regularly; as 1, 2, 0, 5, 4, 0, 8, 4, etc. ... write any results on paper, but spend at least *three* minutes in careful practice.

To Multiply by Means of Cross Multiplication

Example:—Find the product of 74×23.

74
23

1702

Solution:—4×3=12. Write 2 as the first figure of the product and carry 1. 7×3+1 (carried) +8 (4... =30. Write 0 as the second figure of the product and carry 3. 7×2+3(carried)=17. Write 17 to the left of the figures already written in the product, thus completing the multiplication and obtaining a product of 1702.

Note:—To see the various steps more clearly, work the question by the ordinary method, writing every line of the solution. When you do the same work by cross multiplication, you will see that it is simply a matter of carrying in your head the work you ordinarily put on paper.

DRILL 66

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
326×8=	346×8=	247×8= .....
623×8=	436×8=	472×8= .....
263×8=	634×8=	742×8= .....
435×8=	256×8=	356×8= .....
354×8=	562×8=	563×8= .....
453×8=	652×8=	653×8= .....

(4)	(5)	(6)
359×8=	378×8=	473×8= .....
539×8=	738×8=	374×8= .....
935×8=	837×8=	743×8= .....
467×8=	462×8=	654×8= .....
647×8=	264×8=	465×8= .....
746×8=	642×8=	564×8= .....

(7)	(8)	(9)
589×8=	678×8=	929×8= .....
859×8=	786×8=	299×8= .....
958×8=	876×8=	579×8= .....
735×8=	923×8=	795×8= .....
537×8=	329×8=	957×8= .....
375×8=	293×8=	498×8= .....

(10)	(11)	(12)
22×24=	36×35=	44×48= .....
23×26=	34×36=	46×52= .....
28×32=	36×38=	56×48= .....
25×27=	38×42=	58×48= .....
24×34=	44×46=	62×64= .....
32×34=	46×32=	64×46= .....

Divide and add quotients:

(13)	(14)
896544÷8=	267896÷8= .....
927432÷8=	273568÷8= .....
934872÷8=	294872÷8= .....
892352÷8=	235968÷8= .....
968936÷8=	173984÷8= .....
899824÷8=	192672÷8= .....
929352÷8=	684736÷8= .....
899632÷8=	578968÷8= .....
992752÷8=	693472÷8= .....
987848÷8=	749896÷8= .....

Accuracy first, then speed

LESSON 67

Multiplication Drill:

2	9	5	4	7	8	3	6	5	7	4	6	8	7	3	2	6	4	8	7
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8

(1) Multiply the figures in the top line by 8, starting at the left side and naming the products at a regular rate of speed; as 16, 72, 40, 32, 56, 64, etc. Practise *three* minutes, going from left to right and from right to left.

(2) Start at the right side and multiply by 8, adding the carrying figure; 56, 69, 38, 51, 21, etc. Practise *five* minutes in this way, in order that you may be able to name results without any hesitancy. Concentrate for the best results.

Division Drill

8)9	8	5	4	6	7	2	4	8	3	7	6	9	2	5	4	6	7	4	4

Take a quick, sharp drill on the above short division exercise; as 1, 2, 3, 1, 8, 3, 4, etc. Do not write any figures on the paper, but use the drill for a lively mental exercise. Go over and over several times until you can name the results without stumbling.

Short Method

To multiply by 18:

Long way:

2769
18

22152
2769

49842

Short way:

$9\times8 = 72$
$6\times8+7+9 = 64$
$7\times8+6+6 = 68$
$2\times8+6+7 = 29$
$2+2 = 4$

After learning the short method by 18, you will be able to make extensions at sight where 18 is used as a multiplier. For instance: 48 yds. at 18 cents a yard; 392 lbs. at 18 cents a lb.; 4266 ft. at 18 cents a foot, etc.

DRILL 67

Date *Name*

Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
362×8=	321×8=	436×8=
632×8=	123×8=	346×8=
263×8=	231×8=	643×8=
475×8=	469×8=	578×8=
574×8=	649×8=	758×8=
744×8=	946×8=	875×8=
(4)	(5)	(6)
468×8=	478×8=	764×8=
648×8=	748×8=	647×8=
864×8=	847×8=	467×8=
927×8=	978×8=	759×8=
279×8=	789×8=	597×8=
972×8=	988×8=	975×8=
(7)	(8)	(9)
162×18=	364×18=	462×18=
134×18=	463×18=	264×18=
243×18=	346×18=	642×18=
342×18=	234×18=	378×18=
432×18=	342×18=	738×18=
621×18=	432×18=	837×18=
(10)	(11)	(12)
567×18=	359×18=	678×18=
675×18=	953×18=	786×18=
576×18=	593×18=	876×18=
496×18=	479×18=	499×18=
694×18=	749×18=	949×18=
964×18=	947×18=	877×18=
(13)	(14)	(15)
72×84=	84×48=	92×24=
65×88=	78×32=	96×22=
62×36=	76×36=	98×32=
56×48=	48×88=	94×26=
42×64=	44×92=	84×34=
66×32=	46×94=	86×24=

Divide and add quotients:

(16)	(17)	(18)
8928÷8=	8944÷8=	2752÷8=
9272÷8=	3752÷8=	2976÷8=
9768÷8=	4976÷8=	2632÷8=
9696÷8=	5784÷8=	2544÷8=
8976÷8=	5976÷8=	2832÷8=
9344÷8=	6984÷8=	2968÷8=

LESSON 68

Drill on Multiplication by 8:

7	2	6	4	8	9	3	4	7	2	6	4	7	2	6
4	8	7	3	6	2	5	9	3	4	8	6	5	9	2
8	4	6	4	8	3	7	6	9	2	7	5	4	6	8
9	3	5	7	6	2	4	8	2	3	6	9	2	4	7

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 8; as 56, 16, 48, 32, 64, 72, etc. Next, read from the right side to the left, multiplying each figure by 8; as 48, 16, 56, 32, 48, 16, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 8, adding the carrying figure; as 48, 20, 58, 37, 51, 21, etc. Drill on the other lines in a similar way. Go over each line several times. Practise, practise, practise. Persevere and you are sure to win.

Cross Multiplication

Example:—Find the product of 124×62.

Long way:

```
  124
   62
  ---
  248
 744
 ---
 7688
```

Solution by cross multiplication:—4×2=8. Write 8 as the first figure of the product. 2×2+24(4×6)=28. Write 8 as the second figure of the product and carry 2. 1×2+12(2×6)+2 (carried)=16. Write 6 as the third figure of the product and carry 1. 1×6+1 (carried) =7. Write 7 as the fourth figure of the product, thus completing the multiplication and obtaining a product of 7688.

Go over the illustration carefully two or three times in order to fix the different steps in your mind. An application of cross multiplication is made every day in the office, so be sure to master the short method.

DRILL 68

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
465×8=	672×8=	427×8=
564×8=	276×8=	247×8=
644×8=	762×8=	742×8=
326×8=	346×8=	374×8=
236×8=	463×8=	743×8=
632×8=	643×8=	473×8=

(4)	(5)	(6)
486×8=	398×8=	649×8=
684×8=	893×8=	496×8=
864×8=	983×8=	964×8=
966×8=	769×8=	778×8=
699×8=	697×8=	877×8=
879×8=	976×8=	788×8=

(7)	(8)	(9)
246×18=	294×18=	572×18=
426×18=	492×18=	752×18=
642×18=	924×18=	257×18=
357×18=	738×18=	799×18=
573×18=	837×18=	979×18=
486×18=	387×18=	789×18=

(10)	(11)	(12)
652×18=	727×18=	939×18=
562×18=	277×18=	399×18=
256×18=	399×18=	754×18=
334×18=	993×18=	457×18=
433×18=	466×18=	574×18=
566×18=	664×18=	888×18=

(13)	(13)	(15)
116×24=	232×24=	342×34=
124×26=	256×36=	356×48=
136×48=	248×48=	365×58=
142×52=	264×56=	372×64=
164×32=	284×64=	354×56=
158×42=	276×72=	368×96=

Accuracy first, then speed

LESSON 69

Drill on Multiplication by 8:

5	6	8	4	2	6	7	3	4	9	2	6	4	7	8	4
2	7	3	5	8	2	4	9	6	2	7	8	3	2	4	7
5	6	2	7	2	9	3	2	7	4	8	2	7	6	5	4
2	7	8	3	6	5	4	7	8	2	4	8	3	4	6	8

(1) Multiply each figure in the first line by 8, reading from left to right and then from right to left; as 40, 48, 64, 32, 16, 48, etc. Do not write any figures on r ... simply name the products. Drill on the other lines in a similar way. Be ... to name results accurately and smoothly.

(2) Start at the right side of the first line and multiply by 8, adding carrying figure; as 32, 67, 62, 38, 51, 21, etc. Go over each line *four* times. After practising a few minutes, try to increase your speed. Make the drill sharp and lively.

(3) When multiplying by 18, you have two figures to add, as a general rule —the carrying figure and the figure to the right of the one multiplied. Start on the third line at the top of the page, at the right side, and multiply each figure by 8. Add to the product, the two figures above. To illustrate: 32, 39, 43; 40, 44, 52; 48, 50, 57, etc. Drill from left to right in a similar way and then use the last three lines. Drill *five* minutes.

Cross Multiplication

Example:—Find the product of 236×78.

Long way:

$$\begin{array}{r} 236 \\ 78 \\ \hline 1888 \\ 1652 \\ \hline 18408 \end{array}$$

Solution by cross multiplication or short way:—6×8=48. Write 8 as the first figure of the product and carry 4. 3×8+4 (carried) + 42(6×7)=70. Write 0 as the second figure of the product and carry 7. 2×8+7 (carried) + 21(3×7)=44. Write 4 as the third figure of the product and carry 4. 2×7+4 (carried) =18. Write 18, thus completing the multiplication and obtaining a product of 18408.

DRILL 69

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
1246×8=	2462×8=	2578×8= .....
1352×8=	2352×8=	2484×8= .....
1483×8=	2474×8=	2676×8= .....
1676×8=	2636×8=	2489×8= .....
1424×8=	2546×8=	2674×8= .....
1636×8=	2764×8=	2593×8= .....

(4)	(5)	(6)
3252×8=	4264×8=	6324×8= .....
3474×8=	4375×8=	6572×8= .....
3564×8=	4788×8=	6248×8= .....
3678×8=	4629×8=	6342×8= .....
3484×8=	4787×8=	6757×8= .....
3979×8=	4929×8=	6878×8= .....

(7)	(8)	(9)
1343×18=	2346×18=	3646×18= .....
1252×18=	2574×18=	3454×18= .....
1276×18=	2638×18=	3758×18= .....
1293×18=	2494×18=	3487×18= .....
1278×18=	2787×18=	3579×18= .....
1546×18=	2939×18=	3648×18= .....

(10)	(11)	(12)
4272×18=	5636×18=	6492×18= .....
4678×18=	5282×18=	6373×18= .....
4829×18=	5676×18=	6747×18= .....
4373×18=	5494×18=	6929×18= .....
4929×18=	5696×18=	6548×18= .....
4872×18=	5707×18=	6278×18= .....

(13)	(14)	(15)
464×24=	584×32=	692×28= .....
487×32=	568×48=	673×64= .....
493×46=	575×45=	684×82= .....
488×48=	592×66=	656×48= .....
472×54=	584×44=	646×52= .....
498×64=	572×84=	688×92= .....

Aim to get 100%

LESSON 70

Drill on Multiplication by 8:

4	7	8	2	6	3	5	8	7	2	9	4	5	7	2
3	9	2	5	7	8	2	6	4	7	8	2	3	5	6
4	7	8	2	4	3	5	4	8	3	6	7	4	8	9
3	2	7	6	8	7	4	9	2	5	8	6	2	6	4
6	4	8	2	4	6	9	2	3	4	7	8	6	5	6
4	9	2	3	6	7	2	6	8	5	4	3	2	8	7

(1) Drill on the first line, multiplying each figure by 8, reading from left to right and then from right to left; as 32, 56, 64, 16, 48, 24, etc. Draw your pencil along the line, naming the products as the pencil comes under each figure. Try to name the results regularly and accurately. Go over each line *twice*.

(2) Start at the right side of the first line and multiply by 8, adding carrying figure; as 48, 20, 58, 45, 36, 75, etc. Drill on each line in this way, *three* times.

(3) Group *two* lines, multiplying the lower figure by 8 and adding the top figure; as 56, 62; 48, 50; 40, 47; 24, 29, etc. Read from right to left and then back on the same two lines. Drill on the other lines in a similar way.

(4) Group *three* lines, multiplying the figure in the third line by 8 and adding the *two* figures above; as 48, 55, 61; 72, 78, 80; 64, 69, 76; 32, 35, 40, etc. Practise three minutes on this form of grouping the figures.

Cross Multiplication

Example:—Find the product of 2146×32.

Long way:

$$\begin{array}{r} 2146 \\ 32 \\ \hline 4292 \\ 6438 \\ \hline 68672 \end{array}$$

Solution by cross multiplication: $6 \times 2 = 12$. Write 2 and carry 1. $4 \times 2 + 1$(carried) $+ 18$ $(6 \times 3) = 27$. Write 7 and carry 2. $1 \times 2 + 2$ (carried) $+ 12 (4 \times 3) = 16$. Write 6 and carry 1. $2 \times 2 + 1$(carried) $+ 3 (1 \times 3) = 8$. Write 8 in the product. $2 \times 3 = 6$. Write 6, thus completing the multiplication and obtaining a product of 68672.

Study the plan very carefully by going over the solution two or three times.

DRILL 70

Date **Name**

Time **Seat No.**

Extend and add products:

(1)
1264 x 8=
1346 x 8=
1672 x 8=
1762 x 8=
1487 x 8=
1565 x 8= _____

(2)
2647 x 8=
2565 x 8=
2484 x 8=
2972 x 8=
2767 x 8=
2494 x 8= _____

(3)
3474 x 8=
3646 x 8=
3767 x 8=
3598 x 8=
3479 x 8=
3868 x 8= _____

(4)
4626 x 8=
4575 x 8=
4787 x 8=
4929 x 8=
4799 x 8=
4969 x 8= _____

(5)
5342 x 8=
5646 x 8=
5787 x 8=
5929 x 8=
5474 x 8=
5696 x 8= _____

(6)
6787 x 8=
6549 x 8=
6323 x 8=
6792 x 8=
6939 x 8=
6988 x 8= _____

(7)
1412 x 18=
1636 x 18=
1492 x 18=
1376 x 18=
1929 x 18=
1478 x 18= _____

(8)
2326 x 18=
2474 x 18=
2696 x 18=
2979 x 18=
2737 x 18=
2596 x 18= _____

(9)
3456 x 18=
3672 x 18=
3962 x 18=
3489 x 18=
3769 x 18=
3928 x 18= _____

(10)
4264 x 18=
4323 x 18=
4578 x 18=
4929 x 18=
4737 x 18=
4989 x 18= _____

(11)
5264 x 18=
5492 x 18=
5363 x 18=
5486 x 18=
5676 x 18=
5924 x 18= _____

(12)
6492 x 18=
6378 x 18=
6292 x 18=
6874 x 18=
6939 x 18=
6789 x 18= _____

(13)
2342 x 24=
2676 x 28=
2594 x 32=
2878 x 48=
2496 x 52=
2969 x 36= _____

(14)
4264 x 26=
4692 x 35=
4987 x 42=
4765 x 64=
4936 x 72=
4298 x 84= _____

(15)
6273 x 28=
6496 x 36=
6585 x 45=
6878 x 56=
6492 x 64=
6788 x 48= _____

LESSON 71

9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
4	8	7	6	3	2	4	1	2	6	7	4	5	8	2	3	4	6	7	2

(1) Add 9 to each of the lower figures, beginning at the left side; as 13, 17, 16, 15, 12, 11, etc. Draw the blunt end of your pencil along slowly, naming the sums as the pencil comes under each group. Next, read from right to left in a similar way. Practise *three* minutes.

(2) Start at the right side and name the sums of the groups, adding the carrying figure; as 11, 17, 16, 14, 13, 12, etc. Drill faithfully by going over the groups *five* times.

Fractions

To find the product of two mixed numbers when the fractions are identical.

Question:—Multiply 6¼ by 4¼.

6¼
4¼
—
26 9/16

Solution:—Consider 4¼ as the multiplier, and multiply first by ¼, and then by 4.

1st Step—¼×¼= 1/16
2nd Step—¼× 6= 1½ } 10 times ¼
3rd Step— 4×¼= 1 }
4th Step— 4× 6=24

—
26 9/16

Rule:—To the product of the integers, add the product of the sum of the integers times the common fraction, plus the product of the fractions.

In question illustrated:

Product of the integers — 24
Sum of integers (10) times ¼ — 2½
Product of the fractions — 1/16

—
Product — 26 9/16

DRILL 71

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)
2479	6789	4567	2679	7234	4829
8263	3248	8279	7264	2689	3672
4929	7632	9342	3787	3474	4828
7838	4[illegible]	8927	4296	9268	5646
9264	8347	9236	3474	3456	2979
8779	2654	4678	8269	2787	9266
2345	9235	2983	2787	6236	3644
8676	4928	5426	3474	9697	5876
9237	6273	9234	2696	4287	2481
8249	5646	8689	4789	2979	3929
2345	8294	2976	2937	3464	6734
6879	9365	4737	6724	5868	5246
9236	4267	2696	9299	9279	2836
4782	9239	5434	4627	4828	5787
9237	6723	4979	9348	7929	4998

In the above questions, add the reverse way to prove that your answers are correct.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Allowing discounts of 5% and 3%, find net price.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

By inspection, find the value of:

(13)	(21)	(29)
$2\frac{1}{4}\times4\frac{1}{4}=$	$8\frac{1}{4}\times3\frac{1}{4}=$	$10\frac{1}{4}\times2\frac{1}{4}=$ .....
(14)	(22)	(30)
$3\frac{1}{4}\times2\frac{1}{4}=$	$8\frac{1}{4}\times4\frac{1}{4}=$	$10\frac{1}{4}\times3\frac{1}{4}=$ .....
(15)	(23)	(31)
$4\frac{1}{4}\times5\frac{1}{4}=$	$9\frac{1}{4}\times2\frac{1}{4}=$	$10\frac{1}{4}\times4\frac{1}{4}=$ .....
(16)	(24)	(32)
$5\frac{1}{4}\times3\frac{1}{4}=$	$9\frac{1}{4}\times3\frac{1}{4}=$	$10\frac{1}{4}\times5\frac{1}{4}=$ .....
(17)	(25)	(33)
$6\frac{1}{4}\times4\frac{1}{4}=$	$9\frac{1}{4}\times4\frac{1}{4}=$	$10\frac{1}{4}\times6\frac{1}{4}=$ .....
(18)	(26)	(34)
$6\frac{1}{4}\times5\frac{1}{4}=$	$9\frac{1}{4}\times5\frac{1}{4}=$	$10\frac{1}{4}\times7\frac{1}{4}=$ .....
(19)	(27)	(35)
$7\frac{1}{4}\times2\frac{1}{4}=$	$9\frac{1}{4}\times6\frac{1}{4}=$	$10\frac{1}{4}\times8\frac{1}{4}=$ .....
(20)	(28)	(36)
$8\frac{1}{4}\times2\frac{1}{4}=$	$9\frac{1}{4}\times7\frac{1}{4}=$	$10\frac{1}{4}\times9\frac{1}{4}=$ .....

Aim to get 100%

LESSON 72

9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
2	6	7	5	8	9	3	4	5	6	1	2	7	8	3	9	2	6	4	3

(1) Add 9 to each of the lower figures, beginning at the left side and reading to the right; as 11, 15, 16, 14, 17, 18, 12, etc. Do not write the sums, but simply name the results. Read from the right side to the left in a similar way. Drill *three* minutes. Watch accuracy and regularity.

(2) Read from right to left, adding the carrying figure; 12, 14, 16, 12, 19, 13, etc. Go over the list *six* times. Drill faithfully.

(3) Consider the top number 19 instead of 9, and add combinations, beginning at the left side; as 21, 25, 26, 24, 27, 28, etc. Read back and forth several times until you can name the results easily and accurately.

Trade Discount

Example:—The wholesale list price of goods is $246.66, with discounts of 25% and 5% off. Find the net price.

$246.66
61.67=25%
184.99
9.25= 5%
$175.74

Solution:—25% expressed fractionally is 25/100 or ¼, therefore 25% of $246.66 may be solved rapidly by simply taking ¼ of $246.66 or $61.67 to the nearest cent. In business, 5 mills or more is considered a whole cent, hence you will follow that plan when taking off trade discounts. 5% is ½ of 10% of $184.99 or ½ of $18.499 or $9.25 to the nearest cent. After deducting 25% and 5% from the list price, $246.66, the net price equals $175.74.

Exercises in Trade Discounts will give you excellent practice in percentages, decimals, and subtraction. Watch the position of your figures when making deductions.

DRILL 72

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6)	(7)	Totals.
2469	4687	4989	5792	2874	8424	.....	.....
9254	9678	2545	3478	2936	3269	.....	.....
3675	2498	8767	2689	7424	8742	.....	.....
4267	7347	3256	2778	8546	7536	.....	.....
8356	8256	4787	9234	9289	2484	.....	.....
4924	9348	2656	5678	3474	9676	.....	.....
7689	.2654	4929	4926	2676	3564	.....	.....
3246	3767	.3656	5879	9234	5878	.....	.....
2689	9246	4262	2654	5676	2646	.....	.....
9236	.8769	5879	3256	5434	4939	.....	.....
5424	2346	2686	8797	2787	2787	.....	.....
6787	9265	9326	2656	2696	6474	.....	.....
3262	4678	8548	4878	5242	8268	.....	.....
5496	9234	.9239	2679	9367	9379	.....	.....
8734	5676	2676	2937	8248	2649	.....	.....
5646	8278	5437	4829	5797	8931	.....	.....
8739	4682	4828	9236	4929	2787	.....	.....
4926	9289	9739	2787	3471	4929	..	....
———	———	———	———	———	———	—	--

After adding the six questions above, add in a horizontal direction to express the various sums in the "Totals" column on the right side of the . The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree? If not, re-add.

Consider each of the answers in questions 1 to 7, inclusive, as a list price in dollars and cents. Find the net price, after allowing 25% and 5%.

(8)$	(9)$	(10)$	(11)$	(12)$	(13)$	(14)$
———	———	———	———	———	———	———
———	———	———	———	———	———	———
$	$	$	$	$	$	$

By inspection, find the value of:

(15)	(21)	(27)
$12\frac{1}{4}\times2\frac{1}{4}=$	$14\frac{1}{4}\times2\frac{1}{4}=$	$16\frac{1}{4}\times4\frac{1}{4}=$ .....
(16)	(22)	(28)
$12\frac{1}{4}\times3\frac{1}{4}=$	$14\frac{1}{4}\times3\frac{1}{4}=$	$16\frac{1}{4}\times5\frac{1}{4}=$ .....
(17)	(23)	(29)
$12\frac{1}{4}\times4\frac{1}{4}=$	$14\frac{1}{4}\times4\frac{1}{4}=$	$16\frac{1}{4}\times6\frac{1}{4}=$ .....
(18)	(24)	(30)
$12\frac{1}{4}\times5\frac{1}{4}=$	$14\frac{1}{4}\times5\frac{1}{4}=$	$16\frac{1}{4}\times8\frac{1}{4}=$ .....
(19)	(25)	(31)
$12\frac{1}{4}\times6\frac{1}{4}=$	$14\frac{1}{4}\times6\frac{1}{4}=$	$16\frac{1}{4}\times10\frac{1}{4}=$ .....
(20)	(26)	(32)
$12\frac{1}{4}\times7\frac{1}{4}=$	$14\frac{1}{4}\times7\frac{1}{4}=$	$16\frac{1}{4}\times12\frac{1}{4}=$ .....

LESSON 73

9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
2	3	5	4	7	9	6	4	2	1	3	5	8	9	7	6	5	4	8	2

(1) Name the sums of the various groups, moving your pencil back and forth from left to right and from right to left. Let the eye take in each group quickly, instead of naming the different figures that comprise the group. Do not say: 9 and 2 are 11, but name the total promptly, 11. Beginning at the left side, we have the following results:—11, 12, 14, 13, 16, 18, 15, etc. Drill faithfully.

(2) Imagine the figures in the top row to be 29. Start at the left side and run your pencil to the right, naming the sums as your pencil comes under each group; as 31, 32, 34, 33, 36, 38, etc. Go over the list several times until you can name the sums regularly and accurately. Similarly, try adding 39, 49, 59, etc., as the top number.

Fractions

To multiply together any two mixed numbers when the fractions are ⅛.

Question:—Multiply 6⅛ by 4⅛.

6⅛
4⅛
——
25 17/64

Solution:—Consider 4⅛ as the multiplier, and multiply first by ⅛, and then by 4.

1st Step—⅛×⅛= 1/64
2nd Step—⅛× 6= ¾ } 10 times ⅛
3rd Step— 4×⅛= ½ }
4th Step— 4× 6=24

——
25 17/64

Rule:—To the product of the integers, add the product of the sum of the integers times the common fraction, plus the product of the fractions.

In question illustrated:

Product of the integers = 24
Sum of the integers (10) times ⅛ = 1¼
Product of the fractions = 1/64

Product = 25 17/64

DRILL 73

Date *Name*
Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6) Totals.
42689	96923	42689	92476	49269	.....
96846	45682	96847	37629	23482	.....
34524	34578	37265	82734	67264	.....
92678	92645	49546	56492	93725	.....
34562	37248	92678	76345	82698	.....
92648	72679	57247	92873	93729	.....
34592	23542	36596	56247	82654	.....
68276	92676	82654	82896	24936	.....
34567	48792	93785	56749	82674	.....
92688	93789	78923	34578	93624	.....
73548	24565	62358	28496	91994	.....
92649	26476	49264	93264	29439	.....
37826	49232	57348	87489	36545	.....
52474	78945	92678	24937	48923	.....
87623	27374	79234	62478	56436	.....
92346	92647	92678	96237	82769	.....
76528	87926	28949	82892	28548	.....
49284	42649	36584	49289	92752	.....
26478	35784	92678	26537	46829	.....
92823	49269	78947	42859	34572	.....

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition questions should agree with the sum of the totals in the "Totals" column. This is the proof for the addition questions. If your grand totals do not agree, re-add to make the correction.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing 25% and 5%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

Study illustration under heading "Fractions", Lesson 71, then by inspection, find the value of:

(13) $2\frac{1}{8}\times3\frac{1}{8}=$.....	(19) $8\frac{1}{8}\times4\frac{1}{8}=$.....	(25) $6\frac{2}{5}\times3\frac{2}{5}=$.....
(14) $3\frac{1}{8}\times4\frac{1}{8}=$.....	(20) $9\frac{1}{8}\times3\frac{1}{8}=$.....	(26) $12\frac{2}{7}\times8\frac{2}{7}=$.....
(15) $5\frac{1}{8}\times6\frac{1}{8}=$.....	(21) $9\frac{1}{8}\times5\frac{1}{8}=$.....	(27) $11\frac{1}{6}\times5\frac{1}{6}=$.....
(16) $6\frac{1}{8}\times2\frac{1}{8}=$.....	(22) $10\frac{1}{8}\times2\frac{1}{8}=$.....	(28) $33\frac{1}{3}\times6\frac{1}{3}=$.....
(17) $6\frac{1}{8}\times4\frac{1}{8}=$.....	(23) $10\frac{1}{8}\times4\frac{1}{8}=$.....	(29) $66\frac{2}{3}\times6\frac{2}{3}=$.....
(18) $6\frac{1}{8}\times3\frac{1}{8}=$.....	(24) $10\frac{1}{8}\times5\frac{1}{8}=$.....	(30) $44\frac{4}{9}\times4\frac{4}{9}=$.....

Aim to get 100%

LESSON 74

Drill on rapid addition:

4	6	8	9	2	6	3	4	5	7	8	2	6	4	5	9	2	7	4	9
6	8	2	3	4	7	8	2	6	5	7	4	2	6	9	2	3	4	8	1
5	6	8	2	3	4	6	9	2	3	4	7	8	9	2	6	4	3	7	4
2	5	3	4	9	2	4	7	8	2	6	3	4	5	8	3	6	4	2	8
9	2	6	3	7	4	7	3	2	4	9	2	6	4	9	2	5	6	8	3
4	8	9	2	3	7	8	5	4	6	2	1	3	2	1	5	7	8	9	2
7	9	2	3	4	5	6	4	8	2	6	5	4	7	8	2	3	4	6	9
8	2	7	9	2	6	4	2	7	3	5	4	9	2	7	8	9	3	4	7
2	7	9	2	3	4	8	7	6	9	2	6	4	9	2	3	4	7	8	5
7	2	7	8	9	2	3	4	7	6	5	4	3	2	9	7	6	2	7	8
9	3	4	2	6	8	2	4	9	8	2	6	7	8	4	2	7	3	8	9
2	9	2	4	9	3	7	9	2	1	4	9	8	6	9	3	2	9	4	7
3	4	5	6	7	9	8	3	4	8	2	7	9	2	3	4	9	2	6	9
4	9	8	2	3	4	8	9	2	6	5	4	8	7	6	9	3	7	2	4
8	2	9	3	4	7	2	7	5	9	2	6	7	3	4	8	6	9	3	6
4	7	2	6	9	8	7	4	3	2	9	5	4	8	2	6	7	3	8	9
9	2	3	4	7	2	8	5	4	9	2	6	5	4	8	2	4	9	2	7
3	4	5	6	8	9	2	6	9	8	3	4	6	8	5	6	2	7	8	9
4	2	6	1	3	7	4	5	4	7	6	2	4	9	8	2	6	3	4	5
8	9	2	6	7	3	5	8	7	9	2	7	6	4	8	9	3	7	8	9

(1) Add each column, beginning at the right side. Do not carry at first and do not write any results on paper. Start at the left side and add the columns. Practise reading the columns for *five* minutes. Try to acquire accuracy, smoothness and speed—the three great essentials for expert work in addition.

(2) Drill on horizontal addition. Start on the top line, add from left to right and then from right to left on the same line. Do you get the same result? Practise horizontal addition on the other lines of the question, in a similar way.

(3) Let the above block of figures, twenty wide and twenty deep, represent an addition question. Pencil the sum as you add, writing the figures at the bottom. Add and re-add, running from bottom to top and from top to bottom, until you can add the complete question in *four* minutes.

DRILL 74

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6) Totals.
42689	72649	92478	92649	64739	.....
96847	34587	43236	83456	28426	.....
32684	26492	57428	25634	52874	.....
96827	34826	92345	82478	26498	.....
64738	72478	76526	32656	48934	.....
42976	26237	82458	49234	26478	.....
28734	93489	48923	82549	78929	.....
82649	67235	76256	37264	26474	.....
76234	49878	28496	72649	35646	.....
82842	26484	92478	56789	28524	.....
69236	92374	47264	32548	92489	.....
57826	48249	89826	26487	32678	.....
49234	36726	52634	64963	57234	.....
87548	57484	87426	58472	82526	.....
92674	92876	92734	69487	49234	.....
83428	28939	72698	65342	87656	.....
93672	24764	52489	82478	29437	.....
84536	78546	36524	57649	85232	.....
74249	92649	92478	26543	92488	.....
82676	85476	36547	92487	76277	.....
93924	23489	24869	26543	56892	.....
72484	82678	32478	72478	47369	.....
87649	56424	56734	56526	25436	.....
29373	72689	29467	92349	82492	.....
28496	89346	82535	67423	32656	.....
49234	24637	49246	26579	49238	.....
82645	64248	76523	36266	78527	.....
93769	56726	42649	48489	29496	.....
24837	26489	37428	92642	73289	.....
49248	37572	49269	34567	28936	.....

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree? If not, re-add.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing 25% and 5%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
____	____	____	____	____	____
____	____	____	____	____	____
$	$	$	$	$	$

By inspection, find the value of:

(13) $12\frac{1}{2} \times 12\frac{1}{2} =$..... (15) $8\frac{1}{4} \times 8\frac{1}{4} =$..... (17) $14\frac{1}{7} \times 6\frac{1}{7} =$.....

(14) $8\frac{1}{3} \times 8\frac{1}{3} =$..... (16) $33\frac{1}{3} \times 3\frac{1}{3} =$..... (18) $45\frac{5}{6} \times 5\frac{5}{6} =$.....

LESSON 75

Drill *ten* minutes on the following:

4	2	6	7	8	2	4	5	8	3	2	6	7	9	2	4	8	9	2	4
9	3	4	6	2	8	7	6	4	9	6	8	5	6	3	2	4	7	6	9
2	9	8	3	4	7	2	7	9	2	4	9	8	5	4	3	2	6	4	3
9	2	3	4	9	2	3	4	8	7	6	2	7	4	9	2	7	8	9	2
3	9	2	5	7	8	7	9	2	6	3	4	5	6	4	9	8	2	6	9
7	8	7	2	6	4	8	3	7	2	6	9	2	4	7	2	9	8	3	7
2	5	6	4	2	7	2	7	8	9	2	7	9	3	4	8	7	6	2	9
9	3	4	7	8	2	5	4	8	2	9	3	2	7	6	4	6	9	3	4
8	5	9	3	9	8	9	7	5	6	4	7	3	6	5	7	8	2	6	5
4	9	2	8	7	3	4	9	7	8	5	4	9	2	6	4	9	7	3	8
7	2	8	7	2	6	3	4	8	5	6	2	3	9	2	6	4	8	7	9
2	4	7	8	7	2	9	3	6	2	4	7	8	7	6	9	2	3	4	2
9	3	2	4	2	8	7	6	4	3	2	6	9	2	4	3	7	8	2	6
2	4	9	8	7	2	4	9	3	6	9	2	3	7	8	2	4	7	8	8
4	9	2	7	8	7	2	6	5	7	3	4	2	9	3	6	7	4	2	9
2	6	5	4	3	2	6	7	8	9	2	6	5	4	6	9	3	6	9	2
7	8	4	8	7	9	2	4	6	7	4	7	8	5	4	2	6	9	3	7
4	9	2	6	5	8	3	7	2	4	7	8	3	7	8	9	2	6	4	6
5	2	3	4	7	2	9	3	6	8	4	7	8	2	6	3	4	2	6	9
8	4	7	3	4	7	2	9	4	7	2	6	9	3	5	6	7	4	8	2

(1) After drilling *ten* minutes on reading the above columns, try to add the question in *four* minutes. When reading the columns at first, do not write the results, but simply use the drill as a quick, snappy, mental exercise. Aim to read smoothly and accurately. After preparatory practice for *ten* minutes, treat the question as an addition question and write the results in pencil figures. There are 400 figures in the question. After getting the correct result, say in *four* minutes, try to increase your speed. Can you beat your record and add the question in three and a half minutes?

(2) Practise horizontal addition for *three* minutes. Start on the top line and read from right to left and then from left to right on the same line. Do your totals agree?

(3) Add by 9's from 18 to 81; from 72 to 162.

DRILL 75

Date *Name*

Time *Seat No.*

(1)	(2)	(3)	(4)	(5)	(6) Totals.
36549	92698	49268	92769	89288	.....
28488	34574	78923	49234	56473	.....
92643	28437	46756	87325	79248	.....
74892	62982	82347	92646	92694	.....
24789	47436	29436	78282	73478	.....
28937	82548	78692	93679	96235	.....
97654	93892	49278	42856	49478	.....
32726	78939	36547	75438	32596	.....
96476	26478	85632	92653	76478	.....
85649	49239	96548	24829	29369	.....
23456	87542	29256	67237	47256	.....
72848	93656	76838	52468	29534	.....
93789	42498	49248	29432	78426	.....
24576	36876	82679	54369	92658	.....
37298	28599	23547	28523	56437	.....
76379	24376	29624	76248	29679	.....
24768	72724	54378	29372	28489	.....
92345	82549	26426	49235	92367	.....
76987	36478	92439	92478	54874	.....
26548	62549	86276	67236	29436	.....
92488	23576	75429	59479	92375	.....
76929	82692	24732	27826	49236	.....
47437	78479	34697	52439	72648	.....
82549	36842	56426	28763	56734	.....
26476	54727	83279	93276	29478	.....
38547	62536	24782	54785	56749	.....
92854	28492	93264	49237	39264	.....
46426	39649	87656	92342	87656	.....
82679	49236	26499	87258	92539	.....
93924	56789	83256	29764	69274	.....

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree? Many systems of accounting require frequent additions in a horizontal direction. It is desirable to be able to do this without writing the numbers on other sheets, thus saving time and lessening opportunities for errors.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 25% and 5%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

LESSON 76

4	2	6	8	7	9	2	3	4	6	5	3	7	9	2	6	5	8	7	3
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

(1) Beginning at the left side, name the product of each of the top figures by 9; as 36, 18, 54, 72, 63, 81, etc. To assist the eye, run the blunt end of your pencil along the base of the 9's and try to name the products regularly. Start at the right side and name the products. Drill faithfully for *three* minutes.

(2) Start at the right side and multiply by 9, as in ordinary multiplication, adding the carrying figure; as 27, 65, 78, 52, 59, 23, etc. Do not write any results on paper just now, but make the exercise a brisk mental drill. Spend *three* minutes on this form of practice. Go over and over the line until you can name the results with ease and accuracy.

Division

9)2	8	4	9	8	2	6	7	4	8	9	2	3	5	6	8	7	4	6	9

Drill on short division by 9, naming the figures slowly at first, but regularly; as 3, 1, 6, 6, 4, 7, 4, etc. Do not write any results on paper, but spend at least *three* minutes in careful practice.

Cross Multiplication

Example:—Find the product of 214×236.

Long way:

214
236

1284
642
428

50504

Solution:—4×6=24. Write 4 in the product and carry 2. 1×6+2(carried)+12(4×3)=20. Write 0 as the second figure of the product and carry 2. 2×6+2(carried)+3(1×3)+8(4×2)=25. Write 5 as the third figure of the product and carry 2. 2×3+2(carried)+2(1×2)=10. Write 0 as the fourth figure of the product and carry 1. 2×2+1(carried)=5. Write 5 as the fifth figure of the product, thus completing the multiplication and obtaining a product of 50504.

Study the solution carefully by going over it two or three times. By cross multiplication, three figures can be multiplied by three figures and the product only written on paper.

DRILL 76

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(3)	(3)
235×9—	323×9—	247×9— .....
213×9—	346×9—	274×9— .....
262×9—	325×9—	742×9— .....
136×9—	463×9—	356×9— .....
147×9—	475×9—	563×9— .....
156×9—	492×9—	365×9— .....

(4)	(5)	(6)
427×9—	369×9—	429×9— .....
247×9—	639×9—	249×9— .....
742×9—	963×9—	942×9— .....
578×9—	478×9—	546×9— .....
758×9—	748×9—	465×9— .....
875×9—	847×9—	646×9— .....

(7)	(8)	(9)
589×9—	789×9—	499×9— .....
859×9—	879×9—	949×9— .....
985×9—	889×9—	844×9— .....
768×9—	579×9—	488×9— .....
687×9—	759×9—	766×9— .....
876×9—	979×9—	677×9— .....

(10)	(11)	(12)
214×175—	346×264—	627×145— .....
235×247—	492×365—	832×235— .....
284×165—	563×245—	764×325— .....
292×184—	678×325—	926×465— .....
275×128—	496×225—	834×335— .....
464×275—	572×335—	932×425— .....

Divide and add quotients:

(13)	(14)	(14)
2476242÷9—		4675869÷9— .....
2698479÷9—		4937625÷9— .....
1647324÷9—		3792789÷9— .....
1982673÷9—		4783644÷9— .....
2568492÷9—		8673768÷9— .....
2983725÷9—		3785427÷9— .....

LESSON 77

Multiplication Drill:

2	6	4	8	7	9	2	3	5	7	9	2	3	6	8	9	5	6	4	2
9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9

(1) Multiply the figures in the top line by 9, starting at the left side and naming the products at a regular rate of speed; as 18, 54, 36, 72, 63, 81, etc. Practise *three* minutes, going from left to right and from right to left.

(2) Start at the right side and multiply by 9, adding the carrying figure; as 18, 37, 57, 50, 86, 80, etc. Practise *three* minutes in this way, in order that you may be able to name results without any hesitancy. Keep your mind on your work. The best results will come from intense concentration.

Division Drill

9)3	7	8	9	2	8	5	6	4	3	2	7	6	9	2	7	8	9	4	8

Take a quick, sharp drill on the above short division exercise; as 4, 2, 1, 0, 3, 1, 7, 3, 8, etc. Do not write any figures on the paper, but use the drill for a lively mental exercise. Go over and over several times until you can name the results without stumbling.

Short Method

To multiply by 19:

Long way:

$$\begin{array}{r} 4679 \\ 19 \\ \hline 42111 \\ 4679 \\ \hline 88901 \end{array}$$

Short way:

$9\times9 = 81$

$7\times9+8+9 = 80$

$6\times9+8+7 = 69$

$4\times9+6+6 = 48$

$4+4 = 8$

In invoicing, such extensions as the following, can be made at sight:—536 yards at 19 cents a yd.; 2486 lbs. at 19 cents a lb., etc. Be sure that you can use multiplication by 19 as accurately as multiplication by 9.

DRILL 77

Date *Name*

Time *Seat No.*

Extend and add products:

(1)

375×9= .....
465×9= .....
753×9= .....
573×9= .....
564×9= .....
645×9= .....

(2)

362×9= .....
356×9= .....
263×9= .....
632×9= .....
563×9= .....
365×9= .....

(3)

436×9= .....
364×9= .....
463×9= .....
578×9= .....
785×9= .....
857×9= .....

(4)

468×9= .....
648×9= .....
846×9= .....
397×9= .....
793×9= .....
973×9= .....

(5)

489×9= .....
849×9= .....
984×9= .....
657×9= .....
567×9= .....
695×9= .....

(6)

487×9= .....
647×9= .....
7[illegible]×9= .....
659×9= .....
569×9= .....
966×9= .....

(7)

135×19= .....
162×19= .....
242×19= .....
422×19= .....
264×19= .....
642×19= .....

(8)

265×19= .....
652×19= .....
652×19= .....
478×19= .....
748×19= .....
847×19= .....

(9)

365×19= .....
635×19= .....
563×19= .....
482×19= .....
842×19= .....
248×19= .....

(10)

635×19= .....
635×19= .....
569×19= .....
472×19= .....
247×19= .....
742×19= .....

(11)

563×19= .....
563×19= .....
489×19= .....
842×19= .....
482×19= .....
834×19= .....

(12)

564×19= .....
645×19= .....
837×19= .....
378×19= .....
783×19= .....
885×19= .....

(13)

462×135= .....
578×245= .....
682×365= .....
426×235= .....
724×165= .....
496×225= .....

(14)

346×245= .....
462×285= .....
356×165= .....
426×245= .....
636×185= .....
424×235= .....

(15)

426×275= .....
396×265= .....
492×285= .....
378×165= .....
248×145= .....
296×235= .....

Divide and add quotients:

(16)

2475÷9= .....
2934÷9= .....
2871÷9= .....
2466÷9= .....
2934÷9= .....
2466÷9= .....

(17)

4374÷9= .....
4869÷9= .....
4725÷9= .....
4932÷9= .....
4725÷9= .....
4932÷9= .....

(18)

5697÷9= .....
5841÷9= .....
5733÷9= .....
5895÷9= .....
5931÷9= .....
6786÷9= .....

LESSON 78

Drill on Multiplication by 9:

4	9	2	3	6	7	8	4	2	5	6	4	2	7	6
9	2	6	4	7	3	2	8	5	4	2	9	6	3	7
2	5	7	8	4	9	3	2	6	5	8	7	4	2	9
3	9	4	2	7	8	2	6	9	2	4	8	5	4	3

(1) Name the product of each figure in the first line, beginning at the left side and multiplying by 9; as 36, 81, 18, 27, 54, 63, etc. Next, read from the right side to the left, multiplying each figure by 9; as 54, 63, 18, 36, 54, 45, etc. Go over the first line *four* times and then drill on the other lines in a similar way.

(2) Let the first line represent the top line of a multiplication question. Begin at the right side and multiply by 9, adding the carrying figure; as 54, 68, 24, 38, 57, 50, etc. Drill on the other lines in a similar way. Go over each line several times. Practise, practise, practise! Right methods of practice will always bring excellent results.

Short Method

To multiply two numbers in which the units' figures added make 10, the other figures being the same in each:

Example:—What is the product of 76 multiplied by 74?

76 74 —— 5624	Solution:—$6\times4=24$. Write 24 as the two right hand figures of the entire product. Then, adding 1 to the tens' figure of the multiplier, we have $7+1=8$. $7\times8=56$. Prefixing 56 to 24, we have 5624, the entire product.

Rule:—For the two right hand figures of the entire product, write the product of the units. Add 1 to the tens' figure of the multiplier, multiply the tens' figure of the multiplicand by the sum thus obtained, and prefix the product to the figures derived from multiplying the units.

DRILL 78

Date *Name*
Time *Seat No.*

Extend and add products:

(1)	(2)	(3)
463×9=	237×9=	375×9= .....
634×9=	372×9=	573×9= .....
364×9=	732×9=	753×9= .....
582×9=	426×9=	478×9= .....
285×9=	624×9=	784×9= .....
852×9=	462×9=	874×9= .....

(4)	(5)	(6)
567×9=	398×9=	659×9= .....
657×9=	893×9=	569×9= .....
765×9=	983×9=	965×9= .....
439×9=	769×9=	778×9= .....
394×9=	967×9=	877×9= .....
934×9=	679×9=	788×9= .....

(7)	(8)	(9)
235×19=.....	274×19=	579×19=.....
325×19=.....	472×19=	795×19=.....
523×19=.....	742×19=	975×19=.....
346×19=.....	738×19=	799×19=.....
463×19=.....	837×19=	997×19=.....
643×19=.....	387×19=	789×19=.....

(10)	(11)	(12)
653×19=.....	727×19=	939×19=.....
356×19=.....	277×19=	399×19=.....
656×19=.....	399×19=	488×19=.....
825×19=.....	993×19=	884×19=.....
528×19=.....	466×19=	377×19=.....
285×19=.....	664×19=	773×19=.....

(13)	(14)	(15)
24×26=	85×85=	112×118=.....
72×78=	92×98=	123×127=.....
63×67=	91×99=	135×135=.....
47×43=	64×66=	179×171=.....
31×39=	53×57=	146×144=.....
34×36=	67×63=	187×183=.....

Accuracy first, then speed

LESSON 79

Drill on Multiplication by 9:

1	6	7	8	5	2	3	9	6	7	8	2	5	6	8	4
2	5	9	3	6	8	5	4	9	2	7	8	9	3	6	7
5	6	4	9	2	3	7	8	2	9	6	3	7	4	8	5
3	7	9	2	6	8	4	3	7	2	9	6	5	8	3	9

(1) Multiply each figure in the first line by 9, reading from left to right and then from right to left; as 36, 54, 63, 72, 45, 18, etc. Do not write any figures on paper, simply name the products. Drill on the other lines in a similar way. Be careful to name results accurately and smoothly.

(2) Start at the right side of the first line and multiply by 9, adding carrying figure; as 36, 75, 61, 51, 23, 74, etc. Go over each line *four* times. After practising a few minutes, try to increase your speed. Make the drill sharp and lively.

(3) When multiplying by 19, you have two figures to add, as a general rule —the carrying figure and the figure to the right of the one multiplied. Start on the third line at the top of the page, at the right side, and multiply each figure by 9. Add to the product, the two figures above. To illustrate: 45, 52, 56; 72, 78, 86; 36, 39, 45, etc. Drill from left to right in a similar way and then use the last three lines. Drill *five* minutes.

Short Method

To multiply two numbers in which the units' figures are the same:

Example:—Multiply 46 by 66.

46
66
——
3036

Method:

6×6 =36, carry 3

(4+6)×6+3(carried) =63, carry 6

4×6+6(carried) =30

DRILL 79

Date *Name*
Time *Seat No.*

(1)	(2)	(3)
1345×9=	2342×9=	2434×9=
1268×9=	2456×9=	2656×9=
1472×9=	2643×9=	2767×9=
1369×9=	2782×9=	2978×9=
1575×9=	2937×9=	2939×9=
1973×9=	2878×9=	2797×9=

(4)	(5)	(6)
3127×9=	4127×9=	6234×9=
3245×9=	4237×9=	6494×9=
3356×9=	4565×9=	6789×9=
3474×9=	4678×9=	6439×9=
3565×9=	4585×9=	6578×9=
3767×9=	4929×9=	6929×9=

(7)	(8)	(9)
1234×19=	2123×19=	3262×19=
1347×19=	2462×19=	3424×19=
1454×19=	2324×19=	3525×19=
1565×19=	2767×19=	3656×19=
1676×19=	2585×19=	3464×19=
1649×19=	2474×19=	3828×19=

(10)	(11)	(12)
4124×19=	5123×19=	6132×19=
4262×19=	5664×19=	6242×19=
4324×19=	5467×19=	6535×19=
4575×19=	5623×19=	6494×19=
4282×19=	5784×19=	6273×19=
4737×19=	5929×19=	6496×19=

(13)	(14)	(15)
31×21=	58×48=	126×146=
67×57=	81×91=	115×125=
53×93=	22×72=	135×135=
44×54=	32×82=	197×117=
68×78=	45×55=	186×126=
72×52=	76×36=	124×114=

Aim to get 100%

LESSON 80

Drill on Multiplication by 9:

3	7	5	4	8	2	9	3	6	4	2	7	5	2	7	8
4	9	2	3	7	8	7	9	2	6	7	8	2	5	2	9
3	4	7	8	2	9	3	2	7	2	5	4	8	2	4	5
5	2	6	7	4	3	9	8	2	6	7	5	4	8	2	6
7	3	2	6	9	4	2	7	8	2	6	4	9	3	7	2
9	2	3	4	5	6	8	2	5	7	3	5	2	6	8	9

(1) Drill on the first line, multiplying each figure by 9, reading from left to right and then from right to left; as 27, 63, 45, 36, 72, etc. Draw your pencil along the line, naming the products as the pencil comes under each figure. Try to name the results regularly and accurately. Go over each line *twice*.

(2) Start at the right side of the first line and multiply by 9, adding carrying figure; as 72, 70, 25, 47, 67, 24, etc. Drill similarly on each line, *three* times.

(3) Group *two* lines, multiplying the lower figure by 9 and adding the top figure; 81, 89; 18, 25; 45, 47, etc. Read from right to left and then back on the same two lines. Drill on the other lines in a similar way.

(4) Group *three* lines, multiplying the figure in the third line by 9 and adding the *two* figures above; as 45, 54, 62; 36, 38, 45; 18, 23, 25, etc. Practise three minutes on this form of grouping the figures.

Short Method

To multiply two figures in which the units' figures are unlike, the remaining figures being alike:

Example 1:—Multiply 78 by 72.

78
72
—
5616

Method:
8×2 —16, carry 1
(8+2)×7+1(carried)—71, carry 1
7×7+7(carried)—56.

Example 2:—Multiply 126 by 122.

126
122
—
15372

Method:
6×2 —12, carry 1
(6+2)×12+1(carried)—97, carry 9
12×12+9(carried)—153.

DRILL 80

Date *Name*

Time *Seat No.*

Extend and add products:

(1)
1316 x 9=
1472 x 9=
1563 x 9=
1478 x 9=
1565 x 9=
1284 x 9= _____

(2)
2647 x 9=
2732 x 9=
2846 x 9=
2936 x 9=
2748 x 9=
2569 x 9= _____

(3)
3262 x 9=
3464 x 9=
3575 x 9=
3686 x 9=
3929 x 9=
3848 x 9= _____

(4)
4525 x 9=
4327 x 9=
4686 x 9=
4737 x 9=
4828 x 9=
4939 x 9= _____

(5)
5134 x 9=
5626 x 9=
5438 x 9=
5727 x 9=
5834 x 9=
5787 x 9= _____

(6)
6282 x 9=
6437 x 9=
6549 x 9=
6737 x 9=
6548 x 9=
6638 x 9= _____

(7)
1626 x 19=
1927 x 19=
1535 x 19=
1838 x 19=
1454 x 19=
1939 x 19= _____

(8)
2646 x 19=
2494 x 19=
2565 x 19=
2848 x 19=
2737 x 19=
2939 x 19= _____

(9)
3626 x 19=
3484 x 19=
3767 x 19=
3262 x 19=
3757 x 19=
3929 x 19= _____

(10)
7242 x 19=
7323 x 19=
7545 x 19=
7646 x 19=
7575 x 19=
7434 x 19= _____

(11)
8464 x 19=
8262 x 19=
8575 x 19=
8393 x 19=
8272 x 19=
8989 x 19= _____

(12)
9121 x 19=
9262 x 19=
9434 x 19=
9575 x 19=
9484 x 19=
9769 x 19= _____

(13)
27 x 28=
46 x 45=
73 x 77=
56 x 55=
68 x 61=
74 x 78= _____

(14)
48 x 43=
85 x 84=
27 x 29=
74 x 72=
49 x 45=
66 x 62= _____

(15)
126 x 121=
147 x 145=
168 x 161=
153 x 152=
144 x 143=
178 x 175= _____

LESSON 81

Addition by Grouping

2 (1		3 (2	
(1		(1	
2	1	1	1
1	2	1	2
1	2	1	2
2	1	1	1
2	1	2	2
1	2	1	1
2	1	2	1
1	2	1	2
1	2	1	1
1	1	2	1
1	2	1	2
2	1	2	1
2	1	2	2
1	2	1	1
1	1	1	2
2	1	2	1
2	2	1	1
1	1	1	2
2	2	2	2
1	1	1	1
1	2	2	1
2	1	1	2
1	1	2	2
2	2	1	1
2	2	1	2
1	1	2	1
1	2	1	2
1	1	2	1
1	2	1	1
2	1	2	2
1	2	1	1
2	1	2	1
2	1	2	2
1	2	1	1
2	1	2	1
2	1	2	2
1	2	1	1
1	1	1	2
1	2	2	1

If the work of the preceding lessons has been faithfully done, you are now ready to take an important step toward becoming an expert, rapid calculator. Hitherto your reading of columns of figures has been on the same line almost as reading a page of print, by naming the separate letters one after the other. Why not make your figure reading the same as ordinary reading, by making convenient combinations of figures? It can be done quite as well with figures as with letters, and if there is any secret about rapid addition, it lies in the ability to combine groups of figures at sight.

Our concern will be with groups of two figures each. As you well know, there are only nine digits used in addition. The highest possible result from adding any two of these is 18. We must, therefore, become familiar with all possible combinations of numbers which, in pairs, produce results up to 18. The following table shows what that really means:—

2 (1	8 (1234	14 (567
(1	(7654	(987
3 (1	9 (1234	15 (67
(2	(8765	(98
4 (12	10 (12345	16 (78
(32	(98765	(98
5 (12	11 (2345	17 (8
(43	(9876	(9
6 (123	12 (3456	18 (9
(543	(9876	(9
7 (123	13 (456	
(654	(987	

Looking over the list, we find there are only 45 combinations. These, of course, must be thoroughly memorized. No great task is this; you practically know them now. All we really want is practice at taking in two figures at a glance instead of one.

Here is our plan for practice along this line. While we suggest at the top of the page the figures used, we want you to get special drill from the columns of figures. You will notice that the figures are arranged this time in double lines. Suppose you take the first row, as you did the table drill at the top of the preceding addition lessons. That is, slide your pencil along beneath the row and call out the sums of the pairs as you come to them. Come back over the list the same way. Then try the next row. Next run up and down the columns by twos in the same way. Do no carrying of results from one figure to another.

Now you are ready to try the regular addition of a column. Remember you must see in each group of two figures, one amount. Bear in mind what we have said about smoothness and regularity in your work. Start slowly, slide the pencil up along the column, name the sums as regularly as the clock ticks. Do not be in a hurry to get away from the easier pages. When you have drilled yourself thoroughly on the columns to the left where the numbers have been blocked out in sets of two for you, try the questions on the back of this sheet. Persevere, and don't let yourself fall back to going up one figure at a time.

Short Method

To square any number containing two figures:

Example:—Square 72 (may be written 72^2).

72
72
5184

Solution (1):—$2\times2=4$. Write 4 as the first figure of the product. $14(7+7)\times2=28$. Write 8 as the second figure of the product, and carry 2. $7\times7+2=51$. Write 51 to complete the product.

Solution (2):—$2\times2=4$. Write 4 as the first figure of the product. $4(2+2)\times7=28$. Write 8 as the second figure of the product, and carry 2. $7\times7+2=51$. Write 51 to complete the product.

DRILL 81

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
12121	21212	12121	21212	12121
21212	12121	21212	12121	21212
12121	21212	12121	21211	12111
21112	12121	11211	12122	21212
12222	11212	21121	11211	12121
21111	12121	12212	21122	21112
12212	21212	11121	12111	12221
21121	12121	22112	21221	11112
12121	21112	11221	12112	21221
21212	12211	12112	11221	12112
12111	21121	21221	22112	11221
11212	12212	12111	11221	12112
21121	11211	21221	22112	11221
11212	21122	12112	11221	21112
22111	12111	21221	21112	12221
11221	21222	12112	12221	11112
12122	12112	21221	21112	22121
21211	21211	12112	12121	11212
12121	12122	21221	21212	22121
11212	21111	12112	12121	11212

In the above questions, add the reverse way to prove that your answers are correct.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Allowing discounts of 25% and 5%, find net price.

(6)$	(7)$	(8)$	(9)$	(10)$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

Square the following numbers and add products:

(11)	(12)	(13)	(14)	(15)
27	24	91	54	62
36	37	49	66	78
49	42	57	76	34
52	56	74	82	92
87	68	28	84	94
64	72	34	86	96

Aim to get 100%

LESSON 82

Addition by Grouping

Kindly review the paragraphs relating to "Addition by Grouping," given in Lesson 81, after which carry out the following suggestions for this lesson:

(1) Name the sums of the groups in the first row of figures to the left, sliding your pencil along beneath the row as an aid to the eye. Come back over the list the same way. Follow the other rows in a similar manner.

(2) Next, run up and down the columns, naming the sums of the pairs as you come to them. Do no carrying of results from one group to another.

(3) Try reading or adding the different columns, first without carrying. Be sure to add regularly.

(4) Consider the illustrated figures as a question in addition—6 columns wide, 20 pairs deep, or 240 figures. Try to add the question in *two* minutes. Can you add it in one minute and a half?

When adding the columns on the back of this sheet, group two figures with the eye. Be sure to add two figures at a time.

	4	(2	3	1	
		(2	1	3	
3	2	1	3	2	1
1	2	3	1	1	3
2	1	2	1	3	2
1	2	1	3	1	2
2	3	2	1	2	3
1	1	1	1	2	1
1	2	1	3	2	2
2	2	2	1	1	1
1	1	2	2	3	1
3	2	1	1	1	2
2	3	1	2	3	1
2	1	2	2	1	1
2	1	3	1	2	3
2	3	1	1	1	1
3	3	1	2	1	2
1	1	3	2	2	2
2	1	2	3	3	1
2	3	2	1	1	3
2	3	1	1	2	3
2	1	2	3	2	1
1	2	3	2	1	2
2	1	1	2	3	2
2	3	3	1	2	1
2	1	1	2	1	2
1	1	2	3	2	1
2	2	1	1	2	2
2	3	1	2	3	3
1	1	2	2	1	1
3	1	2	2	3	2
1	3	1	2	1	2
3	1	1	2	2	1
1	3	3	2	1	2
3	2	2	3	1	1
1	1	1	1	2	3
2	2	1	1	3	2
1	2	3	2	1	1
1	1	2	2	2	1
3	3	2	1	2	1
3	2	1	2	2	1
1	1	2	2	1	2

Trade Discount

Example:—The wholesale list price of goods is $268.65, with discounts of 30% and 3⅓ off. Find the net price.

$268.65
80.60=30%
188.05
6.27=3⅓%
$181.78

Solution:—30% should be based on 10%. We get 10% of an amount by shifting the decimal point one place to the left. 10% of $268.65=$26.865. Then 30% will be 3 times as much or $80.60 to nearest cent, 5 mills or more being counted a full cent in business. 3⅓% is ⅓ of 10%. 10% of $188.05=$18.805, therefore 3⅓% will be ⅓ of $18.805 or $6.27 to nearest cent. The net price will be $181.78.

DRILL 62

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)	(6) Totals.
12321	21212	21212	31212	13131	.....
31122	12121	13122	12231	31313	.....
22311	31312	21321	21323	21232	.....
12133	12131	12122	22121	21211	.....
21311	21212	32111	31223	32311	.....
22122	13121	12232	13121	11133	.....
13211	11312	21121	21313	23121	.....
31223	31121	23211	22121	21323	.....
13111	13112	11233	33123	31212	.....
31231	11321	23111	11321	13232	.....
22113	22113	12311	23231	13113	.....
11331	11331	21133	21213	31131	.....
21312	12113	23211	12132	23213	.....
12121	12131	21233	32312	21231	.....
31211	11321	13221	21231	32312	.....
12133	12122	21123	23213	11132	.....
31211	11313	12312	31122	32123	.....
12122	31111	22122	13322	12321	.....
21211	13121	12313	13231	23132	.....
12133	21313	32131	31213	21312	.....

After adding the five questions above, add in a horizontal direction and express the various sums in the "Totals" column on the right side of the page. The sum of the answers to the five addition problems should agree with the sum of the totals in the "Totals" column. Do they agree?

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing 30% and 3½%

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

Find the sum of the following products:

(13)	(14)	(15)	(16)
25^2=	33^2=	41^2=	51^2= .....
32^2=	34^2=	42^2=	52^2= .....
46^2=	35^2=	43^2=	53^2= .....
48^2=	36^2=	44^2=	54^2= .....
56^2=	37^2=	45^2=	57^2= .....
55^2=	38^2=	47^2=	58^2= .....

Accuracy first, then speed.

5 (2 3 4 1
(3 2 1 4

2	4	3	1	2	1	3	4
1	1	2	4	3	4	2	1
1	3	2	4	2	1	3	2
4	2	1	1	3	1	2	2
3	2	4	1	2	3	4	2
2	3	1	2	3	2	1	3
2	4	1	4	2	4	3	1
1	1	2	1	3	1	2	3
2	1	4	2	3	4	3	2
3	2	1	2	2	1	2	3
1	2	4	1	3	2	1	4
4	2	1	4	1	3	1	1
3	4	1	2	3	1	4	2
1	1	3	3	1	4	1	2
2	3	4	1	2	3	2	1
2	2	1	3	3	1	3	3
4	1	3	2	3	2	4	2
1	3	2	2	1	3	1	3
3	4	2	2	3	4	3	2
1	1	3	3	1	1	1	2
3	2	3	1	2	3	4	1
2	3	2	4	2	2	1	3
4	2	3	2	1	2	3	4
1	3	1	3	4	1	2	1
3	2	1	4	2	3	1	2
1	3	4	1	2	1	4	3
2	1	3	2	3	1	3	1
2	4	1	3	1	4	1	2
1	3	2	4	1	3	2	4
4	2	3	1	2	2	1	1
2	3	2	3	4	2	1	4
3	2	1	2	1	3	4	1
2	2	4	2	3	2	3	2
2	3	1	3	2	2	2	2
2	4	2	1	2	3	4	2
3	1	3	3	2	2	1	3
4	3	2	3	2	4	3	1
1	2	3	1	3	1	2	4
2	3	1	3	4	2	2	1
3	1	4	2	1	2	3	4

Addition by Grouping.

Notice the groups at the top of the page, and you will see four groups comprising 5. In addition to the groups making 2, 3, and 4, we shall have the groups making 5, to learn. For practice, the figures are arranged in pairs at the left of the page and we should spend at least ten minutes in faithful practice, before trying the problems on the back of this sheet.

(1) Name the sums of the groups, reading from left to right and then from right to left on the same line. Start on the top line and then run over the groups in all of the other lines.

(2) Run up and down the columns, naming the sums of the pairs.

(3) Add the different columns, first without carrying and then add with carrying.

(4) Time yourself adding the whole list of figures as an addition question. Try adding the 320 figures in *three* minutes.

Short Method.

To multiply when the multiplier lacks one fractional unit of being an integer:

Question:—Multiply 96 by 3⅞.
Solution:—96×4=384
96×⅛=12

372

Multiplying by 4 gives a result greater than it should be by ⅛ of the amount to be multiplied. Find ⅛ of the amount, and subtract it from 4 times the amount, and we have 3⅞ times the amount.

DRILL 83

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)	(6) Totals.
24232	42321	24232	32421	24231	.....
31221	12234	21213	22134	31224	.....
23423	23123	42321	23242	23131	.....
22122	22122	12124	21213	21422	.....
13431	41242	31232	42324	34232	.....
11121	13212	24213	12131	11223	.....
31412	34124	42342	32342	22412	.....
23112	21421	12212	12213	32142	.....
42323	14232	23131	43234	24234	.....
12122	31222	22421	12221	31221	.....
23232	42341	42143	24342	24243	.....
22323	12114	13312	31213	21312	.....
42142	31323	21233	42342	42231	.....
12412	22122	31212	12212	13214	.....
31231	42411	42324	32124	23423	.....
21224	12144	12131	22131	22122	.....
13123	24323	23423	32242	41231	.....
42122	21122	32121	13212	14224	.....
31432	42413	42313	42343	24313	.....
24123	12141	12242	12212	31242	.....

Prove that your answers to the five addition questions are correct by adding horizontally and then totalling the answers and the extensions in the "Totals" column. If the sum of the answers agrees with the sum of the totals in the "Totals" column, your addition questions are correct. Do they agree? If not, go over your addition.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 30% and 3⅓%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	P	$	$

Find the sum of the products:

(13)	(14)	(15)
$72\times4\frac{3}{4}$=.....	$125\times3\frac{4}{5}$=.....	$660\times4\frac{1}{11}$=.....
$24\times6\frac{1}{4}$=.....	$275\times2\frac{4}{5}$=.....	$288\times5\frac{7}{8}$=.....
$84\times7\frac{2}{3}$=.....	$490\times4\frac{4}{7}$=.....	$328\times6\frac{7}{8}$=.....
$36\times6\frac{2}{3}$=.....	$210\times8\frac{4}{7}$=.....	$342\times9\frac{4}{9}$=.....
$96\times7\frac{1}{8}$=.....	$190\times7\frac{9}{10}$=.....	$264\times6\frac{4}{9}$=.....
$72\times5\frac{1}{8}$=.....	$320\times5\frac{9}{16}$=.....	$723\times9\frac{2}{3}$=.....

LESSON 84

6	(1 2 3 5 4
	(5 4 3 1 2

3	2	1	2	4	5	2	4
3	1	3	3	1	1	3	1
3	1	2	3	1	1	4	3
2	5	4	3	1	5	2	3
3	3	2	2	3	1	3	1
1	3	1	4	1	3	1	5
1	2	3	1	2	4	5	2
4	2	3	1	1	2	1	1
1	1	2	4	1	3	2	4
3	5	2	2	5	1	2	2
3	2	1	4	2	3	1	3
2	2	1	1	4	3	1	3
1	2	4	5	2	3	4	2
2	3	2	1	2	3	2	2
2	2	3	1	2	3	2	1
2	4	3	3	2	2	4	2
2	1	4	2	1	4	1	4
2	1	2	2	1	2	1	2
1	3	1	1	1	3	1	4
5	3	5	4	3	3	5	1
3	1	1	2	2	1	2	5
3	5	4	3	4	5	2	1
1	3	1	2	1	2	3	2
5	3	3	2	1	4	3	4
5	2	1	2	3	4	4	5
1	2	1	2	3	2	2	1
3	1	2	1	2	3	2	3
3	5	4	5	4	3	2	2
3	4	5	4	3	2	3	1
3	2	1	2	3	4	3	4
2	3	5	3	2	2	1	5
4	3	1	1	4	3	4	1
3	2	1	4	5	2	5	1
3	4	5	2	1	4	1	1
1	2	4	4	2	1	2	5
4	3	2	1	2	4	4	1
3	4	1	3	4	4	5	4
3	2	5	3	2	2	1	2
4	3	4	3	2	3	4	3
2	3	2	3	4	3	2	3

Addition by Grouping

In addition to the groups making 2, 3, 4 and 5 as illustrated in previous lessons, this lesson will contain the groups making 6. The various groups are written at the top of the page.

Practise on the columns set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right and then from right to left on the same line. Start on the top line and then run over the groups in all of the other lines. Watch smoothness and regularity.

(2) Run up and down the columns, naming the sums of the various pairs of figures.

(3) Add the different columns, first without carrying and then add with carrying.

(4) Consider the block of figures an addition question. Try adding the 320 figures in *three* minutes. Is your answer correct? Add the reverse way to prove.

Trade Discount

Example:—Goods are listed at $246.19, with discounts of 40% and 2½% off. Find the net price.

Solution:—40% should be based on 10%, being 4 times 10%. 10% of $246.19 is $24.619, therefore 40% will be 4 times $24.619 or $98.48 to nearest cent (5 mills or more will be counted a full cent). 2½% should also be based on 10%, as it is just ¼ of 10%. 10% of $147.71 is $14.771, therefore 2½% will be ¼ of $14.771 or $3.69 to nearest cent. The net price, after deduction, will be $144.02.

$246.19
98.48—40%

147.71
3.69—2½%

$144.02

DRILL 84

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)	(6) Totals.
52314	43212	32512	23425	14322	.....
12352	23454	33154	23241	52334	.....
24121	32343	21431	42323	41231	.....
22535	34313	25235	12323	23225	.....
41233	23453	12343	34234	41323	.....
25232	23113	42323	31122	22312	.....
54314	52525	53131	23423	32434	.....
12352	13121	13535	43242	33232	.....
33144	41432	42242	32324	22343	.....
23412	25222	24224	31232	32323	.....
35251	52351	32531	13243	21325	.....
31315	12215	34135	53423	32231	.....
13213	33153	42215	23214	14224	.....
53443	31413	24251	43332	52422	.....
41352	23534	45142	21322	32342	.....
24314	22131	11524	42124	33224	.....
32424	52525	32453	34324	24513	.....
33242	12131	33113	32232	32153	.....
21431	43125	21342	24512	42324	.....
45235	23541	42224	32154	24122	.....

Prove your work by carrying out the extensions to the "Totals" column. The sum of the five addition questions must equal the sum of the "Totals" column. If the work does not prove, find your mistake by re-adding.

Consider each of the answers in questions 1 to 6, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 40% and 2½%.

(7)$	(8)$	(9)$	(10)$	(11)$	(12)$
$	$	$	$	$	$

Find the sum of the products:

(13)
$36\times2\frac{3}{4}=$.....
$36\times3\frac{1}{2}=$.....
$36\times5\frac{1}{4}=$.....
$48\times4\frac{7}{8}=$.....
$48\times2\frac{3}{8}=$.....
$48\times3\frac{3}{4}=$.....

(14)
$48\times5\frac{1}{8}=$.....
$45\times8\frac{5}{9}=$.....
$72\times2\frac{2}{3}=$.....
$72\times3\frac{3}{4}=$.....
$72\times6\frac{7}{8}=$.....
$72\times8\frac{1}{9}=$.....

(15)
$84\times 6\frac{3}{4}=$.....
$84\times 3\frac{3}{4}=$.....
$84\times 5\frac{5}{8}=$.....
$96\times 6\frac{7}{8}=$.....
$84\times 5\frac{1}{12}=$.....
$96\times10\frac{1}{12}=$.....

Accuracy first, then speed

7	(1 2 3 6 5 4 (6 5 4 1 2 3						
4 2	3 3	2 1	2 5				
1 4	3 4	2 5	4 1				
3 1	2 1	4 2	6 5				
3 4	2 6	2 2	1 2				
1 3	2 1	5 2	3 1				
2 4	1 1	2 4	4 2				
5 1	3 2	1 3	3 2				
2 1	4 4	2 4	1 4				
3 1	4 2	3 5	2 5				
2 2	1 2	4 1	2 2				
4 2	4 6	2 4	3 4				
1 2	3 1	2 2	1 2				
2 3	2 2	5 1	2 6				
2 4	1 2	2 6	1 1				
3 1	5 6	2 1	5 3				
4 2	2 1	2 4	2 2				
4 5	1 2	3 4	1 4				
2 2	3 5	1 3	3 3				
1 2	3 3	1 5	2 3				
1 4	4 2	4 1	4 4				
5 2	3 1	2 6	5 2				
2 1	2 1	4 1	1 5				
3 1	4 2	3 5	3 2				
2 2	1 2	4 1	1 5				
2 4	6 2	4 3	1 2				
1 2	1 1	2 2	6 4				
5 2	3 1	2 6	5 2				
2 1	2 1	4 1	1 4				
1 2	3 3	1 5	3 3				
1 4	4 2	4 1	1 4				
5 1	3 2	1 3	1 2				
2 1	4 4	2 4	4 3				
2 3	2 2	5 1	4 5				
2 4	1 2	2 6	2 2				
1 3	2 1	5 2	1 2				
2 4	1 1	2 4	1 1				
3 1	2 1	4 2	3 4				
3 4	2 6	2 2	3 3				
4 2	3 3	2 1	1 1				
1 4	3 4	2 5	5 6				

Addition by Grouping

This lesson contains the groups making 7, as illustrated at the top of the page, in addition to the groups making 2, 3, 4, 5 and 6.

Practise on the columns set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right, and then from right to left on the same line. Start on the top line and then run over the other lines in a similar way. Let the eye take in the various groups at a glance. Be regular in your practice. Go over and over, until you can name the groups smoothly.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group.

(3) Add the different columns, first without carrying and then with carrying.

(4) Consider the block of figures an addition question. Try adding the 320 figures correctly in three minutes.

Short Method

To multiply together any mixed numbers:

Question:—Multiply 18¾ by 16⅔.

Solution:—(1) 18 × 16—288
(2) ⅔ of 18— 12
(3) ¾ of 16— 12
(4) ⅔ × ¾— ½

312½

Rule:—Multiply the whole numbers together. Multiply the upper whole number by lower fraction. Multiply the lower number by the upper fraction. Multiply the fractions together. Add the four products for the answer.

DRILL 85

Date . *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)		(4)	(5)
62454	43561	45154	53265	25363
15322	24216	32623	24412	22413
32531	32423	23256	32434	54234
42235	35143	43121	43333	23423
12424	41535	24542	32365	52335
65332	36232	43235	42212	14122
32423	24243	23531	34635	42563
35344	53524	24246	32131	34113
24132	13243	32354	43626	45324
53645	64523	44323	23131	12433
42425	14324	24235	32524	35324
32321	52453	53432	43222	21322
24535	61454	62244	34243	62534
23242	16222	15332	33523	14243
35154	32561	34213	62434	21321
32623	44216	33523	13233	32411
24321	34245	23526	52464	53454
52356	33532	42251	22311	24323
15342	21365	25463	43621	46243
62435	56412	42314	33156	31534

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Be sure to add by grouping two figures. This will give you excellent practice in adding by grouping. Are your answers correct?

Consider each of the answers in questions 1 to 5 inclusive as a list price in dollars and cents. Find the net price, after allowing discounts of 40% and 2½%.

(6)	(7)	(8)	(9)	(10)
\$	\$	\$	\$	\$
\$	\$	\$	\$	\$

Find the value of:—

(11) $72\frac{3}{4} \times 24\frac{5}{8} =$.....
(12) $16\frac{3}{8} \times 25\frac{3}{5} =$.....
(13) $36\frac{2}{3} \times 18\frac{5}{6} =$.....
(14) $63\frac{3}{4} \times 32\frac{4}{7} =$.....
(15) $615\frac{4}{5} \times 41\frac{1}{3} =$.....
(16) $473\frac{5}{8} \times 19\frac{3}{4} =$.....
(17) $576\frac{3}{4} \times 15\frac{2}{3} =$.....
(18) $738\frac{3}{7} \times 84\frac{5}{6} =$.....
(19) $748\frac{4}{7} \times 36\frac{6}{11} =$.....
(20) $295\frac{6}{11} \times 288\frac{1}{8} =$.....
(21) $75\frac{5}{16} \times 64\frac{7}{16} =$.....
(22) $1825\frac{3}{4} \times 25\frac{1}{8} =$.....

LESSON 86

8	(1 2 3 4 7 6 5 (7 6 5 4 1 2 3						
1	1	4	3	3	3	1	4
5	6	4	5	4	3	3	2
2	2	1	2	1	1	2	2
6	3	6	4	5	5	6	6
1	5	1	4	1	7	3	1
5	3	7	4	7	1	5	3
1	2	1	3	4	3	6	5
7	6	7	3	2	3	2	2
4	6	7	3	4	2	1	4
4	2	1	3	2	4	7	3
2	3	2	3	3	3	3	3
6	3	2	5	5	4	5	3
1	3	2	3	1	1	4	2
2	3	2	5	6	4	4	1
2	4	2	1	3	2	1	3
6	4	6	7	5	6	7	5
2	1	6	3	4	7	2	4
4	5	1	3	4	1	6	2
3	5	2	3	1	2	4	1
2	1	4	3	7	3	4	5
5	3	2	7	1	5	1	3
3	1	6	1	7	3	7	5
3	7	6	3	4	2	3	7
5	1	2	5	4	6	5	1
3	1	3	4	2	3	4	6
5	7	5	3	4	3	2	2
2	6	7	5	3	4	5	2
6	2	1	3	4	2	3	3
4	6	7	4	3	7	6	4
4	2	1	4	3	1	2	1
6	7	5	4	3	2	4	3
2	1	3	4	5	6	4	2
3	4	5	4	6	7	4	6
5	4	3	4	2	1	4	2
4	2	3	4	5	3	3	7
3	4	2	3	3	5	5	1
2	4	5	3	4	6	3	4
6	4	3	5	4	2	5	4
4	7	6	5	6	4	7	1
3	1	2	3	2	2	1	7

Addition by Grouping

In addition to the groups making 2, 3, 4, 5, 6, and 7, this lesson contains the groups making 8, as illustrated at the top of the page.

Practise on the columns set opposite, in the following manner:

(1) Go over each line and name the sums of the various groups, reading from left to right and then from right to left. For instance, 1st line:—6, 7, 8, 8, 7, 6, 4, 6. Be regular.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group. For instance, 1st column, right side:—8, 8, 8, 8, 5, 5, 5, 8, etc.

(3) Add the different columns, first without carrying and then with carrying. To illustrate, 1st column, right side:—8, 16, 24, 32, 37, 42, 47, 55, etc.

(4) Consider the block of figures an addition question. Try to add the 320 figures in *three* minutes. Be sure that your answer is correct.

Follow the grouping plan when adding the columns in Drill 86, and other drills which are to follow. Be an expert adder. Practice will win.

Trade Discount

Example:—Goods are listed at $564.35, with discounts of 33⅓% and 3% off. Find the net price.

Solution:—33⅓% expressed in a fraction is 33⅓/100 or ⅓; therefore to get 33⅓% of $564.35, take ⅓ of $564.35, which is $188.12 to nearest cent (5 mills or more will be counted as a full cent; anything under 5 mills will be dropped). 3% should be based on 1%. You get 1% of the amount by moving the decimal two places to the left. 1% of $376.23=$3.7623 and 3% will be 3 times $3.7623 or $11.2869, which is $11.29 to nearest cent. The net price, after deductions, is $364.94.

$564.35
188.12—33⅓%

376.23
11.29—3%

$364.94

DRILL 86

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
72465	43536	54237	26347	43565
16423	44352	34641	42531	42323
45236	32435	23734	24324	34314
43552	55322	44153	64233	52433
34235	43464	23463	52653	23524
54633	42324	62223	34235	44362
23424	35234	53143	23643	34513
65464	53623	25724	43134	23264
73153	24255	72437	23524	72346
13735	53412	15341	54363	15521
45624	32523	64522	35263	53434
43264	45344	23354	33625	25253
34545	52423	35347	43342	63423
33243	36454	23521	22536	23265
65324	63537	63235	63234	45241
23554	24251	24653	24543	32647
73423	43642	42372	52614	53461
13365	42236	46416	36272	25326
45164	53427	25623	23542	52743
43723	25361	53245	64346	36145

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Group two figures when you add. Are your answers correct?

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 33⅓% and 3%.

(6) $	(7) $	(8) $	(9) $	(10) $
$	$	$	$	$

Find the value of:

(11) $24\frac{3}{5}\times32\frac{4}{6}=$.....	(17) $28\frac{4}{5}\times27\frac{4}{7}=$.....	(23) $60\frac{4}{6}\times24\frac{11}{12}=$.....
(12) $35\frac{1}{3}\times32\frac{4}{7}=$.....	(18) $32\frac{2}{3}\times15\frac{5}{8}=$.....	(24) $66\frac{2}{3}\times12\frac{7}{11}=$.....
(13) $42\frac{3}{4}\times24\frac{4}{7}=$.....	(19) $48\frac{4}{5}\times36\frac{2}{3}=$.....	(25) $72\frac{1}{8}\times35\frac{4}{6}=$.....
(14) $36\frac{1}{2}\times16\frac{4}{5}=$.....	(20) $50\frac{4}{5}\times45\frac{1}{3}=$.....	(26) $84\frac{1}{4}\times18\frac{7}{8}=$.....
(15) $44\frac{2}{3}\times21\frac{5}{11}=$.....	(21) $52\frac{1}{2}\times21\frac{3}{4}=$.....	(27) $96\frac{2}{3}\times24\frac{7}{9}=$.....
(16) $48\frac{3}{4}\times28\frac{4}{16}=$.....	(22) $55\frac{4}{5}\times18\frac{7}{11}=$.....	(28) $95\frac{4}{5}\times27\frac{7}{19}=$.....

Accuracy first, then speed

9	(1 2 3 4 8 7 6 5 (8 7 6 5 1 2 3 4						
1	3	4	2	4	1	1	7
6	5	5	2	5	7	8	2
5	3	2	2	3	6	6	3
1	5	7	2	3	2	3	4
1	3	1	1	2	1	2	5
5	4	5	2	7	3	4	4
3	2	3	1	1	2	1	1
4	7	5	7	2	7	6	1
1	1	3	1	2	2	2	2
2	5	4	8	4	5	4	2
4	3	2	2	3	1	1	7
5	6	7	7	5	3	2	1
2	2	3	1	1	1	2	4
2	7	5	7	4	8	6	2
4	5	1	2	1	3	1	3
4	2	6	3	8	7	1	1
5	2	8	4	5	1	2	4
4	1	1	4	2	6	1	4
1	5	7	2	2	1	2	5
2	1	2	7	3	2	1	3
6	1	6	4	2	1	6	2
3	2	3	5	4	3	3	1
6	7	6	4	5	6	4	4
3	2	3	2	3	3	2	4
8	5	4	3	2	2	8	1
1	2	4	3	3	4	1	7
3	2	3	8	5	6	7	4
3	7	6	1	3	2	2	2
5	3	3	4	2	3	5	8
4	6	3	4	7	6	4	1
7	3	4	3	7	8	2	5
2	3	5	6	2	1	7	4
6	2	2	4	8	5	4	1
3	7	7	5	1	4	5	1
8	3	4	2	3	6	4	4
1	6	5	7	6	3	5	2
2	7	8	3	2	5	7	3
7	2	1	3	2	3	2	6
4	3	2	3	7	4	2	5
5	2	2	6	2	3	7	4

Addition by Grouping

This lesson contains the groups making 9, as illustrated at the top of the page, in addition to the groups of two figures making 2, 3, 4, 5, 6, 7, and 8.

Practise on the columns of figures set opposite, in the following manner:

(1) Name the sum of the various groups, reading from left to right and then from right to left, on the same line. Start on the top line and then run over the other lines in a similar way. For instance, top line, left side:—7, 8, 9, 4, 9, 8, 9, 9. Then start at right side of same line; as 9, 9, 8, 9, 4, 9, 8, 7. Let the eye take in the various groups at a glance.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group.

(3) Add the different columns, first without carrying and then with carrying. For instance, 1st column, right side:—9, 18, 24, 26, 35, 44, 50, 58, 66, etc.

(4) Consider the block of figures an addition question. Try to add the question in *three* minutes —320 figures.

Short Methods in Division

To divide one number by another, leaving out the products:

Subtract the right-hand figure of each product as it is formed. When it is larger than the one above, borrow as in subtraction, and add one more to the next product than you would otherwise have done.

Divide 42343014 by 973.

Ordinary method:

```
973)42343014(43518
    3892
    ----
     3423
     2919
     ----
      5040
      4865
      ----
       1751
        973
       ----
       7784
       7784
       ----
       0000
```

products:

```
42343014 | 973
---------|-----
 3423    | 43518
 ----    |
  5040
  ----
  1751
  ----
  7784
  ----
  0000
```

The first quotient figure is 4, by which we multiply. 4 times 3 are 12, which, subtracted from 14 (the next number greater ending with 4), leaves 2. Write 2 in the remainder and carry 1. 4 times 7 are 28, and 1 carried makes 29, which, subtracted from 33 (the next number greater ending with 3), leaves 4. Write 4 in the remainder and carry 3. 4 times 9 are 36 and 3 carried makes 39, which, subtracted from 42 (the next number greater ending with 2), leaves 3. 4 subtracted from 4 leaves 0. Bring down 3 the next figure in the dividend. So proceed until the division is completed.

DRILL 87

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
12346	73724	43571	52362	43253
87653	26175	24428	47437	56726
25824	32346	45132	32413	23534
64162	65322	32612	35512	42431
31345	32464	43145	52623	23245
21124	35535	52312	47345	53134
37647	12323	34453	42324	22424
52342	87654	65426	47155	65133
43223	24632	71246	32432	32745
56745	53367	28533	12467	46243
45624	74472	24124	52473	64324
33275	25417	54135	43526	25134
41327	42324	31527	34235	51255
58652	35125	22462	35742	36434
34746	52342	35278	65353	23243
62153	47657	44721	32444	14154
43247	32413	24374	24265	22435
55352	36253	35615	75723	63342
21343	24345	23537	43545	23284
78656	52544	46462	52453	76715

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Be sure to add by grouping two figures. Are your answers correct?

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 33⅓ and 3%.

(6)$	(7)$	(8)$	(9)$	(10)$
$	$	$	$	$

Show solutions for following questions in Division, leaving out the products as illustrated under "Short Methods in Division" in this lesson. Attach a sheet of paper, showing the solutions neatly arranged. Show answers only opposite the questions below.

(11) 1728 ÷ 48 = ...
(12) 2025 ÷ 135 = ...
(13) 2268 ÷ 44 = ...
(14) 87524 ÷ 31 = ...
(15) 52467 ÷ 19 = ...
(16) 47625 ÷ 367 = ...
(17) 250000 ÷ 793 = ...
(18) 115680 ÷ 155 = ...
(19) 666666 ÷ 2154 = ...
(20) 934620 ÷ 999 = ...

Aim to get 100%

10	(1 2 3 4 5 9 8 7 6
	(9 8 7 6 5 1 2 3 4

3	4	5	4	3	4	1	4
3	5	5	6	3	6	6	2
2	8	3	1	2	2	3	5
4	2	7	3	6	4	6	5
2	3	1	8	1	1	3	4
4	6	3	2	7	5	7	4
1	4	2	9	7	3	7	2
6	5	4	1	1	3	2	1
3	1	1	2	2	3	1	6
4	4	8	8	3	5	8	3
3	1	4	4	2	2	2	4
5	3	4	4	8	5	3	2
2	2	4	2	5	3	1	1
5	4	4	3	5	7	2	2
5	1	2	5	2	1	4	2
5	9	3	1	7	9	6	1
2	4	5	8	1	7	2	4
6	4	5	2	6	3	4	4
5	2	1	2	8	1	5	5
3	5	7	3	2	6	5	5
3	7	1	4	2	3	1	4
4	2	7	4	8	5	7	6
5	5	2	5	3	1	2	2
2	1	4	5	7	6	8	8
4	5	2	1	4	2	1	4
3	5	2	3	4	7	5	5
3	4	5	3	2	4	1	7
3	5	5	6	3	6	6	1
2	8	3	1	2	2	3	2
4	2	7	3	6	4	6	2
2	3	1	8	1	1	3	4
4	6	3	2	7	5	7	4
1	4	2	9	7	3	7	8
6	5	4	1	1	3	2	1
3	1	1	2	2	3	1	1
4	4	8	8	3	5	8	7
3	1	4	4	2	2	2	4
5	3	4	4	8	5	3	2
2	2	4	2	5	3	1	5
5	4	4	3	5	7	2	1

Addition by Grouping

In addition to the groups making 2, 3, 4, 5, 6, 7, 8, and 9, this lesson contains the groups making 10, as illustrated at the top of the page.

Review instructions for Lesson 81, and then practise on the columns set opposite, in the following manner:

(1) Go over each line and name the sums of the various groups, reading from left to right, and then from right to left. For instance, 1st line:—6, 9, 10, 10, 6, 10, 7, 6. Now read back to left side.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group. For instance, 1st column, right side:—6, 6, 8, 9, 8, 4, 8, 9, 10, 10, 10, 8, etc.

(3) Add the different columns, first without carrying and then with carrying. To illustrate plan of adding, 1st column, right side:—6, 12, 20, 29, 37, 41, 49, 58, 68, 78, 88, 96, etc.

(4) Consider the block of figures an addition question. Try to add the 320 figures in *three* minutes. Be sure that your answer is correct. What is the test?

Short Methods in Division

To divide when there are ciphers on the right of the divisor:

1. Cut off from the right of the dividend as many figures as there are ciphers in the divisor, also cut off the ciphers from the right of the divisor.

2. Find how many times the remaining portion of the divisor is contained in the remaining portion of the dividend.

3. The figures cut off will be the remainder unless there is a difference from dividing, in which case annex the figures cut off to that difference for the true remainder.

Problem: Find the quotient of 39862÷300.

300)398—62

132 $^{262}/_{300}$

Solution:—Cut off the figures as directed. Then, 39÷3=132 with a remainder, 2. To the 2, annex the figures of the dividend that were cut off, making 262, under which draw a line and write the divisor beneath. Answer, 132 $^{262}/_{300}$.

DRILL 88

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
18543	43927	34265	42794	23548
92562	67183	56745	68316	87562
56236	43273	35252	23524	64476
44724	55624	24347	64265	31324
93236	25737	64273	34672	53243
17443	74262	36615	52314	47754
13253	35479	45237	32547	52342
84141	75531	24753	67533	46256
28434	12325	25326	22445	83473
71652	14674	64223	85343	23323
62548	92353	74532	23125	52835
43562	16423	32476	64164	46241
35637	23592	42352	32635	23273
42442	14417	67747	47142	44627
52572	63472	34324	63525	52423
47435	42438	62656	27464	47674
42943	52453	27542	83523	52367
65167	46345	63566	27477	32423
54379	26357	63212	42439	42538
56231	74643	47898	35671	64472

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Be sure to group two figures when you add.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 33⅓% and 3%.

(6) $	(7) $	(8) $	(9) $	(10) $
$	$	$	$	$

Write the answers to the following, at sight:

(11) 1164 ÷ 100 = ...
(12) 2684 ÷ 30 = ...
(13) 9040 ÷ 60 = ...
(14) 8325 ÷ 100 = ...
(15) 4165 ÷ 500 = ...
(16) 8264 ÷ 600 = ...
(17) 94275 ÷ 700 = ...
(18) 73024 ÷ 1100 = ...
(19) 50642 ÷ 120 = ...
(20) 62094 ÷ 400 = ...
(21) 12468 ÷ 500 = ...
(22) 62097 ÷ 900 = ...

Accuracy first, then speed

	11	(2 3 4 5 9 8 7 6					
		(9 8 7 6 2 3 4 5					
3	2	5	1	2	5	1	4
8	4	6	8	9	2	7	1
2	2	5	2	4	4	4	7
4	9	1	8	6	7	5	4
1	7	1	2	4	1	3	2
8	2	6	9	7	6	8	3
4	2	3	5	1	2	1	9
7	1	4	2	6	8	9	2
4	2	8	2	1	3	8	4
4	3	1	4	7	8	3	5
7	1	8	2	1	2	8	6
4	9	3	7	4	3	3	5
1	7	4	5	2	1	2	2
6	3	7	6	3	1	2	8
3	1	2	2	4	1	5	7
6	4	2	9	7	6	2	2
5	2	6	9	4	3	4	1
5	8	3	1	4	3	7	5
2	1	3	2	4	8	1	4
7	9	3	1	3	3	7	4
2	1	2	8	1	2	3	3
4	6	7	3	4	6	7	4
3	2	5	1	2	5	1	7
8	4	6	8	9	2	7	1
2	2	5	2	4	4	4	7
4	9	1	8	6	7	5	4
1	7	1	2	4	1	3	8
8	2	6	9	7	6	8	1
4	2	3	5	1	2	1	9
7	1	4	2	6	8	9	2
4	2	8	2	1	2	8	4
4	3	1	4	7	8	3	5
7	1	8	2	4	8	1	7
4	9	3	7	4	3	7	2
1	7	4	5	2	1	2	1
6	3	7	6	3	1	2	3
3	1	2	2	4	1	5	8
6	4	2	9	7	6	2	3
5	2	6	9	4	2	4	9
5	8	3	1	4	3	7	2

Addition by Grouping

This lesson contains the groups making 11, as illustrated at the top of the page, in addition to the other groups that you have had.

Practise on the columns of figures set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right and then from right to left, on the same line. Start on the top line and then run over the other lines in a similar way. For instance:—11, 6, 11, 9, 11, 7, 8, 5. Then read back from the right side; as 5, 8, 7, 11, 9, 11, 6, 11.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group.

(3) Add the different columns, first without carrying and then with carrying. For instance, 1st column, right side:—11, 22, 26, 35, 44, 55, 64, 75, 83, 90, 98, etc.

(4) Consider the block of figures an addition question. Try adding the question in *three* minutes—320 figures.

Trade Discount

Example:—Goods are listed at $496.48 with discounts of 16⅔% and 2% off. Find the net price.

Solution:—16⅔% should be based on 100%, and expressed as a fraction, it would be written 16⅔/100 or ⅙. 16⅔% of $496.48 equals ⅙ of $496.48 or $82.75 to nearest cent. 2% may be based on 10% or 1%. You can see that 2% is ⅕ of 10% or twice 1%. 10% of $413.73 is $41.373 (moving the decimal one place to the left), therefore 2% will be ⅕ of $41.373 or $8.27, to nearest cent. The net price, after deductions, is $405.46.

$496.48
82.75—16⅔%

413.73
8.27—2%

$405.46

DRILL 89

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(5)	(5)
93752	43872	52387	52324	72462
28469	75243	69734	47867	35749
34632	45243	23462	25326	32472
57475	36673	63514	44784	76345
43247	54282	37245	32427	43273
77644	56732	33644	75131	27628
39387	47357	27274	23458	54327
22722	62642	61637	86363	52173
93564	73234	54232	54525	47523
14553	48412	56789	23645	23647
72965	65637	24324	82425	24529
43246	42473	27623	37766	62472
53124	24247	52354	84377	35143
41167	86532	44757	24624	82672
38473	93245	23245	35183	53275
72747	17676	97634	42727	48625
43224	23546	27426	23284	43546
77657	97523	63574	97632	24522
32598	26787	43273	45978	32593
89623	44334	78948	76243	87628

Add the reverse way and prove that your answers are correct. Be sure to add by grouping two figures. Make certain that the addition questions are correct before using the figures for list prices.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 16⅔% and 2%.

(6) $	(7) $	(8) $	(9) $	(10) $
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

Write the answers to the following, at sight:

(11) 46342 ÷ 200 = ...	(17) 487643 ÷ 300 = ...
(12) 37847 ÷ 30 = ...	(18) 592479 ÷ 110 = ...
(13) 67249 ÷ 60 = ...	(19) 647877 ÷ 120 = ...
(14) 82743 ÷ 300 = ...	(20) 462562 ÷ 800 = ...
(15) 47284 ÷ 500 = ...	(21) 874967 ÷ 900 = ...
(16) 85749 ÷ 70 = ...	(22) 478799 ÷ 110 = ...

Aim to get 100%

LESSON 90

	12	(3 4 5 6 9 8 7 (9 8 7 6 3 4 5					
5	1	9	7	1	2	1	4
7	2	3	5	6	8	3	7
2	4	2	8	2	4	6	8
9	3	1	4	2	3	6	4
1	2	3	4	5	2	1	1
6	9	2	1	7	4	1	9
2	5	2	3	7	2	1	6
4	5	1	4	5	3	5	5
5	3	9	1	4	2	7	8
7	8	2	4	4	6	1	3
3	7	2	3	8	5	6	7
4	5	1	2	4	2	6	5
2	1	4	2	1	2	1	4
9	3	8	7	6	2	4	4
3	4	1	7	2	1	2	1
9	2	6	3	8	4	2	6
2	6	5	4	2	1	2	7
2	6	5	4	7	6	9	2
1	4	8	1	6	5	2	9
7	2	4	8	6	5	1	3
8	2	1	8	2	1	2	7
4	2	7	4	9	8	7	4
4	7	1	4	1	6	4	6
3	5	7	2	6	6	6	4
2	4	3	2	1	2	4	1
2	4	9	3	7	5	6	7
5	1	9	7	1	2	1	4
7	2	3	5	6	8	3	4
2	4	2	8	2	4	6	8
9	3	1	4	2	3	6	2
1	2	3	4	5	2	1	1
6	9	2	1	7	4	1	6
2	5	2	3	7	2	1	7
4	5	1	4	5	3	5	5
5	3	9	1	4	2	7	8
7	8	2	4	4	6	1	4
3	7	2	3	8	5	6	1
4	5	1	2	4	2	6	2
2	5	4	2	1	2	1	7
9	3	8	7	6	2	4	3

Addition by Grouping

In addition to the groups making 2 to 11, inclusive, this lesson contains the groups making 12, as illustrated at the top of the page.

Practise on the columns set opposite, in the following manner:

(1) Go over each line and name the sums of the various groups, reading from left to right and then from right to left. For instance, 1st line:—12, 3, 12, 12, 7, 10, 4, 11. Read back to left side.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group. For instance, 1st column, right side:—10, 3, 12, 12, 7, 10, 8, 8, 10, 11, 12, etc.

(3) Add the different columns, first without carrying and then with carrying. To illustrate method of adding 1st column, right side:—10, 13, 25, 37, 44, 54, 62, 70, etc.

(4) Consider the block of figures an addition question. Try to add the 320 figures in *three* minutes.

Short Methods in Division.

To divide by 10, 100, 1000, 10000, etc.: Cut off from the right of the dividend as many figures as there are ciphers in the divisor. The remaining figures will express the quotient, and the figures cut off will express the remainder.

Example:—Divide 37589 by 100.

Explanation:—Cut off the two right-hand figures (89) of the dividend, which is equivalent to moving the remaining figures of the dividend two places to the right, thus decreasing the dividend one hundredfold, and producing the required quotient, 375. The figures cut off (89) being the undivided part of the true dividend, must be the true remainder.

If the divisor were 800, cut off two figures from the right of the dividend and the two ciphers in the divisor. Divide by 8 and the result will be $46\,^{789}/_{800}$.

Solution:

1/00) 375/89

---

375 quo. 89 rem.

$375\,^{89}/_{100}$ Ans.

DRILL 90

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(3)	(8)	(4)	(5)
36859	74283	54274	65748	74685
94463	53949	68558	64583	53647
45464	24754	24725	73436	32427
46783	63356	56375	23224	35762
72362	25415	42532	59393	14535
54347	77237	73714	42127	32134
92423	34865	62419	24374	25342
33763	27242	65281	68738	67282
45238	13274	37425	25425	34674
75174	28958	65837	85173	52658
53423	75231	24546	74237	23245
22718	37741	67536	58875	61217
72952	27527	74252	43623	12748
48376	94683	53742	27418	18374
74327	53274	64324	73273	25423
52895	78652	67657	47624	67847
42348	32425	52342	53274	28573
72174	45137	62769	79858	62459
34567	27897	74698	47638	27435
98765	64435	58634	85694	85897

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Group two figures when you add. Are your answers correct?

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 16⅔% and 2%.

(6) $	(7) $	(8) $	(9) $	(10) $
$	$	$	$	$

By inspection, find the complete quotients of:

(11) 49657÷100= .....
(12) 39827÷ 60= .....
(13) 49737÷ 70= .....
(14) 98275÷120= .....
(15) 39789÷ 80= .....
(16) 96235÷400= .....
(17) 4367524÷1300= .....
(18) 6472389÷1200= .....
(19) 8237245÷1500= .....
(20) 7372467÷1000= .....
(21) 6328428÷1400= .....
(22) 7213879÷1800= .....

Accuracy first, then speed

13	(4 5 6 9 8 7						
	(9 8 7 4 5 6						
4	1	7	1	9	1	5	6
4	8	6	6	4	5	8	1
1	3	2	1	2	5	1	7
2	5	7	8	9	6	1	4
6	1	2	4	1	6	7	1
7	1	4	9	5	6	2	2
2	5	1	4	6	7	1	5
2	8	9	2	1	5	8	8
8	1	7	2	1	7	6	6
5	4	4	2	8	5	7	7
2	6	4	3	1	4	2	4
9	7	2	3	7	9	2	4
1	4	3	7	5	4	1	9
7	4	2	6	5	9	8	2
4	1	6	4	7	2	4	3
9	1	7	2	1	3	4	2
1	2	4	4	2	4	1	4
6	7	4	9	2	3	5	1
6	2	4	5	6	4	4	5
7	8	1	7	7	2	9	2
1	2	1	5	4	5	1	7
6	3	7	5	9	5	4	6
2	8	4	5	2	1	2	2
9	4	1	8	7	6	3	4
2	1	4	2	1	4	5	7
8	6	9	2	7	5	5	1
4	1	7	1	4	1	7	4
4	8	2	6	4	5	6	4
1	3	2	1	2	5	1	2
2	5	7	8	9	6	1	2
6	1	2	4	1	6	7	8
7	1	4	9	5	6	2	2
2	5	1	4	6	7	1	7
2	8	9	2	1	5	8	6
8	1	7	2	1	7	6	9
5	4	4	2	8	5	7	1
2	6	4	3	1	4	2	2
9	7	2	3	7	9	2	9
1	4	3	7	5	4	1	7
7	4	2	6	5	9	8	6

Addition by Grouping

This lesson contains the groups making 13, as illustrated at the top of the page, in addition to the other groups that you have practised.

Practise on the columns of figures set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right and then from right to left, on the same line. Start on the top line and then run over the other lines in a similar way. For instance:—8, 9, 13, 7, 13, 6, 13, 7. Then read back from the right side.

(2) Run up and down the columns, naming the sums of the various pairs of figures. Do not carry from group to group.

(3) Add the different columns, first without carrying and then with carrying. For instance, 1st column, right side:—13, 24, 34, 47, 57, 61, 69, etc.

(4) Consider the block of figures an addition question. Try adding the question in *three* minutes—320 figures. Be sure to get the correct answer. What is the test?

Trade Discount

Example:—The wholesale list price of goods is $462.45, with discounts of 12½% and 5% off. What is the net price?

Solution:—12½% expressed in a fraction is $^{12\frac{1}{2}}/_{100}$ or ⅛; therefore to get 12½% of $462.45, take ⅛ of $462.45, which is $57.81 to nearest cent. 5% is ½ of 10% of $404.64 or ½ of $40.464, which is $20.23 to nearest cent. The net price then would be $384.41.

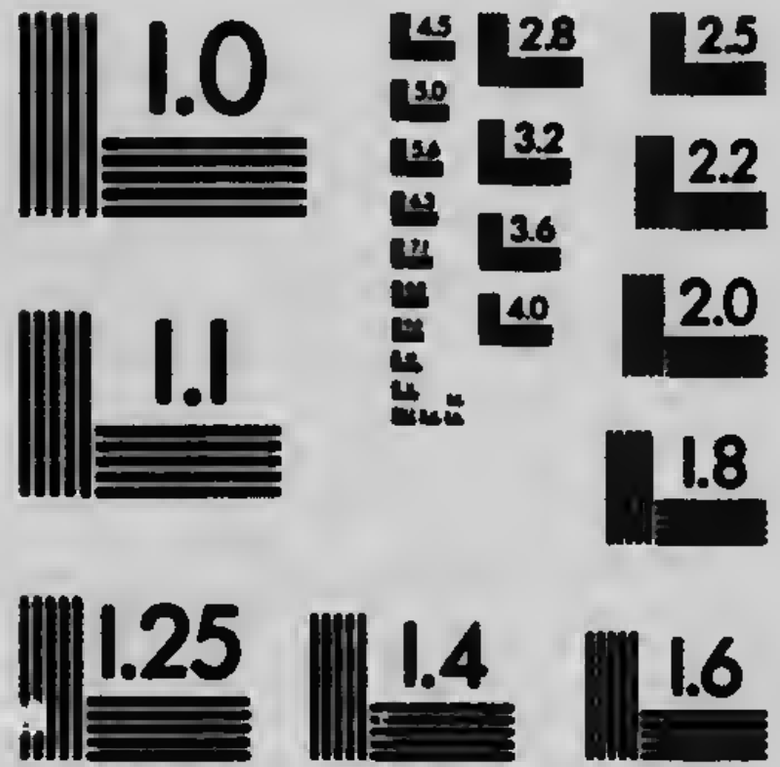
$462.45
57.81—12½%

404.64
20.23—5%

$384.41

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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(716) 482 - 0300 - Phone
(716) 288 - 5989 - Fax

DRILL 91

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
43592	74396	43252	73897	54638
76547	67644	97648	64246	67775
35276	23238	74386	35436	43637
64637	41275	39757	27224	27243
32452	52348	32853	75243	27483
42186	42172	46272	38697	93747
43578	79843	83549	25438	25376
96465	64577	46784	87975	64627
43127	83279	37283	42352	53728
22183	24544	66457	92367	43694
59837	38326	29364	84923	36293
44561	72764	84259	53464	74747
84798	53411	32483	25247	84658
22345	85251	76257	87696	57765
32835	29467	25329	52743	43634
47264	73776	64784	78589	27216
43435	34646	65478	47512	83259
98632	52564	67252	32113	27864
78473	24278	74869	87974	47896
35968	31535	69574	56469	96547

Prove that your answers to the addition questions are correct by adding the reverse way. Group two figures when you add. Are your answers correct?

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 12½% and 5%.

(6)	(7)	(8)	(9)	(10)
\$	\$	\$	\$	\$
\$	\$	\$	\$	\$

By inspection, find the complete quotient of each of the following:

(11) 3654268 ÷ 100 = ...
(12) 4234652 ÷ 30 = ...
(13) 1267467 ÷ 40 = ...
(14) 2345682 ÷ 60 = ...
(15) 1278267 ÷ 700 = ...
(16) 3426425 ÷ 800 = ...
(17) 2432671 ÷ 1000 = ...
(18) 1674624 ÷ 900 = ...
(19) 1324927 ÷ 1200 = ...
(20) 3267243 ÷ 1300 = ...
(21) 1245682 ÷ 800 = ...
(22) 6724427 ÷ 1100 = ...

Aim to get 100%

	14	(5 6 7 9 8					
		(9 8 7 5 6					
5	2	4	2	5	1	7	6
9	1	3	7	9	6	7	8
2	6	7	1	2	6	4	7
2	8	7	3	2	8	4	1
3	2	1	9	1	7	2	8
1	5	4	5	2	7	2	2
5	9	2	1	7	2	1	6
5	5	2	4	3	4	5	7
3	2	1	2	5	6	7	8
4	5	7	9	5	4	7	6
1	2	4	1	6	2	1	7
6	2	4	7	8	9	4	7
4	6	1	2	3	4	6	4
8	8	7	9	5	2	1	4
1	2	7	2	4	7	2	9
3	7	7	1	8	7	6	5
8	1	8	9	1	3	5	2
2	2	1	5	2	4	6	1
7	3	4	8	1	9	2	4
1	7	4	2	7	5	2	3
7	2	4	6	7	2	4	7
4	9	5	1	7	3	5	7
4	5	6	4	5	7	5	2
4	1	2	7	3	7	1	9
8	7	2	1	5	2	4	1
6	7	4	6	3	9	2	6
5	2	4	2	3	1	7	4
9	1	3	7	3	6	7	8
2	6	7	1	2	6	4	2
2	8	7	3	2	8	4	2
3	2	1	9	1	7	2	4
1	5	4	5	2	7	2	4
5	9	2	1	7	2	1	9
5	5	2	4	3	4	5	5
3	2	1	2	5	8	7	4
4	5	7	9	5	4	7	8
1	2	4	1	6	2	1	2
6	2	4	8	8	9	4	9
4	6	1	2	3	4	6	7
8	8	7	9	5	2	1	7

Addition by Grouping

In addition to the groups making 2 to 13, inclusive, this lesson contains the groups making 14, as illustrated at the top of the page.

Practise on the columns set opposite, in the following manner:

(1) Go over each line and name the sums of the various groups, reading from left to right and then from right to left. For instance, 1st line:—14, 3, 7, 9, 14, 7, 14, 14. Read back to left side. By this method, you learn the groups and accustom the eye to the various combinations. Take in each group at a glance.

(2) Run up and down the columns, naming the sums of the various pairs of figures. For instance, 1st column, right side:—14, 11, 12, 14, 8, 4, 12, 7, 11, 14, etc.

(3) Add the different columns, first without carrying and then with carrying. Method of adding 1st column, right side:—14, 25, 37, 51, 59, 63, 75, 82, 93, 107, etc.

(4) Consider the block of figures an addition question. Try to add the 320 figures in *three* minutes.

Short Methods in Division

To divide when all the figures of the divisor, except the first on the left, can be changed to ciphers:

Example:—Divide 35273 by 15.

Explanation:—The divisor, 15, is changed to 30 by multiplying it by 2; the dividend being also multiplied by 2, the quotient is not altered. Cutting off the cipher and dividing by 3, there is 1 remainder, which, prefixed to the 6 cut off, makes 16. 16 divided by 2 gives the true remainder.

Solution:

15)35273
2)

3/0)7054/6

2351—8 rem.

Therefore: 15)35273(2351⅘

DRILL 92

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
53743	73276	48379	54835	96782
97765	74538	66475	67649	54346
42382	45247	46342	42686	49767
68468	39623	87788	37454	65743
32648	24326	74315	34837	74269
41326	52357	77229	97497	53531
34245	43528	43843	43574	42359
26589	24676	24677	62236	86485
32435	32487	98746	27439	43774
78797	45667	36264	87895	66376
43274	34234	74135	42429	84249
48972	21276	76227	35673	53524
54631	42483	34835	46494	67294
92771	65767	27649	95852	43857
27359	27438	43629	35438	83589
87425	93976	27452	25672	27625
43877	24325	34347	74897	43768
27223	56786	72543	79257	64722
56798	78965	85769	54768	97496
98765	76589	69785	99786	57858

Prove that your answers to the addition questions are correct by adding the reverse way—top to bottom. Group two figures when you add.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 12½% and 5%.

(6)	(7)	(8)	(9)	(10)
$	$	$	$	$
$	$	$	$	$

Show solutions on sheet of paper to be attached to this one, for following questions in division, using short method illustrated in this lesson. Write answers only, opposite the questions on this sheet.

(11) 47254 ÷ 15 = ...
(12) 29685 ÷ 25 = ...
(13) 78169 ÷ 35 = ...
(14) 47129 ÷ 55 = ...
(15) 27967 ÷ 45 = ...
(16) 46834 ÷ 75 = ...
(17) 279461 ÷ 75 = ...
(18) 471649 ÷ 125 = ...
(19) 479647 ÷ 225 = ...
(20) 714628 ÷ 150 = ...
(21) 217964 ÷ 250 = ...
(22) 364728 ÷ 450 = ...

Accuracy first, then speed

15 (6 7 9 8
(9 8 6 7

2	6	2	7	1	2	6	4
6	9	4	8	4	5	9	7
4	2	2	7	5	9	4	8
6	1	7	1	4	5	2	4
1	2	7	1	2	5	7	9
6	3	8	4	9	8	8	6
1	2	4	1	8	7	1	1
7	2	4	5	6	2	3	2
1	8	2	1	2	8	7	4
6	4	9	7	4.	7	8	8
2	4	8	2	6	1	2	6
4	5	7	4	5	8	2	3
7	2	8	1	2	7	4	2
8	5	2	6	8	1	5	9
2	5	6	2	3	8	1	8
2	5	9	1	4	5	7	7
6	2	1	4	2	1	4	6
4	7	9	7	5	6	8	5
4	6	5	2	8	6	7	1
8	9	4	9	4	1	3	8
2	5	4	8	8	2	1	4
8	5	4	7	5	9	1	4
4	2	5	1	2	3	8	7
5	9	7	6	2	7	7	8
7	2	2	7	2	3	4	1
4	6	8	4	1	8	1	9
2	6	3	7	1	2	6	9
6	9	4	8	4	5	1	6
4	2	2	7	5	9	4	2
6	1	7	1	4	6	2	4
1	2	"	1	2	5	7	8
6	3		4	9	8	8	5
1	2	4	1	8	7	1	9
7	2	4	5	6	2	3	1
1	8	2	1	2	8	7	9
6	4	9	7	4	7	8	6
2	4	8	2	6	1	2	8
4	5	6	4	5	8	2	4
7	2	8	1	2	7	4	6
8	5	2	6	8	1	5	9

Addition by Grouping

This lesson contains the groups making 15, as illustrated at the top of the page, in addition to the other groups that you have learned.

Practise on the columns of figures set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right and then from right to left, on the same line. Start on the top line and then run over the other lines in a similar way. For instance:—8, 15, 6, 15, 5, 7, 15, 11. Next, read from right to left.

(2) Run up and down the columns, naming the sums of the various pairs of figures. For instance, 1st column, right side:—15, 12, 15, 10, 13, 6, 15, 10, 15, etc.

(3) Add the different columns, first without carrying and then with carrying. For instance, 1st column, right side:—15, 27, 42, 52, 65, 71, 86, 96, 111, etc.

(4) Consider the block of figures an addition question. Try adding the question in *three* minutes—320 figures. Be sure to get the correct answer. What is the proof?

Trade Discount

Example:—The wholesale list price of goods is $264.45, with discounts of 15% and 5% off. What is the net price?

Solution:—15% should be based on 1%. 1% of $264.45 is $2.6445 (moving the decimal two places to the left), then 15% will be 15 times $2.6445 or $39.6675, which will be taken as $39.67 in business. 5% is ½ of 10% of $224.78 or ½ of $22.478, which is $11.24 to the nearest cent. The net price then will be $213.54.

$264.45
39.67—15%

224.78
11.24—5%

$213.54

DRILL 93

Date *Name*
Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
64679	47358	57282	63684	43279
97386	66742	43976	47256	27636
35674	95357	94245	73467	43423
44326	64628	53725	72898	72157
94372	53653	72138	42474	82754
62731	42476	36247	83239	76458
57548	92354	53784	54785	37576
23577	64224	42379	26325	64634
65475	87547	36543	47242	78413
32335	28363	37526	68536	45222
43546	85495	23275	45723	47857
96724	35668	97884	95814	63768
32434	61357	27451	53287	43249
72755	72447	63122	73723	57364
94276	27589	76436	47854	32743
63527	93466	37274	33259	76582
74266	43547	52742	73426	65879
29736	23563	86897	21719	46476
67976	94867	89767	74768	94768
98679	67797	76798	89797	68797

Prove that your answers to the addition questions are correct by adding the reverse way. Group two figures when you add. Are your answers correct?

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price after allowing discounts of 15% and 5%.

(6)	(7)	(8)	(9)	(10)
$	$	$	$	$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
$	$	$	$	$

Show solution on sheet of paper to be attached to this one, for the following questions in division, using short method illustrated in Lesson 92. Write answers only, opposite the questions on this sheet.

(11) 248764 ÷ 25 = ...
(12) 367879 ÷ 35 = ...
(13) 492736 ÷ 45 = ...
(14) 781361 ÷ 75 = ...
(15) 926432 ÷ 15 = ...
(16) 287493 ÷ 45 = ...
(17) 9264873 ÷ 125 = ...
(18) 7647341 ÷ 225 = ...
(19) 5462347 ÷ 150 = ...
(20) 7234264 ÷ 250 = ...
(21) 4234624 ÷ 450 = ...
(22) 5278267 ÷ 350 = ...

Aim to get 100%

LESSON 94

Addition by Grouping

	16	(7 8 9					
		(9 8 7					
8	9	4	9	2	4	7	7
8	5	9	7	9	3		2
2	3	2	7	4	2	8	1
8	1	2	9	7	1	8	9
6	9	7	2	6	2	8	4
4	1	9	4	7	2	4	4
4	1	2	8	4	2	8	8
6	1	2	8	7	4	6	2
5	2	8	1	5	4	8	9
7	4	6	7	9	8	8	7
7	6	9	7	8	4	1	2
4	1	5	9	8	2	6	4
8	7	1	4	7	2	7	8
2	9	6	4	1	8	4	8
5	1	7	4	8	1	4	4
2	1	9	6	2	7	8	4
7	5	4	2	8	7	4	2
9	5	7	6	1	9	5	8
8	3	7	5	7	4	1	9
2	4	1	4	8	2	6	7
5	7	8	5	7	8	9	6
2	1	4	1	4	2	6	4
4	1	7	4	8	9	2	9
5	6	8	4	5	1	2	5
5	4	7	1	8	8	7	9
9	8	2	6	4	8	9	1
1	9	4	1	2	4	7	8
2	5	9	7	9	3	1	4
2	3	2	7	4	2	8	9
8	1	2	9	7	1	8	7
6	9	7	2	6	2	8	6
4	1	9	4	7	2	4	6
4	1	2	8	4	2	8	9
6	1	2	8	7	4	6	7
5	2	8	1	5	4	8	8
7	4	6	7	9	8	8	2
7	6	9	7	8	4	1	4
4	1	5	9	8	2	6	1
8	7	1	4	7	2	7	8
2	9	6	4	1	8	4	2

In addition to the groups making 2 to 15, inclusive, this lesson contains the groups making 16, as illustrated at the top of the page.

Practise on the columns set opposite, in the following manner:

(1) Go over each line and name the sums of the various groups, reading from left to right and then from right to left. For instance, 1st line:—16, 14, 13, 16, 11, 7, 16, 9. Now read back to left side.

(2) Run up and down the columns, naming the sums of the various pairs of figures. For instance, 1st column, right side: 10, 5, 10, 16, 12, 16, 12, 10, 14, etc.

(3) Add the different columns, first without carrying and then with carrying. Method of adding 1st column, right side: 10, 15, 25, 41, 53, 69, 81, 91, 105, etc.

(4) Consider the block of figures an addition question. Try to add the 320 figures in *three* minutes.

Short Methods in Division

To divide by the factors of a divisor:—

Illustration.—Divide 9128 by 126.

$126=3\times7\times6$

3)9128

7)3042+2= 2

6) 434+4×3= 12

72+2×3×7=42

56

Quotient, $72^{56}/_{126}$

Solution.—Since the divisor is equal to $3\times7\times6$, the division of 9128 by 126 may be accomplished by dividing successively by these factors.

Dividing 9128 by 3 (or one forty-second of the true divisor, 126) produces 3042 (or 42 times the true quotient) and a remainder of 2. Since this remainder is left from the true dividend, it must be a part of the true remainder.

Dividing 3042 (one forty-second of the true quotient) by the second factor, 7, produces 434 (which must be one-seventh of 42, or 6 times the true quotient) and a remainder of 4. Since 4 is left from dividing one-third of the true dividend, this remainder must be one-third of the true remainder ($4\times3=12$), second part of the true remainder.

Dividing 434 (one-sixth of the true quotient) by the remaining factor, 6, produces 72 (the true quotient) and a remainder of 2. Since 2 is the remainder from dividing 434 (one-third of one-seventh of the true dividend), this remainder must be one-third of one-seventh of the true remainder ($2\times3\times7=42$), third part of the true remainder.

Add the several parts of the true remainder, obtaining 56 as the total true remainder.

DRILL 94

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
49648	72938	46898	54325	69274
67538	35788	52778	62765	46836
43482	42542	46745	79836	92879
25678	76568	52785	87844	17867
49352	54215	79367	53478	34712
77451	51316	27423	22637	46312
37463	83948	52339	52925	98428
98578	76564	64127	48746	75388
47239	36598	82375	93429	94376
97987	96477	54636	72137	52996
54724	35732	94742	43846	35724
58866	64878	58345	67834	46396
95382	57429	45857	93842	74347
64787	65687	96968	77513	87263
47247	53854	48437	12743	54724
63569	42799	75423	19564	59946
54324	35654	47594	96296	34763
89756	66456	63574	74774	76872
98789	89789	87697	49487	49879
78987	87987	89979	67889	77897

Prove that your answers to the addition questions are correct by adding the reverse way. Be sure to group two figures when you add.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 15% and 5%.

(6) $	(7) $	(8) $	(9) $	(10) $
$	$	$	$	

Divide by the factors of the divisor as illustrated in this lesson, writing answers only on this sheet. Attach a sheet of paper to this one, showing full solutions.

(11) 25394 ÷ 36 = ...
(12) 23741 ÷ 48 = ...
(13) 43165 ÷ 64 = ...
(14) 41765 ÷ 63 = ...
(15) 31279 ÷ 72 = ...
(16) 43827 ÷ 84 = ...
(17) 29373 ÷ 81 = ...
(18) 23725 ÷ 96 = ...

Accuracy first, then speed

	17	(8 9 (9 8		18	(9 (9		
2	7	8	4	8	5	9	2
1	3	9	4	2	5	9	4
8	2	4	1	7	2	1	9
8	3	4	6	8	5	8	9
4	7	1	2	4	7	1	8
4	8	6	8	4	8	6	8
4	1	2	4	7	8	9	6
7	1	2	4	3	1	9	4
9	4	7	8	2	7	1	9
8	8	1	9	1	2	1	1
7	9	4	1	9	1	9	9
1	9	8	2	7	6	9	9
9	4	2	8	4	1	5	4
9	7	8	9	2	6	9	8
3	4	9	1	7	4	2	6
3	2	8	1	8	6	1	3
4	8	1	9	4	7	2	8
4	4	6	9	8	1	4	9
4	7	6	4	7	1	6	4
4	8	5	4	9	2	8	4
9	7	2	6	7	4	2	7
9	4	8	1	7	4	2	8
2	4	1	5	4	8	1	2
2	7			7	2	7	9
2	6			5	7	4	4
2	5			6	8	4	6
2	7		4	8	5	1	8
1	3	1	4	2	5	1	8
8	2	4	1	7	2	1	9
8	3	4	6	8	5	8	9
4	7	1	2	4	7	1	4
4	8	6	8	4	8	6	4
4	1	2	4	7	8	9	2
7	1	2	4	3	1	9	8
9	4	7	8	2	7	1	4
8	8	1	9	1	2	1	6
7	9	4	1	9	1	9	9
1	9	8	2	7	6	9	7
9	4	2	8	4	1	5	8
9	7	8	9	2	6	9	4

Addition by Grouping

This lesson contains the groups making 17 and 18, as illustrated at the top of the page, in addition to the other groups that you have learned.

Practise on the columns of figures set opposite, in the following manner:

(1) Name the sums of the various groups, reading from left to right and then from right to left, on the same line. Start on the top line and then run over the other lines in a similar way. For instance:—3, 10, 17, 8, 10, 10, 18, 6. Next, read from right to left.

(2) Run up and down the columns, naming the sums of the various pairs of figures. For instance, 1st column, right side:—12, 16, 10, 10, 8, 18, 16, 10, 11, 15, 8, 17, etc.

(3) Add the different columns, first without carrying and then with carrying. For instance, 1st column, right side:—12, 28, 38, 48, 56, 74, 90, 100, 111, 126, 134, 151, etc.

(4) Consider the block of figures an addition question. Try adding the question in *three* minutes—320 figures. Is your answer correct?

Trade Discount

Example:—The list price of goods is $234.75, with discounts of 6% and ¼% off. What is the net price?

Solution:—6% should be based on 1%. 1% of $234.75 is $2.3475 (moving the decimal two places to the left), then 6% will be 6 times $2.3475, or $14.0850, which will be taken as $14.09 in business. ¼% should also be based on 1%. 1% of $220.66 is $2.2066, then ¼% will be ¼ of $2.2066 or .55165, or 55 cents to the nearest cent. (Drop anything less than 5 mills.) The net price then will be $220.11.

$234.75
14.09=6%

220.66
.55=¼%

$220.11

DRILL 95

Date *Name*

Time *Seat No.*

Add by grouping two figures:

(1)	(2)	(3)	(4)	(5)
46983	54796	62939	27697	62597
74997	76395	47189	54998	47498
46749	47249	28483	48934	34727
93368	68568	75794	79966	99863
34296	35429	27425	96728	57284
95394	42172	61335	74394	43969
24849	34856	92536	39749	85324
77567	77754	86474	79866	78786
32465	27929	45231	48476	92839
41977	98879	61433	65979	67299
73245	45425	86298	52347	48952
84565	75695	54719	78123	77788
74729	47439	32472	27479	32239
39867	97979	42986	95638	78428
47364	84798	97493	28462	74275
74586	56317	93798	75798	78889
97899	48256	44357	49279	62547
98998	71364	79853	61838	37563
89674	97879	28979	79849	49899
49589	98978	79998	59999	67998

Add the above questions the reverse way. Be sure to group two figures when you add.

Consider each of the answers in questions 1 to 5, inclusive, as a list price in dollars and cents. Find the net price, after allowing discounts of 6% and ¼%.

(6)	(7)	(8)	(9)	(10)
\$	\$	\$	\$	\$
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
\$	\$	\$	\$	\$

Divide by the factors of the divisor, as illustrated in Lesson 94, writing answers only on this sheet. Attach a sheet of paper to this one, showing full solutions.

(11) 426725÷48= .....
(12) 378269÷64= .....
(13) 564274÷72= .....
(14) 647856÷84= .....
(15) 926724÷96= .....
(16) 567267÷125= .....
(17) 378496÷135= .....
(18) 426752÷147= .....
(19) 564375÷168= .....
(20) 987647÷648= .....

Aim to get 100%

LESSON 96

The Two-column Method of Addition

Some accountants are very partial to the two-column method of addition, claiming that it is more rapid and accurate. Others again claim that mistakes are more likely to occur by this plan and are slow to admit that it possesses very great advantages over the single column method as a time saver. Quite often, however, the method can be used with success, and the average student can acquire considerable speed in handling not only two columns, but three columns. Experts who handle three columns as easily as some add one column have acquired this skill through persistent practice.

In adding two columns at once, combine first the tens of the numbers and then the units. Thus, in adding 45 and 34, think of 75 (45+30) and 4, or 79.

To illustrate this method of addition, take the accompanying example. It is worked out in detail.

75	Beginning with 82, proceed as follows:
81	82+70—152; 152+6—158
24	158+20—178; 178+4—182
76	182+80—262; 262+1—263
82	263+70—333; 333+5—338
338	

As in all the previous work, aim at reading the columns regularly. Name results only. Thus, the reading for the columns just added would be as follows: 152, 158, 178, 182, 262, 263, 333, 338.

Sometimes you may readily recognize combinations that make 100, just as you have formerly found combinations of 10. Such combinations are quite common in business and lend facility in reading two columns.

Practise the following, adding by double columns as explained above:

24	52	48	28	45	57	42	13	22	27	41	57
26	48	42	52	39	31	28	56	68	65	38	24

Read the above double columns from left to right and then from right to left; as 46, 50; 98, 100; 82, 90; 72, 80, etc. Drill on the above combinations until you can read them rapidly. Go over and over the drill *ten* times at least and then try naming totals only of the combination; as 50, 100, 90, 80, etc.

Practise reading the following double columns:

42	26	18	19	22	19	24	36	43	28	42	54
63	72	73	62	36	36	32	44	62	42	56	62
54	43	32	48	52	42	24	56	54	53	38	48

22	18	14	22	24	18	24	44	23	42	18	27
36	24	26	36	16	42	36	23	48	39	24	32
46	37	34	46	35	37	22	67	61	27	36	44
54	62	56	34	75	23	46	43	37	56	54	23

DRILL 96

Date *Name*
Time *Test No.*

Add, using the two-column method:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
56	39	46	27	42	34	26	37
48	61	33	64	27	65	34	46
(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
12	21	17	16	18	27	28	22
24	36	24	27	26	33	38	46
36	42	62	37	37	67	47	37
(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
16	23	28	24	21	27	16	26
24	24	32	36	37	34	42	37
32	27	46	27	62	62	27	46
25	32	47	42	35	39	32	52
(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
22	42	35	34	22	24	16	18
26	36	26	29	37	23	29	41
34	43	37	36	41	63	62	38
32	27	42	21	63	24	41	69
43	24	37	47	27	82	73	41
(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
16	32	24	42	22	16	21	24
27	24	26	54	43	29	36	37
32	26	34	26	27	42	42	61
43	37	27	37	62	36	57	23
54	42	52	24	35	42	62	42
26	56	64	73	75	58	37	73
(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)
16	18	24	25	24	18	19	16
24	23	36	42	16	27	56	42
36	27	31	33	35	33	42	33
28	37	26	26	43	42	38	52
42	62	35	42	42	35	62	47
33	34	42	37	26	46	37	63
41	27	37	52	39	39	43	77

LESSON 97

Two-column Addition

42	52	37	42	64	55	26	43	52	48	52	62
33	35	22	53	27	42	27	48	42	26	47	54
73	64	78	47	33	38	52	57	37	72	37	73

Read the above double columns from left to right and then from right to left; as 103, 106 146, 148; 94, 99, 149, 151, etc. Go over and over the drill, naming results of combinations only, until you can name them rapidly and regularly.

In all lines of retail business, the small counter bill is in general use. The principle of two-column addition is quite applicable there and should be used to facilitate speed. For instance, a saleslady has sold the following bill:

$1.62
.37
.59
.17
.45

It should not be necessary to run slowly the different columns, one by one, but with a little practice, two columns can be totalled at once. Using the items above, read as follows:—55, 62, 112, 121, 151, 158, 218, 220, 320. Another plan is to group the tens quickly and then add the units; as 1.00 (40+50)+.90 (30+60)+.30(12+18)—$3.20. Sometimes, you can see combinations of 20 and 25 in the units' column, or even combinations of 50c, 60c, or $1.00 in the cents' column.

Practice the following:

$2.25	$4.18	$3.16	$2.76	$3.39	$4.48
.14	.25	.24	.37	.52	.29
.62	.35	.46	.29	.37	.35
.38	.75	.23	.51	.49	.75

$4.35	$2.35	$1.19	$2.49	$4.12	$3.79
.22	.29	.33	.55	.49	.25
.35	.15	.45	.79	.65	.55
.65	.65	.69	.22	.18	.28

DRILL 97

Date *Name*
Time *Seat No.*

Add:

(1)	(2)	(3)	(4)	(5)	(6)
$1.16	$2.35	$4.49	$3.75	$4.29	$3.89
.37	.49	.35	.42	.33	.16
.45	.54	.65	.18	.85	.55
.25	.85	1.15	.52	1.15	1.25
(7)	(8)	(9)	(10)	(11)	(12)
$1.55	$3.35	$4.45	$4.15	$3.19	$4.15
.32	.25	.32	.75	.28	.33
.57	.50	.19	.15	.45	.52
.15	1.25	.69	1.29	2.15	1.16
(13)	(14)	(15)	(16)	(17)	(18)
$2.65	$4.16	$3.49	$3.25	$3.75	$2.55
.45	.29	.16	.49	.45	.49
.62	.31	.58	.55	.60	.35
.39	1.45	2.16	2.15	1.19	2.25
(19)	(20)	(21)	(22)	(23)	(24)
$1.50	$2.35	$3.35	$4.19	$3.45	$2.75
.35	.29	.55	.16	.15	.55
.19	.40	.16	.39	.35	.17
.60	.25	.49	.59	.18	.35
2.25	1.19	2.25	1.75	2.35	2.25
.49	.16	.50	.49	.50	.25
(25)	(26)	(27)	(28)	(29)	(30)
$1.35	$2.23	$1.79	$3.39	$4.25	$3.31
.39	.15	.24	.16	.37	.59
.25	.45	.39	.35	.25	.35
.49	1.15	.45	.15	.55	.42
.55	.39	1.29	2.19	1.15	2.35
2.45	1.25	1.35	3.30	1.49	1.56

Aim to get 100%

LESSON 98

Practise the following by the two-column method:

16	42	58	72	49	71	26	42	33
24	36	46	28	21	28	42	16	42
72	51	73	35	63	32	37	28	15
23	18	24	62	51	19	29	35	64
42	25	57	47	12	51	16	14	37
36	47	63	34	24	42	35	27	22
24	32	72	52	36	36	47	36	51
72	48	18	48	52	48	28	22	19
64	27	28	51	43	17	16	43	81
73	36	37	32	17	27	42	16	32
25	19	18	24	24	42	17	27	29
34	51	49	56	76	38	53	54	31

18	26	31	28	42	41	22	22	49
22	19	18	42	54	59	43	33	31
24	18	27	37	36	63	62	47	72
36	29	42	52	47	21	48	62	15
42	42	51	48	22	19	37	18	43
17	33	42	25	35	46	41	19	19
35	54	35	37	49	18	26	27	44
43	19	46	29	62	34	37	61	26
26	28	55	51	21	16	24	39	17
42	37	42	47	52	26	19	42	34
21	22	39	62	63	49	17	53	51
18	54	71	28	22	61	29	61	69

22	17	22	16	41	42	35	16	22
33	22	35	34	16	35	42	28	43
47	43	18	17	35	46	31	31	24
28	48	26	28	42	28	17	42	55
52	17	19	61	16	16	18	33	34
13	22	41	24	27	39	21	42	16
14	34	32	19	35	41	39	19	39
27	26	35	72	42	24	41	17	21
37	17	17	35	61	26	22	61	42
41	21	42	41	33	33	36	27	37
29	42	37	27	49	29	45	17	41
16	18	26	73	51	61	16	43	39

DRILL 98

Date *Name*

Time *Seat No.*

Add by the two-column method:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
17	22	25	21	18	25	41	21	17	19
26	33	47	35	22	41	22	33	24	26
34	41	16	42	31	13	31	42	32	31
16	17	31	36	24	17	43	35	16	42
27	22	24	21	16	31	29	16	24	35
42	19	35	42	31	26	32	41	33	41
33	31	16	34	25	43	43	27	42	16
47	33	28	26	16	17	19	13	63	24
24	18	34	31	35	28	13	42	21	16
32	26	22	42	19	42	26	32	42	19
35	42	46	33	24	19	42	19	24	28
45	19	54	16	43	25	53	51	36	35

(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
16	18	14	16	41	17	16	17	27	42
24	21	35	27	17	48	24	23	33	16
17	19	16	31	29	24	32	41	29	28
27	27	42	43	16	32	17	17	41	31
18	16	17	18	32	17	29	42	16	46
24	31	31	26	41	59	16	51	44	21
19	15	18	32	18	16	42	17	26	29
26	45	29	17	28	47	18	61	39	13
31	16	19	29	17	15	81	23	42	45
17	32	42	18	32	35	16	48	61	16
24	15	24	42	41	16	47	16	39	59
26	42	36	57	59	54	53	24	51	41

(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
36	18	25	17	16	27	41	27	16	18
24	22	33	42	48	31	16	31	35	22
16	31	42	33	24	42	34	42	46	33
22	40	37	50	32	56	62	33	19	47
17	26	49	42	16	47	30	47	28	51
42	42	26	39	40	33	47	62	45	28
33	20	44	72	39	22	50	37	15	15
41	35	32	35	16	41	28	28	60	49
16	61	63	20	35	16	36	41	32	55
18	42	47	32	55	28	72	26	46	64
33	60	28	47	42	33	49	52	19	30
54	79	72	53	68	57	51	48	17	29

Note:—Add the reverse way to prove your answers.

Accuracy first, then speed

LESSON 99

The Three-column Method of Addition

126	152	312	371	253	328	482	525	621
621	246	244	128	147	216	317	475	139

Name the totals of the above combinations at sight from left to right and then from right to left; as 747, 398, etc. Drill on the above until you can announce the totals quickly and accurately. Let the eye run over the combinations quickly, and from your previous practice in grouping numbers, you should be able to name results without much hesitancy.

In totalling small retail sales, a person soon becomes quite expert in grouping three figures. You may not be able to do so at first, but a little practice will show you the feasibility of the plan. For instance, a saleslady has these items on her bill:

$1.25
.65
.49
2.15
4.60

She should not add the items slowly, a single column at a time, but use some plan of grouping the amounts. This may be accomplished by grouping the figures in the cents' column first, using the two-column addition, or the three columns may be added at one time. For instance:—She can readily see that the two lower numbers added will give $6.75; $6.75+.49 will give $7.24; and $7.24+$1.90 (.65+$1.25) will give $9.14.

In adding three columns at once, combine first the hundreds, then the tens and units. Very often, the eye will make a quick combination of two or three entire lines at once, particularly where they total around the hundreds or thousands.

To illustrate the method of adding, take the following illustration, worked out in detail:

125	Beginning with 126, proceed as follows:
437	126+300= 426; 426+60= 486; 486+4= 490
262	490+100= 590; 590+40= 630; 630+5= 635
145	635+200= 835; 835+60= 895; 895+2= 897
364	897+400=1297; 1297+30=1327; 1327+7=1334
126	1334+100=1434; 1434+20=1454; 1454+5=1459
1459	

When adding by the three-column method, you are after quick results, hence read results only. Thus the reading for the columns just added would be as follows: 426, 486, 490, 590, 630, 635, 835, 895, 897, 1297, 1327, 1334, 1434, 1454, 1459.

Practise the following:

$2.25	$2.10	$1.16	$2.22	$1.33	$2.75	$1.80
1.16	3.15	3.45	1.46	2.64	1.39	2.75
3.35	2.95	2.85	3.34	1.56	3.41	3.15

DRILL 99

Date *Name*
Time *Seat No.*

Add by three-column method:

(1) $ 1.13 1.32 1.52 1.48	(2) $ 2.25 3.40 2.65 1.45	(3) $ 1.62 3.08 4.25 3.75	(4) $ 2.65 3.15 4.75 2.25	(5) $ 1.35 2.15 3.60 4.35	(6) $ 2.15 1.87 2.13 4.20
(7) $ 2.30 2.55 3.17 4.83	(8) $ 3.15 2.85 1.17 3.23	(9) $ 2.65 1.99 3.21 2.50	(10) $ 3.36 2.84 1.16 5.50	(11) $ 2.33 1.67 4.80 5.55	(12) $ 1.35 2.15 3.49 1.56
(13) $ 3.40 2.65 4.32 5.18	(14) $ 2.15 3.65 1.19 2.71	(15) $ 3.19 2.62 3.49 1.31	(16) $ 2.03 1.37 2.59 1.17	(17) $ 3.59 1.16 2.50 4.75	(18) $ 2.65 1.39 2.15 3.50
(19) $ 1.15 2.19 3.02 4.21 3.16	(20) $ 2.50 1.25 2.59 1.20 4.15	(21) $ 2.14 1.62 3.35 1.15 2.19	(22) $ 3.15 4.25 2.18 3.39 1.15	(23) $ 1.19 2.22 3.30 2.50 3.75	(24) $ 1.16 2.56 2.12 3.18 2.50
(25) $ 1.17 2.53 1.19 2.21 4.60	(26) $ 1.19 2.61 3.50 2.25 1.75	(27) $ 2.35 1.16 2.79 3.12 4.60	(28) $ 2.18 3.72 4.20 1.90 3.20	(29) $ 2.25 1.19 2.35 3.15 4.65	(30) $ 2.20 3.50 1.75 2.25 1.15
(31) $ 3.50 2.19 4.21 3.40 2.75	(32) $ 1.75 2.30 1.18 2.72 3.40	(33) $ 1.15 2.45 1.19 2.71 3.40	(34) $ 1.75 2.15 1.19 2.31 4.65	(35) $ 1.17 2.33 1.19 2.51 4.50	(36) $ 1.19 2.36 4.75 2.81 5.50
(37) $ 2.12 1.18 3.22 1.25 2.75	(38) $ 2.25 3.19 2.21 1.50 3.25	(39) $ 2.75 1.15 3.85 1.40 2.65	(40) $ 2.35 1.25 4.15 2.69 3.31	(41) $ 2.65 3.25 2.16 1.84 4.50	(42) $ 2.45 1.18 3.42 2.60 4.45

Aim to get 100%

LESSON 100

Practise the following by the three-column method:

123	222	323	427	525	621
132	236	336	463	516	632
145	248	342	428	534	627
162	232	321	461	524	621
154	252	337	439	535	639
156	248	363	451	525	641

252	354	254	425	582	427
146	266	316	316	621	321
324	524	261	224	472	538
256	612	533	365	365	222
424	318	419	426	435	567
666	224	221	634	225	137

461	421	372	427	354	116
254	367	489	274	627	234
362	253	131	621	264	462
548	425	567	339	935	338
264	375	133	525	125	465
138	125	827	475	675	135

492	235	425	345	275	115
374	425	375	635	125	478
526	168	262	426	397	232
137	572	378	134	213	573
671	324	521	255	465	672
439	766	129	465	125	118

DRILL 100

Date *Name*
Time *Seat No.*

Add, using the three-column method:

(1)	(2)	(3)	(4)	(5)	(6)	(7)
123	235	176	254	345	423	126
132	426	254	361	263	726	321
156	335	135	254	575	119	427
124	424	264	372	425	315	133
155	376	173	524	133	465	255
165	244	217	166	267	125	135

(8)	(9)	(10)	(11)	(12)	(13)	(14)
225	116	216	117	118	232	275
342	254	346	233	216	163	115
116	312	124	426	314	247	472
133	128	136	234	562	345	318
267	342	157	516	488	125	162
475	148	123	284	122	375	318

(15)	(16)	(17)	(18)	(19)	(20)	(21)
421	135	615	315	116	216	112
124	126	125	427	226	474	318
365	472	432	333	315	385	462
135	325	168	275	465	115	525
426	475	564	125	118	119	165
144	135	126	475	332	431	325

(22)	(23)	(24)	(25)	(26)	(27)	(28)
167	215	117	116	216	215	115
343	465	233	234	474	135	235
266	123	417	123	312	415	416
124	421	153	257	288	285	224
585	255	425	112	121	116	135
125	345	135	788	369	334	225

(29)	(30)	(31)	(32)	(33)	(34)	(35)
132	135	147	226	157	116	215
428	215	233	234	243	254	465
216	162	462	155	225	335	324
334	138	328	235	135	115	236
215	347	235	117	415	234	155
335	223	115	223	235	326	325

Note:—Prove your answers by adding the reverse way.
Accuracy first, then speed

LESSON 101

Cancellation

Cancellation is the process of shortening the operation of division, or the combined operations of multiplication and division, by omitting or striking out equal factors from the dividend and divisor. In case a division is required involving numbers which may readily be written as factors, there is a decided saving of time and effort usually by employing cancellation.

The cancellation method may be used in a wide variety of problems affecting business, such as the figuring of interest, exchange or barter in retail trade, billing of commodities sold by the hundredweight, ton, etc., lumber calculations, grain and seed problems, etc.

Example:—Divide the product of $21\times15\times4$ by the product of $7\times5\times6$.

$$\frac{\overset{3}{21}\times\overset{3}{15}\times\overset{2}{4}}{7\times\underset{2}{5}\times6}=6$$

Explanation:—We first indicate the division by writing the factors of the dividend above, and the factors of the divisor below, a horizontal line. We cancel the factor 7 from the divisor, and also reject 7 from 21 in the dividend, which is accomplished by cancelling 21 and writing the other factor, 3, above; in like manner we cancel 5 from the divisor and reject 5 from 15 in the dividend; we also cancel 3 from the dividend and reject the same factor from 6 in the divisor; then rejecting the factor 2 from both dividend and divisor, our work is complete, since each factor of the divisor has been cancelled. The product of the uncancelled factors, 2 and 3 in the dividend, divided by 1 equals 6, the correct quotient.

From the explanation given, we deduce the following:

(1) Write the dividend, or the factors thereof, above, and the divisor, or its factors, below, a horizontal line.

(2) Cancel all factors common to the dividend and divisor.

(3) Divide the product of the uncancelled factors of the dividend by the product of the uncancelled factors of the divisor, and the result will be the quotient.

The cancellation of a factor is, in effect, a division by the factor; hence, when a factor is cancelled, the factor 1 still remains.

Cancelling a factor from both dividend and divisor does not affect the value of the quotient.

Practise the following:

(a) $\dfrac{8\times9\times12\times24}{2\times14\times8}$ ..... (b) $\dfrac{12\times3\times35\times24\times2}{6\times9\times5\times6}$ .....

Short Method for Figuring Lumber

Multiply the length in feet by the width and thickness in inches, and divide the product by 12, and the result will be the number of board feet of lumber.

In charging, or billing lumber, the number of pieces are entered first, then the thickness and width in inches, then the feet in length. For example, in recording 6 pieces, 4 in. thick by 6 in. wide and 20 ft. long, the form would be thus: 6 pcs. 4 in. $\times$ 6 in. — 20 ft., and would be called off by the salesman, "6 *four-by-sixes* — 20 ft.," *four-by-sixes* being the name by which he selects and sells stock.

Instead of writing "inches" and "feet," lumber billing clerks use (″) for inches, and (′) for feet; thus, 3 in. by 4 in.—17 ft. long, is written, $3''\times4''-17'$.

Question:—Find the number of board feet in 80 scantling, $3''\times4''-17'$.

Solution:—$\dfrac{80\times3\times4\times17}{12}=1360$ feet

DRILL 101

Date *Name*
Time *Seat No.*

Cancel the following:

(1) $\frac{21\times15\times9}{5\times7\times3}$ ..... (2) $\frac{24\times108\times12\times7\times5}{18\times4\times8\times14}$ .....

(3) $\frac{36\times13\times105}{18\times21\times26}$ ..... (4) $\frac{81\times25\times34\times30}{21\times5\times6\times17}$ .....

(5) $\frac{144\times75\times52}{15\times13\times48}$ ..... (6) $\frac{72\times210\times95\times60\times42}{21\times19\times12\times10\times15\times7}$ .....

Use cancellation method to secure results for the following problems:

(7) How many pieces of cloth, each containing 48 yards, at 10 cents a yard, should be received for 6 loads of potatoes, of 60 bushels each, at $1.20 a bushel? Ans. .....

(8) A grocer exchanged 15 boxes of soap, each containing 100 cakes worth 7 cents a cake, for 35 barrels of potatoes, each containing 3 bushels. How much were the potatoes worth a bushel? Ans. .....

(9) A farmer exchanged 2 casks of eggs of 30 dozen each, for 3 bags granulated sugar, each weighing 100 lbs., worth 10 cents a pound. What was the price of the eggs a dozen? Ans. .....

(10) A bridge 84 ft. long and 20 ft. wide is covered with oak planks 2½ inches thick. What is the plank worth at $16.00 a thousand feet? (1 board foot is 1 ft. long, 1 ft. wide and 1 in. thick.) Ans. .....

(11) At $20 per thousand, find the whole cost of 5 scantling, 20 ft. long, 4 inches wide, 3 in. thick; 9 scantling, 18 ft. long, 5 inches wide, 4 in. thick; 6 scantling, 14 ft. long, 6 inches wide, 5 in. thick. Ans. .....

(12) At $32.50 per thousand, what will be the cost of: 8 scantlings, 3″×4″—18′; 12 scantlings, 4″×5″—16′; 8 scantlings, 5″×6″—14′. Ans. .....

(13) Find total cost of the following: 15240 lbs. Wheat at $2.10 a bushel; 6480 lbs. Onions at $2.25 a bushel; 12850 lbs. A. Coal at $9.75 a ton; 4275 lbs. Blue Grass Seed at $15.00 a cwt. Ans. .....

(14) Find interest on:

(a) $ 840 for 63 days at 5% Ans. .....

(b) $ 960 for 75 days at 6% Ans. .....

(c) $1260 for 123 days at 8% Ans. .....

Aim to get 100%

LESSON 102

Aliquot Parts of Ten

$1\frac{1}{9}$—$\frac{1}{9}$ of 10	$1\frac{3}{7}$—$\frac{1}{7}$ of 10	$2\frac{1}{2}$—$\frac{1}{4}$ of 10	2—$\frac{1}{5}$ of 10
$1\frac{1}{4}$—$\frac{1}{8}$ of 10	$1\frac{2}{3}$—$\frac{1}{6}$ of 10	$3\frac{1}{3}$—$\frac{1}{3}$ of 10	5—$\frac{1}{2}$ of 10

An aliquot part of a number is such a part as can be expressed by a simple fraction having 1 for a numerator.

The elements of commercial transactions are the following: *Price, Quantity,* and *Cost.*

Price is the value of one unit of any kind of commodity involved in a business transaction.

Quantity is the total number of units involved in a business transaction.

Cost is the value of the total number of units involved in a business transaction.

When the price is an aliquot part of a dollar, it is frequently more convenient to compute by a common fraction than by a decimal.

Example:—What is the cost of 36 yards of baby ribbon at \$0.03$\frac{1}{3}$ a yard?

3)\$3.60

\$1.20

At 10 cents a yard, we can see that the amount would be \$3.60, but as the price is only one-third of ten cents a yard, the value will be one-third of \$3.60, or \$1.20.

Some common *multiple aliquots* of 10 are used in business calculations, such as $6\frac{2}{3}$, $8\frac{1}{3}$, $3\frac{3}{4}$, etc. Look carefully at the following so that you will be able to recognize the short method of making extensions when the multiple aliquots are used.

$3\frac{3}{4}$—$\frac{3}{8}$ of 10	$4\frac{2}{7}$—$\frac{3}{7}$ of 10	$7\frac{1}{2}$—$\frac{3}{4}$ of 10	$6\frac{2}{3}$ —$\frac{2}{3}$ of 10
$6\frac{1}{4}$—$\frac{5}{8}$ of 10	$7\frac{1}{7}$—$\frac{5}{7}$ of 10	$8\frac{3}{4}$—$\frac{7}{8}$ of 10	$8\frac{1}{3}$—$\frac{5}{6}$ of 10

Fill in answers below:

How would you multiply by $2\frac{1}{2}$? Add a cipher and divide by 4.
" " " $3\frac{1}{3}$?
" " " $7\frac{1}{2}$?
" " " $8\frac{3}{4}$?

Practise the following:

54 lbs.	@	\$ .03$\frac{1}{3}$=	.....
84 "	@	.01$\frac{2}{3}$=	.....
32 "	@	.03$\frac{3}{4}$=	.....
48 "	@	.06$\frac{1}{4}$=	.....
72 "	@	.07$\frac{1}{2}$=	.....
96 "	@	.08$\frac{1}{3}$=	.....

DRILL 102

Date *Name*
Time *Seat No.*

Find the amount of the following bills, using the aliquot part method:

			$
(1)	276 yards Ribbon	@ $ .01⅔ a yd.	.....
	960 yards Ribbon	@ $ .01¼ a yd.	.....
	481 yards Ribbon	@ $ .02½ a yd.	.....
	840 yards Ribbon	@ $ .03⅓ a yd.	.....
			$

			$
(2)	84 yards Lining	@ $ .06⅔ a yd.	.....
	128 yards Lining	@ $ .06¼ a yd.	.....
	96 yards Braid	@ $ .03¾ a yd.	.....
	225 yards Braid	@ $ .03⅓ a yd.	.....
			$

			$
(3)	640 yards Paper Border	@ $ .07½ a yd.	.....
	24 rolls Paper	@ $ .08¾ a roll	.....
	16 rolls Paper	@ $ .07½ a roll	.....
	36 rolls Paper	@ $ .08⅓ a roll	.....
	48 rolls Paper	@ $ .06¼ a roll	.....
	66 rolls Paper	@ $ .06⅔ a roll	.....
			$

			$
(4)	72 yards Elastic	@ $ .03¾ a yd.	.....
	105 yards Elastic	@ $ .04⅞ a yd.	.....
	124 yards Elastic	@ $ .02½ a yd.	.....
	132 yards Cambric	@ $ .08⅓ a yd.	.....
	141 yards Gingham	@ $ .06⅔ a yd.	.....
	136 yards Muslin	@ $ .08¾ a yd.	.....
			$

Accuracy first, then speed

LESSON 103

Aliquot Parts of 100

Study the following table very carefully and become as familiar with the aliquot parts as with the multiplication table. Study and fix them in your mind so thoroughly that you will never hesitate in their application.

6¼—$\frac{1}{16}$ of 100	11⅑—$\frac{1}{9}$ of 100	16⅔—⅙ of 100	33⅓—⅓ of 100
6⅔—$\frac{1}{15}$ of 100	12½—⅛ of 100	20 —⅕ of 100	50 —½ of 100
8⅓—$\frac{1}{12}$ of 100	14⅔—$\frac{1}{7}$ of 100	25 —¼ of 100	

Multiples of the Aliquot Parts of 100

18¾—$\frac{3}{16}$ of 100	81¼—$\frac{13}{16}$ of 100	85⅞—$\frac{6}{7}$ of 100	75 —¾ of 100
31¼—$\frac{5}{16}$ of 100	93¾—$\frac{15}{16}$ of 100	83⅓—⅚ of 100	66⅔—⅔ of 100
43¾—$\frac{7}{16}$ of 100	37½—⅜ of 100	80 —⅘ of 100	
56¼—$\frac{9}{16}$ of 100	62½—⅝ of 100	60 —⅗ of 100	
68¾—$\frac{11}{16}$ of 100	87½—⅞ of 100	40 —⅖ of 100	

An Aliquot Part More or Less Than 100

150 —½ more than 100	95 —$\frac{1}{20}$ less than 100
133⅓—⅓ more than 100	90 —$\frac{1}{10}$ less than 100
125 —¼ more than 100	83⅓—⅙ less than 100
120 —⅕ more than 100	80 —⅕ less than 100
116⅔—⅙ more than 100	75 —¼ less than 100
112½—⅛ more than 100	66⅔—⅓ less than 100
110 —$\frac{1}{10}$ more than 100	62½—⅜ less than 100
108⅓—$\frac{1}{12}$ more than 100	37½—⅝ less than 100

Method of Multiplication

To multiply by 16⅔, annex two ciphers and divide by 6; to multiply by 33⅓, annex two ciphers and divide by 3.

Fill in answers to the following:

How would you multiply by 6¼?
" " " 8⅓?
" " " 12½?
" " " 62½?
" " " 87½?
" " " 66⅔?
" " " 75 ?

Practice Exercises

(1) What aliquot part of $1 is 50c? 33⅓c? 25c? 20c? 16⅔c? 12½c? 10c? 8⅓c?

(2) What aliquot part of 25c is 12½c? 6¼c? 5c? 8⅓c? 2½c? 1⅔c?

(3) What aliquot part of 50c is 2½c? 3⅓c? 6¼c? 8⅓c? 10c? 12½c?

(4) Formulate a short method for finding the cost of a quantity when the price is 50c? 25c? 20c? 16⅔c? 12½c? 6¼c? 8⅓c?

Solution when price is 50c: Since 50c is ½ of $1, to find the cost of a quantity when the price is 50c, consider the quantity dollars and divide by 2. How would you use the other prices?

DRILL 103

Date *Name*
Time *Seat No.*

Extend and total the following bills, using the aliquot part method:

(1)

350	lbs.	Tea	@ .50¢	a lb.
870	"	Coffee	@ 33⅓¢	"
124	"	Raisins	@ 25¢	"
84	"	Raisins	@ 16⅔¢	"
208	"	Seed	@ 6¼¢	"
840	"	Rice	@ 12½¢	"

$

(2)

720	doz.	Eggs	@ 37½¢	a doz.
224	lbs.	Lard	@ 31¼¢	a lb.
256	doz.	Eggs	@ 43¾¢	a doz.
288	lbs.	Ham	@ 37½¢	a lb.
378	lbs.	Pork	@ 33⅓¢	a lb.
728	gal.	Cider	@ 8⅓¢	a gal.

$

(3)

240	sacks	Flour	@ $1.33⅓	a sack
84	"	G. Flour	@ $1.25	"
72	"	Corn Meal	@ $1.16⅔	"
96	"	Rye Flour	@ $1.12½	"
75	"	B. Flour	@ $1.20	"
62	"	Potatoes	@ $1.50	"

$

(4)

24	boxes	Soap	@ 87½¢	a box
120	lbs.	Starch	@ 20¢	a lb.
48	gal.	Molasses	@ 37½¢	a gal.
32	gal.	Vinegar	@ 18¾¢	a gal.
320	lbs.	Salt	@ 1¼¢	a lb.
32	lbs.	Pepper	@ 31¼¢	a lb.
72	lbs.	M. Spices	@ 16⅔¢	a lb.
224	lbs.	B. Powder	@ 18¾¢	a lb.

$

LESSON 104

Aliquot Parts of 1000

The following table of aliquot parts of 1000 and multiples of aliquot parts should be thoroughly mastered:

$83\frac{1}{3}=\frac{1}{12}$ of 1000	375 $=\frac{3}{8}$ of 1000
125 $=\frac{1}{8}$ of 1000	625 $=\frac{5}{8}$ of 1000
$166\frac{2}{3}=\frac{1}{6}$ of 1000	$833\frac{1}{3}=\frac{5}{6}$ of 1000
250 $=\frac{1}{4}$ of 1000	$666\frac{2}{3}=\frac{2}{3}$ of 1000
$333\frac{1}{3}=\frac{1}{3}$ of 1000	875 $=\frac{7}{8}$ of 1000

To multiply by 250, annex three ciphers and divide by 4. How would you multiply by $83\frac{1}{3}$? 125? $166\frac{2}{3}$? 375? 875?

Formulate a method for finding the *quantity* when the cost is given and the price is \$2.50.

Example: Cost \$600, price \$2.50 a yard. How many yards?

Solution: Add two ciphers to the cost, \$600, to bring it to cents — 60000 cents. Now multiply the cost by 4 and divide by 1000. $60000\times4=240000$, and 240000 divided by 1000 gives 240; hence the quantity is 240 yards.

How would you find the *quantity* when the price is $83\frac{1}{3}$c? \$1.25? \$3.75? \$8.75?

Practise the following:

(1) $984\times 83\frac{1}{3}=$ ..... (2) $2904\times125=$ .....

$3792\times333\frac{1}{3}=$ ..... $1312\times250=$ .....

$474\times166\frac{2}{3}=$ ..... $1056\times375=$ .....

$288\times833\frac{1}{3}=$ ..... $1376\times625=$ .....

$423\times666\frac{2}{3}=$ ..... $912\times875=$ .....

DRILL 104

Date *Name*

Time *Seat No.*

Extend and total the following bills:

(1)

184 bu.	Onions	@ $1.25	a bu.	$.....
360 bbls.	Apples	@ $6.25	a bbl.	.....
174 bbls.	Apples	@ $6.66⅔	a bbl.	.....
342 bbls.	Flour	@ $8.33⅓	a bbl.	.....
392 bbls.	Flour	@ $8.75	a bbl.	.....
336 bbls.	Potatoes	@ $3.75	a bbl.	.....

$

(2)

96 yds.	Cheviot	@ $1.66⅔	a yd.	.....
56 yds.	Blue Serge	@ $3.75	a yd.	.....
168 yds.	T. C. Velvets	@ $0.83⅓	a yd.	.....
48 yds.	Worsted Cloth	@ $3.33⅓	a yd.	.....
64 yds.	Cheviot	@ $2.50	a yd.	.....
272 yds.	Silk Lining	@ $1.25	a yd.	.....

$

Find the total quantity of the following:

(3)

Cost $14,	price per lb.,	$ .25	.....
Cost $37,	price per lb.,	.33⅓.....	.....
Cost $54,	price per lb.,	.16⅔.....	.....
Cost $67,	price per lb.,	.12½.....	.....
Cost $72,	price per lb.,	.08⅓.....	.....
Cost $91,	price per lb.,	.06¼.....	.....

(4)

Cost $36,	price per yd.,	$ .66⅔.....	.....
Cost $45,	price per yd.,	1.25	.....
Cost $56,	price per yd.,	1.33⅓.....	.....
Cost $81,	price per yd.,	1.12½.....	.....
Cost $84,	price per yd.,	1.16⅔.....	.....
Cost $76,	price per yd.,	1.18¾.....	.....

Accuracy first, then speed

LESSON 105

Review of Aliquot Parts

Study carefully the following and use a certain number to test each line:

Multiplication by Aliquots

10	annex a cipher.	
100	" two ciphers.	
1000	" three "	
10000	" four "	
100000	" five "	
$1\frac{1}{4}$	" a cipher and divide by	8.
$1\frac{2}{3}$	" " " "	6.
$2\frac{1}{2}$	" " " "	4.
$3\frac{1}{3}$	" " " "	3.
$6\frac{1}{4}$	" two ciphers and divide by	16.
$8\frac{1}{3}$	" " " " "	12.
$12\frac{1}{2}$	" " " " "	8.
$14\frac{2}{7}$	" " " " "	7.
$16\frac{2}{3}$	" " " " "	6.
25	" " " " "	4.
$33\frac{1}{3}$	" " " " "	3.
50	" " " " "	2.
$66\frac{2}{3}$	" " " subtract $\frac{1}{3}$	of the product.
75	" " " deduct $\frac{1}{4}$	" "
$87\frac{1}{2}$	" " " " $\frac{1}{8}$	" "
$37\frac{1}{2}$	" " " take $\frac{3}{8}$	" "
$62\frac{1}{2}$	" " " " $\frac{5}{8}$	" "
$112\frac{1}{2}$	" " " add $\frac{1}{8}$	" "
125	" three ciphers and divide by	8.
$133\frac{1}{3}$	" two " " " add $\frac{1}{3}$	of the product.
$137\frac{1}{2}$	" " " " " $\frac{3}{8}$	" "
150	" " " " " $\frac{1}{2}$	" "
$162\frac{1}{2}$	" " " " " $\frac{5}{8}$	" "
$166\frac{2}{3}$	" three " " divide by	6.
175	" two " " multiply by 2 and deduct $\frac{1}{8}$	of the product.
$187\frac{1}{2}$	" " " " " 2 " $\frac{1}{16}$	" "
250	" three " " divide by	4.

To multiply any number by

To Divide by Aliquots

To divide any number by

$1\frac{1}{4}$	multiply by	8	and divide by	10		$166\frac{2}{3}$	multiply by	6	and divide by	1000	
$1\frac{2}{3}$	" "	6	" " "	10		175	" "	4	" " "	700	
$2\frac{1}{2}$	" "	4	" " "	10		$187\frac{1}{2}$	" "	8	" " "	1500	
$3\frac{1}{3}$	" "	3	" " "	10		250	" "	4	" " "	1000	
$6\frac{1}{4}$	" "	16	" " "	100		$6\frac{2}{3}$	divide by	10	and add	$\frac{1}{2}$	the result.
$8\frac{1}{3}$	" "	12	" " "	100		$7\frac{1}{2}$	" "	10	" "	$\frac{1}{3}$	" "
$9\frac{1}{11}$	" "	11	" " "	100		$8\frac{1}{3}$	" "	10	" "	$\frac{1}{5}$	" "
$12\frac{1}{2}$	" "	8	" " "	100		$13\frac{1}{3}$	" "	10	" deduct	$\frac{1}{4}$	" "
$11\frac{1}{9}$	" "	9	" " "	100		$66\frac{2}{3}$	" "	100	" add	$\frac{1}{2}$	" "
$16\frac{2}{3}$	" "	6	" " "	100		75	" "	100	" "	$\frac{1}{8}$	" "
$14\frac{2}{7}$	" "	7	" " "	100		$87\frac{1}{2}$	" "	100	" "	$\frac{1}{7}$	" "
25	" "	4	" " "	100		$112\frac{1}{2}$	" "	100	" deduct	$\frac{1}{8}$	" "
$33\frac{1}{3}$	" "	3	" " "	100		$116\frac{2}{3}$	" "	100	" "	$\frac{1}{7}$	" "
50	" "	2	" " "	100		125	" "	100	" "	$\frac{1}{8}$	" "
$37\frac{1}{2}$	" "	8	" " "	300		$133\frac{1}{3}$	" "	100	" "	$\frac{1}{4}$	" "
$62\frac{1}{2}$	" "	16	" " "	1000		150	" "	100	" "	$\frac{1}{3}$	" "
125	" "	8	" " "	1000		$333\frac{1}{3}$	" "	1000	" multiply by	3.	
$137\frac{1}{2}$	" "	8	" " "	1100		$666\frac{2}{3}$	" "	1000	" add $\frac{1}{3}$	the result.	
						750	" "	1000	" " $\frac{1}{3}$	" "	

DRILL 105

Date *Name*

Time *Seat No.*

Multiply and add products:

(1)	(2)	(3)
480× 1¼=	375× 1⅔=	432× 6⅔= .....
490× 2½=	870× 8⅓=	528×50 = ...
144× 8⅓=	732×25 = ...	588×33⅓= .....
680×12½=	512× 6¼=	340× 2½= .....
660×16⅔=	434×14⅔=	784×25 = ...

(4)	(5)	(6)
464×125 = ...	494×12½=	384× 6¼= .....
584× 1¼=	381×16⅔=	532× 14⅔= .....
564× 8⅓=	482×50 = ...	326×125 = ...
462× 1⅔=	864×33⅓=	498× 6⅔= .....
240× 6⅔=	165× 3⅓=	342× 11⅑= .....

(7)	(8)	(9)
360× 7½=	1095×33⅓=	840×250 = ...
125×64 = ...	250×44 = ...	232× 62½= .....
584×75 = ...	2163× 3⅓=	320× 18¾= .....
240×16⅔=	432× 6¼=	360× 87½= .....
440×37½=	351×66⅔=	450× 83⅓= .....

Divide and add quotients:

(10)	(11)	(12)
4795÷1¼=	625÷ 8⅓=	1625÷ 25 = ...
6785÷1⅔=	2375÷12½=	1875÷ 62½= .....
2915÷2½=	3750÷16⅔=	2375÷125 = ...
3780÷3⅓=	2100÷14⅔=	1275÷ 37½= .....
1700÷6¼=	2800÷33⅓=	2475÷137½= .....

(13)	(14)	(15)
1875÷ 25=	1500÷166⅔=	3375÷125 = ...
2650÷ 50=	2250÷187½=	4800÷133⅓= .....
3500÷175=	8750÷250 = ...	8000÷333⅓= .....
6300÷ 75=	3825÷112½=	6000÷666⅔= .....
8400÷150=	6650÷116⅔=	6750÷750 = ...

Aim to get 100%

LESSON 106

Short Methods in Percentage

The principles of aliquot parts may be used to advantage in many operations in percentage, and the percentages of the following table with their equivalent fractions should be thoroughly learned.

Per Cent.	Decimal Value	Fractional Value	Fractional Value in Lowest Terms	Per Cent.	Decimal Value	Fractional Value	Fractional Value in Lowest Terms
1%	.01	$\frac{1}{100}$	$\frac{1}{100}$	$22\frac{2}{9}\%$	$.22\frac{2}{9}$	$\frac{22\frac{2}{9}}{100}$	$\frac{2}{9}$
$1\frac{1}{4}\%$	$.01\frac{1}{4}$	$\frac{1\frac{1}{4}}{100}$	$\frac{1}{80}$	$28\frac{4}{7}\%$	$.28\frac{4}{7}$	$\frac{28\frac{4}{7}}{100}$	$\frac{2}{7}$
$1\frac{2}{3}\%$	$.01\frac{2}{3}$	$\frac{1\frac{2}{3}}{100}$	$\frac{1}{60}$	$31\frac{1}{4}\%$	$.31\frac{1}{4}$	$\frac{31\frac{1}{4}}{100}$	$\frac{5}{16}$
$2\frac{1}{2}\%$	$.02\frac{1}{2}$	$\frac{2\frac{1}{2}}{100}$	$\frac{1}{40}$	$33\frac{1}{3}\%$	$.33\frac{1}{3}$	$\frac{33\frac{1}{3}}{100}$	$\frac{1}{3}$
$3\frac{1}{3}\%$	$.03\frac{1}{3}$	$\frac{3\frac{1}{3}}{100}$	$\frac{1}{30}$	$37\frac{1}{2}\%$	$.37\frac{1}{2}$	$\frac{37\frac{1}{2}}{100}$	$\frac{3}{8}$
$6\frac{1}{4}\%$	$.06\frac{1}{4}$	$\frac{6\frac{1}{4}}{100}$	$\frac{1}{16}$	$42\frac{6}{7}\%$	$.42\frac{6}{7}$	$\frac{42\frac{6}{7}}{100}$	$\frac{3}{7}$
$6\frac{2}{3}\%$	$.06\frac{2}{3}$	$\frac{6\frac{2}{3}}{100}$	$\frac{1}{15}$	$43\frac{3}{4}\%$	$.43\frac{3}{4}$	$\frac{43\frac{3}{4}}{100}$	$\frac{7}{16}$
$8\frac{1}{3}\%$	$.08\frac{1}{3}$	$\frac{8\frac{1}{3}}{100}$	$\frac{1}{12}$	50%	.50	$\frac{50}{100}$	$\frac{1}{2}$
$9\frac{1}{11}\%$	$.09\frac{1}{11}$	$\frac{9\frac{1}{11}}{100}$	$\frac{1}{11}$	$56\frac{1}{4}\%$	$.56\frac{1}{4}$	$\frac{56\frac{1}{4}}{100}$	$\frac{9}{16}$
10%	.10	$\frac{10}{100}$	$\frac{1}{10}$	$62\frac{1}{2}\%$	$.62\frac{1}{2}$	$\frac{62\frac{1}{2}}{100}$	$\frac{5}{8}$
$11\frac{1}{9}\%$	$.11\frac{1}{9}$	$\frac{11\frac{1}{9}}{100}$	$\frac{1}{9}$	$66\frac{2}{3}\%$	$.66\frac{2}{3}$	$\frac{66\frac{2}{3}}{100}$	$\frac{2}{3}$
$12\frac{1}{2}\%$	$.12\frac{1}{2}$	$\frac{12\frac{1}{2}}{100}$	$\frac{1}{8}$	$68\frac{3}{4}\%$	$.68\frac{3}{4}$	$\frac{68\frac{3}{4}}{100}$	$\frac{11}{16}$
$14\frac{2}{7}\%$	$.14\frac{2}{7}$	$\frac{14\frac{2}{7}}{100}$	$\frac{1}{7}$	75%	.75	$\frac{75}{100}$	$\frac{3}{4}$
$16\frac{2}{3}\%$	$.16\frac{2}{3}$	$\frac{16\frac{2}{3}}{100}$	$\frac{1}{6}$	$81\frac{1}{4}\%$	$.81\frac{1}{4}$	$\frac{81\frac{1}{4}}{100}$	$\frac{13}{16}$
$18\frac{3}{4}\%$	$.18\frac{3}{4}$	$\frac{18\frac{3}{4}}{100}$	$\frac{3}{16}$	$83\frac{1}{3}\%$	$.83\frac{1}{3}$	$\frac{83\frac{1}{3}}{100}$	$\frac{5}{6}$
20%	.20	$\frac{20}{100}$	$\frac{1}{5}$	$87\frac{1}{2}\%$	$.87\frac{1}{2}$	$\frac{87\frac{1}{2}}{100}$	$\frac{7}{8}$
25%	.25	$\frac{25}{100}$	$\frac{1}{4}$	$93\frac{3}{4}\%$	$.93\frac{3}{4}$	$\frac{93\frac{3}{4}}{100}$	$\frac{15}{16}$

In addition to the methods suggested by the table, such as dividing by 4 to get 25%, dividing by 3 to get $33\frac{1}{3}\%$, and so on, a number of percentages can be rapidly calculated from the 10% base. In previous lessons, you have already used 5%, 2%, $2\frac{1}{2}\%$, and $3\frac{1}{3}\%$—all based on 10%. In billing, you should cultivate the habit of writing the results on the paper direct, without carrying the work to a separate pad and then back to the bill.

Calculate the following mentally, giving result correct to nearest cent:

(1) 10% of \$358.78
(2) 20% of \$346.28
(3) 40% of \$358.79
(4) 5% of \$342.87
(5) $2\frac{1}{2}\%$ of \$1368.74
(6) $3\frac{1}{3}\%$ of \$ 438.73
(7) $1\frac{1}{4}\%$ of \$8326.75
(8) $\frac{1}{4}\%$ of \$3742.85

DRILL 106

Date *Name*

Time *Seat No.*

Make extensions at sight, writing the answers immediately after the amounts:

(1)	20 % profit on.....	$ 5	$ 25	$ 45
(2)	25 % loss on.....	$ 4	$ 36	$ 76
(3)	4 % commission on...	$ 25	$ 75	$125
(4)	12½% interest (1 yr.) on	$ 64	$ 96	$160
(5)	16⅔% duty on.....	$ 6	$ 36	$ 72
(6)	8⅓% discount on.....	$ 12	$ 72	$ 60
(7)	37½% premium on.....	$ 80	$ 32	$ 48
(8)	66⅔% advance on.....	$ 9	$ 27	$ 75
(9)	6¼% brokerage on....	$ 32	$ 64	$256
(10)	31¼% assessment on...	$ 40	$ 80	$144
(11)	87½% dividend on.	$ 16	$ 72	$104
(12)	22⅞% tax on.....	$ 27	$ 45	$ 63
(13)	28⅐% rebate on.....	$ 21	$ 35	$ 56
(14)	$7^{9}/_{12}$% allowance on...	$ 26	$ 39	$ 78
(15)	75 % of.....	$ 24	$ 32	$ 28
(16)	90 % of.....	$ 70	$110	$ 40
(17)	31¼% of.....	$ 64	$256	$288
(18)	43¾% of.....	$384	$224	$928
(19)	50 % of.....	$ 67	$ 49	$ 93
(20)	125 % of.....	$720	$680	$640

Accuracy first, then speed

LESSON 107

Trade Discount

Trade Discount is an abatement from the list or marked price of articles belonging to trade or commerce.

A ***Discount Series*** is a succession of discounts having reference to the same article.

It is a custom with many manufacturers and dealers to list their goods and wares in published catalogues at prices sufficiently high as not to be exceeded by any advance in price, to sell at such reductions as competition may demand, and to add additional discounts whenever prices decline.

It is also customary to allow a discount to the trade on all orders of a certain amount, a second discount on larger orders, a third discount on still larger orders, etc. It is evident that the conditions just mentioned will create a discount series.

Most dealers add still another discount conditioned upon time of payment. Thus, the terms of a bill may be "60 days, 2% 10 days." According to the terms, the buyer has 60 days' credit or time, but if the bill is paid within 10 days, he will be allowed 2% off for prompt payment. This kind of discount is commonly known as Cash Discount.

Example:—Goods are invoiced at $640, with discounts of 25, 10, and 5% off. Find net price of the goods.

Solution:

$640
160 —25% of $640

$480
48 —10% of $480

$432
21.60— 5% of $432

$410.40—Net price

The order in which the discounts of any series are considered is not material, a series of 25%, 10% and 5% being the same as 10%, 25% and 5%, or 5%, 10% and 25%. Use the example just illustrated and prove for your own satisfaction.

In all calculations on dollars and cents, if the mills are 5 or over, add one cent; if less than 5 mills, drop them. Thus, you will get your result to the nearest cent—the plan that is followed by nearly all business houses.

Practice the following:

	List price	Discounts	Net price
(1)	$[illegible].00	less 25 %, 10 % and 10%	$.....
(2)	[illegible]0	" 10 %, 10 % and 5%	$.....
(3)	[illegible].00	" 16⅔%, 12½% and 5%	$.....
(4)	[illegible]2.40	" 30 %, 20 % and 2%	$.....

DRILL 107

Date *Name*
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Find net price in each case, setting your answers opposite each question, but showing full solutions on another sheet to be attached:

	List price	Discount	Net price
(1)	$1550	less 3⅓% and 20 %	$.....
(2)	$ 840	" 25 % and 10 %	.....
(3)	$3500	" 20 % and 14⅔%	.....
(4)	$ 395	" 20 % and 20 %	.....
(5)	$1500	" 25%, 10% and 10%	.....
(6)	$1800	" 20%, 20% and 5%	.....
(7)	$1272	" 33⅓%, 10% and 2%	.....
(8)	$1475	" 30%, 20% and 3%	.....
(9)	$ 928.65	" 10%, 10% and 5%	.....
(10)	$396.17	" 20%, 10% and 2%	.....
(11)	$ 432.50	" 15%, 3⅓% and 2½%	.....
(12)	$ 342.16	" 30%, 3% and ¼%	.....
(13)	$1754.64	" 33⅓%, 16% and 12½%	.....
(14)	$5438.79	" 40%, 25% and 2½%	.....
(15)	$1927.46	" 20%, 14% and ⅓%	.....
(16)	$ 398.79	" 30%, 6% and 1¼%	.....
(17)	$1827.54	" 12½%, 6¼% and ½%	.....
(18)	$1634.75	" 15%, 5% and ⅛%	.....

Aim to get 100%

LESSON 108

Trade Discount

Example:—What single discount is equivalent to 25%, 20% and 5%?

Solution:

	or			
1.00		1.00	1.00	1.00
.25—25% of 1.00		.25	.20	.05
.75—Net after 1st discount		.75 ×	.80 ×	.95—.57
.15—20% of .75		1.00 —	.57 =	.43
.60—Net after 2d discount				
.03—5% of .60				
.57—Net after 3rd discount				

1.00—.57=43 or 43% the single discount.

Practise the following:

What single discount is equivalent to the following discount series:

(1) 10% and 10%
(2) 20% and 10%
(3) 10% and 5%
(4) 20%, 25% and 10%
(5) 25%, 33⅓% and 10%
(6) 20%, 20% and 10%
(7) 50%, 20% and 5%
(8) 30%, 20% and 10%
(9) 30%, 5% and 5%
(10) 40%, 20% and 2½%

Short Method

To find, mentally, a single discount equivalent to a series of two discounts.

Example:—What single discount is equivalent to 10% and 10%?

Long way:

1.00
.10—10% of 1.00
.90
.09—10% of .90
.81—Net
1.00 — .81 = .19 or 19%

Short way:

From the sum of the discounts subtract 1/100 of their product.

(10+10)—1/100(10×10)
= 20 — 1 or 19

When a third discount is given, combine it with the result obtained from the other two.

Note:—While this short method is useful in making comparisons, it cannot be used in invoicing. If two or more discounts are allowed on a bill, they must be taken off one after another as first illustrated.

Go over the above list and find out, at sight, the single discount that would be equivalent to the series.

DRILL 108

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By inspection, find a single rate of discount equivalent to the following discount series:

	Single Discount		Single Discount
(1) 20% and 10 % —	.....	(11) 10 % and 12½% —	.....
(2) 10% and 10 % —	.....	(12) 10 % and 6 % —	.....
(3) 25% and 10 % —	.....	(13) 15 % and 6 % —	.....
(4) 30% and 10 % —	.....	(14) 25 % and 8 % —	.....
(5) 20% and 5 % —	.....	(15) 33⅓% and 6 % —	.....
(6) 20% and 12½% —	.....	(16) 25 % and 20 % —	.....
(7) 20% and 20 % —	.....	(17) 33⅓% and 10 % —	.....
(8) 25% and 25 % —	.....	(18) 20 % and 2½% —	.....
(9) 5% and 5 % —	.....	(19) 16⅔% and 3 % —	.....
(10) 60% and 25 % —	.....	(20) 12½% and 4 % —	.....

(21) One drummer offers to sell to me $1500 worth of iron pipe at a discount of 25%, 10% and 10%; another offers to sell to me a similar quantity of pipe for the same amount less 20%, 20% and 5%. Which is the better offer, and what is the difference expressed in dollars and cents? Ans. .....

(22) Having bought $1500 worth of goods at 20% and 25% off, I sold them for $1500 less 15%, 10% and 20%. Did I gain or lose, and how much? Ans. .....

(23) I paid $108 for an organ and afterward sold it at a discount of 20% and 10% off the marked price. If my profit from the sale was 16⅔%, at what price was the organ marked? Ans. .....

(24) A loss of 10% was sustained by selling an article at 20% and 10% off from the marked price. If the cost was $18.00, what was the marked price? Ans. .....

(25) If a dealer pays $24 per dozen for hats, and marks them at $36 per dozen, at what rate per cent. must he discount them to gain 35%? Ans. .....

Accuracy first, then speed

LESSON 109

Methods for Proving Work

Addition may be verified by reversing the order of adding. Thus, if the various columns in a problem have been added from the bottom to the top, reverse the process and add them from the top to the bottom. If the two answers are identical, the work may fairly be assumed to be correct.

Subtraction may be verified by adding the remainder to the subtrahend. If the sum is identical with the minuend, the work is correct.

Multiplication may be verified in two ways:

(1) By interchanging the multiplier and multiplicand and remultiplying. If the results obtained by both operations are the same, the work is assumed to be correct.

(2) By dividing the product by the multiplier or multiplicand. If the result obtained is the mutliplicand or multiplier. respectively, the work is correct.

Division may be verified by multiplying the qnotient by the divisor and adding the remainder. If the resnlt is identical with the dividend, the work is correct.

Each of these processes may also be verified by means of a "check figure," or by "casting out" a certain figure. There are a great many check figures in common nse, such as 9, 11, 13, 17, 19, etc.

We will illustrate the nse of these check figures by showing how the four simple rules may be verified by "casting out the 9's."

To cast the nines ont of any number is to find the remainder in dividing the number by 9. To do this, add together the digits of the given number, omitting any nines there may be among the digits, then add together the digits of that sum, again omitting all nines, and so continue nntil a number of one digit is obtained. This last nnmber, if it be less than 9, will be the remainder in dividing the given nnmber by 9; if it be 9 the remainder will be zero.

To prove addition by casting out the nines.

Illustration:—Add 375, 425, 623, and 412. Prove the work by casting out the nines.

375= 6 }
425= 2 } 8
623= 2 }
412= 7 }
1835=17=8

Solution:—The excess of nines in 375 is 6; in 425 is 2; in 623 is 2; in 412 is 7. The excess of nines in the sum of 6, 2, 2, and 7 is 8. The excess of nines in 1835 is also 8. Since the excess of nines in all the numbers is eqnal to the excess of nines in the sum of the numbers, the work is assumed to be correct.

To prove subtraction by casting out the nines.

67534=7
38157=6
29377=1

The excess of nines in the minuend, minus the excess of nines in the subtrahend, should equal the excess of nines in the remainder; or, the excess of nines in the subtrahend, plus the excess of nines in the remainder, should equal the excess of nines in the minuend.

To prove multiplication by casting out the nines.

Illustration:—Find the product of 512×324 and verify the result by casting ont the nines.

512=8
324=0
165888=0

Solution:—The excess of nines in 512 is 8; in 324, 0. 8×0=0. The excess of nines in the completed product is 0. Since the excess of nines in the multiplicand, multiplied by the excess of nines in the multiplier, is equal to the excess of nines in the product, the work is assumed to be correct.

DRILL 109

Date *Name*

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Prove each question on the page by casting out the nines:

(1)	(2)	(3)	(4)
42643	75869	34982	49236
87569	38496	76834	27857
38474	27847	29675	42938
96237	63489	48296	54384
42798	26737	38475	92764
67547	42846	49238	57389
92856	97377	69247	27476
85497	48928	72658	92348

(5)	(6)	(7)
8732463	9276543	4321526
— 2984697	— 2893876	— 2976857

Cross multiply and prove:

(8)	(9)	(10)	(11)	(12)
46	64	46	54	72
38	78	73	67	38

(13)	(14)	(15)	(16)	(17)
58	36	37	48	64
37	49	59	72	93

(18)	(19)	(20)	(21)	(22)
87	78	56	76	37
35	58	94	58	77

(23)	(24)	(25)	(26)	(27)
49	86	79	59	85
79	92	88	39	39

(28)	(29)	(30)	(31)	(32)
243	363	436	564	627
158	247	254	247	348

Aim to get 100%

LESSON 110

Methods for Proving Work

To prove division by casting out the nines:

Examples in division may be proved by multiplying the excess of nines in the divisor by the excess of nines in the quotient. If the work is correct, the result should equal the excess of nines in the dividend, or the dividend minus the remainder when there is a remainder.

The process of proving the simple rules by the use of any other check figure is exactly similar to that involved in the case of the nine, except that the method of casting out the check figure is different.

Thus, to cast out the elevens from a number, we begin with the units digit and add to it every alternate digit. Then we begin with the tens digit and add to it every alternate digit. Then, if the sum of the digits in the odd places is greater than the sum of the digits in the even places, the result is the difference between these sums. If the sum of the digits in the even places is the larger, the result is eleven less the difference between these sums. In case either of the sums referred to is greater than eleven, we subtract from it the largest multiple of eleven it contains and proceed as stated above.

Illustration 1:—Cast the elevens out of 5182619274.

Solution

The sum of the digits in the odd places—4+2+1+2+1—10.

The sum of the digits in the even places—7+9+6+8+5—35.

35 being greater than 11, subtract from it 33, which is the largest multiple of 11 it contains, and 2 is left.

10, the sum of the digits in the odd places, is now greater than 2, so the result is 10—2—8.

Illustration 2:—Cast the elevens out of 5160459674.

Solution

The sum of the digits in the odd places—4+6+5+0+1—16.

The sum of the digits in the even places—7+9+4+6+5—31.

From 16 subtract 11 and 5 are left.

From 31 subtract 22 and 9 are left.

5, which comes from the sum of the digits in the odd places, is now less than 9, which comes from the sum of the digits in the even places, so the result is 11—(9—5)—7.

There is no short method of casting out the thirteens, seventeens, or nineteens from a number. To do this, it is necessary to actually divide the numbers by these various check figures. But a little practice will enable the student to divide by any one of these numbers mentally.

Probably the best check figure to be used is 13, although the adherents of each one will advance various reasons why their particular choice is the best. There are numbers of errors that 9 and 11 will not detect. On the other hand, the process of casting out nines or elevens is much easier than that of casting out thirteens, seventeens, or nineteens. Of course, the smaller the divisor the easier the division is effected. So that, all things considered, probably 13 is the best one to be used.

Many bookkeepers and accountants use a check figure in doing their posting and in taking off a Trial Balance. In fact, some will make no calculations that they do not verify in this manner. The check figure 9, however, should for obvious reasons be avoided by the bookkeeper.

For practice, cast the elevens out of the following:

(1) 42368974

(2) 765432876

DRIL 110

Date *No.*

Time *Seat No.*

Prove each question on this page by the 9 Check and the 11 Check:

9 Check 11 Check

(1) 48467
359

(2) 283)876345(

(3) 923645
— 458367

(4) 2467873
3624967
4563256
5824762
6327428
7462967

Accuracy first, then speed

LESSON 111

The Check Figure System of Proving Posting to Ledger

The illustration we have given of the proving of addition by the casting out of nines, or of elevens, will also explain the Check Figure System of proving posting.

To illustrate this particular application of these proofs we show the posting of several items from a Sales Book to a Ledger.

SALES BOOK

Date	Names	Fo.	Check	Amts.	
1919					
Oct. 14	W. McDonald	84	9	124	72
"	J. M. Fraser	84	2	148	96
"	S. J. Stubbs	84	6	14	14
"	W. Miller	84	8	43	20
			3	331	02

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DR. — W. McDONALD — CR.

1919		Fo.	Check			1919			Fo.	Check	
Oct. 14	S. B.	69	9	124	72						

J. M. FRASER

Oct. 14	S. B.	69	2	148	96						

S. J. STUBBS

Oct. 14	S. B.	69	6	14	14						

W. MILLER

Oct. 14	S. B.	69	8	43	20						

Explanation:—

The check figure employed is 11. Both the Sales Book and the Ledger are provided with columns for the extension of the check figure. As each entry is made the check figure is placed, in its column, beside the amount. The first check that is given upon the work is when the Sales Book is posted. The total is proved to be correct, as we have shown any simple addition may be proved, by comparing the check figure of the total with the sum of the check figures of the different addends.

The next check that the system affords is on the posting. As each item is posted to the Ledger, the check figure is placed as illustrated. The check figures of the Ledger must then correspond with check figures of the Sales Book. Instead of adding the total of the amounts posted to the Ledger, the work is tested by simply adding the check figures.

The same operation will prove the posting from the Cash Book, Journal, Purchase Book, or any other book, so that the bookkeeper may prove his work day by day as he goes along.

The check figure is not infallible. Mistakes may be made in extending it, and there are some mistakes it will not check. For example, the check figure 11 will not detect the mistake of posting, $45.10, as $10.45. Different bookkeepers pin their faith to different check figures, 9, 11, 13 or 19, according as they judge them to best measure up to the standard of an accurate proof. The working plan for all of them is practically the same.

DRILL 111

Date *Name*

Time *Seat No.*

Prove by casting out 11's: 11 Check

(1) 492782646372
— 278993754987

(2) 42368746
687

(3) Post the following Invoice Book and prove that the posting is correct by using the 11 Check:

INVOICE BOOK

Date		Fo.	Check	Names and Addresses	Terms	Amounts		Totals
19—								
Jan.	15			T. Kinnear & Co., 49 Front E...	30 da.	428	39	
"	15			Medland Bros., Ltd., 75 Front E.	30 da.	369	47	
"	15			H. P. Eckardt & Co., 3 Church St.	cash	248	75	
"	15			Perkins, Ince & Co., 43 Front E.	30 da.	76	94	
"	15			S. P. Wilson, 406 Queen W.	10 da.	84	78	

DR. LEDGER CR.

19—		Fo.	Check		19—		Fo.	Check	

Aim to get 100%

LESSON 112

Tabular Statements

When numbers are written in horizontal lines, as in the case of invoice and other business forms, they should be added as they stand. Add from right to left and prove by adding from the left to the right.

Horizontal addition becomes a necessity in a great many forms of tabular statements required in different places. The statements are usually added vertically and horizontally. The vertical and horizontal totals should be added to prove the work. The sum of the vertical totals should agree with the sum of the horizontal totals.

Practice the following and prove your work:

SUMMARY OF DAILY SALES

May 15	Shoes	Gloves	Hats	Dress Goods	Clothing	Total
A to D Ledger	$237 31	$126 92	$132 16	$263 64	$423 09	
E to H Ledger	228 80	140 75	110 25	357 18	387 75	
I to L Ledger	238 84	231 78	106 35	676 83	627 71	
M to P Ledger	143 54	157 57	161 69	382 55	541 23	
Q to T Ledger	848 49	657 02	510 45	510 59	551 45	
U to Z Ledger	556 51	213 19	388 54	811 82	680 29	
Total						

RECORDS OF MAIL FOR WEEK ENDING MAY 15, 19—

	Registered Letters	Ordinary Letters	Postal Cards	Book Packets	Parcels	Newspapers	Total
Monday	725	15279	2147	963	181	26419	
Tuesday	461	12365	2011	395	416	21936	
Wednesday	369	16285	1989	618	365	23162	
Thursday	849	14317	416	562	213	23164	
Friday	959	25162	2116	475	163	22790	
Saturday	416	11259	659	384	175	21218	

DRILL 112

Date *Name*

Time *Seat No.*

Complete the following tables by showing the totals of the columns, vertically and horizontally. Prove the work by adding the vertical and horizontal totals.

1. DEPARTMENTAL SALES FOR THE WEEK ENDING Nov. 15, 1919

Days	Clothing	Dry Goods	Furnishings	Millinery	Household Utensils	Total
Monday	$790 50	$988 40	$126 50	$256 85	$496 80	
Tuesday	640 18	890 50	90 18	420 62	841 62	
Wednesday	960 70	950 40	75 60	398 40	462 50	
Thursday	490 18	960 80	214 90	425 60	521 90	
Friday	930 50	720 50	126 70	396 80	762 80	
Saturday	840 15	989 72	215 20	459 65	925 54	
Total						

2. MONTHLY AND YEARLY STATEMENT

Month	1915	1916	1917	1918	1919	Totals
January	124832	345325	784395	528349	112233	
February	728941	167832	286948	956873	668734	
March	325768	589435	753586	424632	297865	
April	924876	654321	321476	594657	192843	
May	543768	234567	592763	294632	765345	
June	928328	891234	198725	528647	294763	
July	764732	567895	539876	328943	348694	
August	654924	438927	247632	294742	728643	
September	628328	624932	586529	486532	397544	
October	784623	864743	738564	674384	867347	
November	398472	157635	328924	586432	247689	
December	153287	594765	895855	975683	348789	
Totals						

3. GRAIN EXPORT OF A CITY FOR ONE WEEK (in bushels)

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Totals
Corn	28325	15236	35715	29128	75183	46217	
Wheat	35719	41719	50108	32546	59275	81126	
Oats	12136	9237	18265	7268	6950	17230	
Barley	18230	15738	21375	15928	19263	13637	
Rye	5275	6829	7201	11325	7825	13261	
Totals							

4. SCHOOL ATTENDANCE

School	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Totals
1st Ward	1126	1019	987	928	1097	1065	989	1074	994	917	
2nd "	1049	984	946	898	1036	978	943	960	917	889	
3rd "	876	807	758	716	847	827	810	864	793	719	
4th "	948	892	868	807	849	808	796	757	714	658	
5th "	1075	1043	985	924	1019	981	967	1007	947	939	
6th "	829	757	749	717	837	806	795	801	824	783	
7th "	743	704	685	612	728	694	709	716	697	651	
8th "	843	807	784	757	838	816	824	775	786	727	
Totals											

LESSON 113

Short Methods in Subtraction

Very often the bookkeeper is required to take the sum of several numbers from a certain number, or to take the sum of several numbers from the sum of several other numbers, without transferring totals to another paper. The following illustrations will show how such work is done.

Question:—From 38295 subtract the sum of 4175, 2849, 5473, and 6284.

Solution:

38295	
4175	For convenience in getting a grasp of the idea, arrange the
2849	figures as shown, with the figures of the subtrahend beneath
5473	the figures of the minuend, and separated from them by a
6284	line.
19514	

Find the sum of the units column of the subtrahend, 21. 21 cannot be subtracted from 5 (the units figure of the minuend) unless we "borrow" two 10's and make the amount 25. 21 from 25 leaves 4, the first figure in our result.

Find the sum of the figures in the tens' column, 26. Add to this the two tens borrowed, making 28. 28 cannot be subtracted from 9 (the tens' figure of the minuend) unless we "borrow" two 100's and make the amount 29. 28 from 29 leaves 1, the second figure in our result.

Find the sum of the figures in the hundreds column, 15. Add to this the 2 hundreds that were borrowed, making 17. To subtract 17 from 2 "borrow" 2 thousand, making 22. 17 from 22 leaves 5, the next figure of the result.

Proceed in the same manner with the rest of the columns.

Question:—From the sum of 2712, 4506, 2923 and 4715, subtract the sum of 179, 287, 396, and 477.

Solution:

2712	Find the sum of the units of the subtrahend, 29. Find the
4506	[illegible] the units of the minuend, 16. 29 cannot be taken
2923	[illegible] unless we "borrow" two tens, making the amount
4715	3[illegible] [illegible]om 36 leaves 7, the first figure of the result.
179	Find the sum of the tens of the subtrahend, 31. To this add
287	the two tens that we "borrowed," making 33. Find the sum
396	of the tens of the minuend, 4. 33 cannot tbe subtracted from
477	4, unless we "borrow" three hundreds, making 34. 33 from
13517	34 leaves 1, the second figure of the result.

Proceed in this manner with the other columns.

Question:—What number added to the sum of 584, 392, and 765 will make 2138?

Solution:

584	This [illegible]mple naturally suggests two operations: first, the
392	addition of the three addends, and second, a subtraction of
765	the sum thus obtained from the given amount; however, one
397	computation can be made to serve the purpose. We write
2138	the numbers as here shown, leaving a space above the foot-
	line for the addend sought. Commencing at the top of the
	units column, we add downward; thus, 6, 11, and 7 (supplied
	in the addend sought) are 18; then carrying the 1 ten, we
	add the tens column downward; thus, 9, 18, 24, and 9 (which we supply) are 33;
	carrying the 3 to the next column, we add the hundreds column downward; thus,
	8, 11, 18, and 3 (which we supply) are 21. The number, 397, written in italics,
	is the addend sought.

A practical application of the method of combining two operations in one is very convenient to the bookkeeper in balancing ledger accounts. Add the side showing the greater amount, place the amount under footline of each column and then find the balance as illustrated.

DRILL 113

Date *Name*

Time *Seat No.*

Use short method in subtraction for getting results in the following:

(1) Find the net weight of 4 tubs of lard, 63—14, 70—15, 71—15, 69—14.
Ans. .....

Note.—In billing, the above numbers are written horizontally as shown. The first number of each pair stands for the gross weight and the second number for the allowance for weight of tub. The net weight should be found without re-writing the numbers.

(2) Find the net weight of 6 baskets of pork loins, 315—48, 312—57, 289—44, 425—51, 341—52, 315—56. Ans. .....

(3) Find the net weight of 10 casks of hams, 426—67, 395—70, 398—64, 400—69, 424—71, 409—67, 412—66, 402—71, 411—71, 398—68. Ans. .....

(4) Find the net weight of 8 casks of shoulders, 352—24, 317—21, 316—18, 314—18, 311—17, 326—19, 322—21, 428—19. Ans. .....

Find the balances of the following accounts, without using pen for anything more than the writing of the results:

(5).

Dr. **T. NEVILLS** **Cr.**

1919			1919		
January 4		$1,274 75	January 9		$375 00
" 18		378 50	" 31		579 23
				Balance	

(6). **JOHN YOUNG**

1919			1919		
January 1		$2,000 00	January 2		$55 00
" 5		190 25	" 4		523 80
" 13		201 75	" 11		178 75
" 26		169 25	" 25		235 00
			" 31		40 00
				Balance	

(7). **H. T. GOUGH**

1919			1919		
January 4		$523 80	January 5		$190 25
" 6		235 00	" 8		169 25
" 11		198 75	" 13		201 75
" 17		228 75	" 22		153 25
" 27		57 00	" 29		82 00
				Balance	

(8). **ROBERT BELL**

1919			1919		
January 7		$1,508 70	January 31		$285 75
" 14		608 00			
" 22		235 25			
				Balance	

(9). **JAMES HUNTER**

1919			1919		
January 5		$475 80	January 6		$400 00
" 12		94 84	" 25		75 98
" 19		17 27	" 31		15 00
				Balance	

Find the balances of the following accounts. Use the pen in writing answers only.

(10) Balance in bank, Aug. 1, $422.15.
Checks for Aug., $25.00, $14.90, $7.87, $46.50, $8.50. Ans. .....

(11) Balance in bank, July 1, $7,087.95.
Checks for July, $298.68, $50.00, $86.25, $579.59, $246.89. Ans. .....

(12) Balance in bank, Aug. 1, $7,232.61.
Checks for Aug., $51.54, $845.27, $91.42, $300, $1,260. Ans. .....

(13) Balance in bank, September 1, $4,722.67.
Checks for September, $79.97, $94.00, $954.89, $67.87, $107.60, $218.27. Ans. .....

Aim to get 100%

LESSON 114

Depositors' Ledger

Short methods of subtraction may be used to advantage in finding balances of customers' accounts in a Depositors' Ledger as kept by a bank. A form of depositors' ledger is illustrated below. You can readily see that it affords excellent practice in addition and subtraction. The first column represents the balance of the depositor carried over from previous day; the second column gives the cheques in detail; the third column, the total cheques for the day; the fourth, the deposits; and the fifth column shows the new balance at the end of the day.

To get the depositors' balance for the day, add the deposits for the day to the previous balance and subtract total cheques. Can you suggest another method?

DEPOSITORS' LEDGER

Depositors	Balances	Cheques in Detail	Total Cheques	Deposits	Balances
Amos, C. D.....	$150 00	$2 50 36 75	$39 25	$50 00	$160 75
Bell, R. A.....	87 64	3 50 12 44 5 86		45 00	
Coon, G. E.....	92 85	4 75 25 39 6 35		25 00	
Duncan, B. N.....	246 72	32 46 52 75		60 50	
Eaton, D. J.....	349 84	7 35 22 46 66 25		75 60	
Frame, C. L.....	73 46	4 19 2 44 23 75		35 00	
Totals.....					

Complete the depositors' accounts and prove your work.

DRILL 114

Date **Name**

Time **Seat No.**

Complete the Depositors' Accounts and prove your work.

DEPOSITORS' LEDGER

Depositors	Balances	Cheques in Detail	Total Cheques	Deposits	Balances
Ames, C.E.	2462.74	150.00 16.35 56.75		314.50	
Bilton, A.D.	634.16	22.40 4.92 117.44		60.75	
Collins, N.O.	66.18	4.19 3.35 26.64		35.40	
Dacks, J.N.	4263.35	32.89 46.50 562.84		250.00	
Evans, C.H.	432.75	4.90 16.55 132.50		65.00	
Ferris, A.E.	632.55	23.46 118.55		48.50	
Glover, J.C.	162.46	46.10 9.85		55.50	
Hoover, N.S.	466.38	4.25 16.42 39.75		115.50	
Irvine, J.A.	246.75	24.36 9.78		45.75	
Totals					

LESSON 115

Short Methods in Decimals

Approximations:

Suppose that the exact result of an operation is 27.47186. For ordinary business purposes three places may be sufficient. Reading our result to the nearest figure, and retaining but three places of decimals, it becomes 27.472, which is an approximate value of 27.47186 correct to three places of decimals. Short methods in decimals are therefore attempts at getting approximate values to a certain number of places.

Addition

(*a*)		(*b*)	
	72.142756		71.143
	15.2176		15.218
	42.71594		42.716
	130.076296		130.077

Solution (a) shows the addition carried out complete.

Solution (*b*) shows the solution correct to three decimal places.

This is done by writing each addend, retaining only three places of decimals.

The addition is then performed in the usual way.

Subtraction may be handled in the same way where an approximation is sufficient.

Multiplication

Question:—Multiply 171.2478 by 8.4712, retaining only 4 decimal places.

(a)

171.2478	
8.4712	
342	4956
1712	478
119873	46
684991	2
13699824	
1450.6743	6336

(b)

171.24780	
21748	
136998240	
6849912	
1198735	
17125	
3425	
1450.67437	
Ans. 1450.6744	

Solution (a) shows the work carried out in full.

Solution (b) shows the work contracted, so as to give an approximation to four decimal places.

Rule.—Reverse the multiplier, placing the unit figure thereof directly under the decimal to which it is intended to extend the work (which should be one place further than an accurate answer is required). Multiply as in ordinary multiplication, ignoring all figures in the multiplicand to the right of the figures we are multiplying by, except to find what is to be carried, and carrying one more when the rejected part of any product is 5 or greater than 5. Arrange the several products so that the figures on the extreme right are directly under each other. Add and point off the number of places to which the work is extended.

Multiply the following by the contracted method and compare your answers with the results obtained by the ordinary method:

(1) 46.2436 × 3.4264 retaining 3 decimal places.
(2) 249.562 × 6.347 " 4 " "
(3) 36.4725 × .0024 " 5 " "
(4) 425.9 × 215.46 " 3 " "

DRILL 115

Date *Name*

Time *Seat No.*

Use contracted method for multiplying the following, showing solutions on this sheet:

Multiply

(1) 36.275 × 4.3678 retaining 2 decimal places.

(2) 41.3075 × 467.32 " 3 " "

(3) 17.0036 × .08245 " 4 " "

(4) .43261 × .73158 " 3 " "

(5) .003647 × .12739 " 4 " "

(6) 700.375 × .02736 " 3 " "

Aim to get 100%

LESSON 116

Contracted Method of Dividing Decimals

Question:—Divide 714.2965 by 14.367, giving result to *four* places of decimals.

14.367)714.2965(

Multiply both divisor and dividend by 1000, thus making the divisor a whole number. 14367.)714296.5(

Note at this point that the number 14367, if divided into the number 7142965, will require three figures in the quotient. One of these figures will be a decimal, as there is only one decimal place in the dividend. If we wish to carry the division to four places we must add three ciphers to the dividend, and proceed as in ordinary long division.

Solution (*a*) Ordinary Method.

```
14367)7142965000(497178
      57468
      ------
      139716      Ans. 49.7178
      129303
      ------
       103135
       100569
       ------
        25660
        14367
        -----
       112930
       100569
       ------
        123610
        114936
        ------
          8674
```

Solution (*b*) Contracted Method.

```
14367)7142965000(497178
      574680
      ------
      139616—Ans. 49.7178
      129303
      ------
       10313
       10057
       -----
         256
         144
         ---
         112
         101
         ---
          11
          11
          --
```

Rule.—Inspect the divisor and dividend to determine the number of places required in the quotient. It is well to take the result one place further than that really wanted, so as to be sure the last figure of the contracted quotient is correct. For the first contracted divisor take as many significant figures from the left of the given divisor as there are places required in the quotient, and at each subsequent division, reject one place from the right of the last preceding divisor.

In multiplying by the several quotient figures, carry from the rejected figures of the divisor the figure that would have been included had the work been carried out in full, and one more when the rejected part of the divisor after multiplication is 5 or greater than 5.

Note.—Before commencing the work supply ciphers at the right of either divisor or dividend, when necessary.

Divide the following by the contracted method and compare your answers with the results obtained by the ordinary method:

(1) 763.14163 ÷ 21.3642 correct to 4 decimal places.
(2) 2.3748 ÷ 1.4736 " 3 "
(3) 73.64 ÷ .43232 " 4 "
(4) .053407 ÷ .047126 " 6 "

DRILL 116

Date *Name*

Time *Sect No.*

Use contracted method for dividing the following decimals, showing solutions on this sheet:

Divide

(1) 27.3782 by 4.3267 correct to 3 decimal places.

(2) 487.24 by 1.003675 " 2 "

(3) 8.47326 by 75.43 " 5 "

(4) .8487564 by .075637 " 3 "

LESSON 1

To Reduce British Currency to Canadian Currency
(Short Method)

£1 at par is equal to $4.86⅔. Analyze this by taking as a base the old Halifax currency of $4 for £1, 20 cents (⅕ of $1) for 1 shilling, and 1⅔c (1/12 of 20c.) for 1 penny.

£1 at par calculated in this way gives

	$4.00
+ ⅕ of $4, or	.80
+ 1/12 of 80 cts. or	.06⅔
	$4.86⅔

To find the value of £15. 3s. 7d. we proceed as follows:

£15, at $4 each	$60.00
3s., at 20c. "	.60
7d., at 1⅔c. "	.12
	$60.72)
+ ⅕ of $60.72 —	12.14) — $4.80 basis
+ 1/12 of 12.14 —	1.01
	$73.87

The Par of Exchange is the established value of the monetary unit of one country expressed in the currency of the other.

Thus, we read in our Canadian Currency Act that "The currency of Canada shall be such that the British sovereign of the weight and fineness now prescribed by the laws of the United Kingdom shall be equal to and pass current for $4.86 2/3 of the currency of Canada." This means that the par of exchange between Canada and Great Britain is $4.86 2/3 for a sovereign or one pound sterling.

The Rate of Exchange is the market value of the monetary unit of one country estimated in the currency of another.

Peculiar Methods of Quoting the Rate of Exchange

Ordinarily we expect that the rate of exchange would be quoted by giving the value of the monetary unit of any country in terms of our own currency.

Thus, the obvious way of quoting the rate for sterling exchange would be to give the value of one pound in our currency. Accordingly, we may find that sterling exchange is quoted at $4.88, $4.89, and so on.

There is another method, however, still in use in Canada, of quoting sterling exchange, which the student will do well to recognize. This method of quoting is based on a reference to the old par of exchange, which used to be $4 4/9 for one pound sterling. As this was below the intrinsic value, the par was raised to its present figure of $4.86 2/3. The old par had been in use so long, however, that the custom grew up, even after the new par had been established, of quoting sterling exchange at a certain increase on the old par. Thus, if we find that sterling exchange is quoted at a premium of 9½%, or, which is the same thing, 109½%, we are to understand this as being a premium of 9½% on the old par of $4 4/9. This increase of 9½%, by the way, just brings us to the present par of $4.86 2/3, and explains the somewhat queer expression that sterling exchange is at par when it is at a premium of 9½%. This means that it is at the present par when it is at 9½% premium over the old par. If sterling exchange is quoted at 10% premium, it means 10% premium on the old part of $4 4/9. In this way any percentage may be quoted on this old par.

Question:—Find the value of £15. 3s. 7d. when exchange is quoted at 9¾% premium.

$$£1 = \frac{109¾}{100} \text{ of } \$4\,{}^{4}/_{9} = \$4.87\,{}^{1}/_{2}$$

(Short Method)

£15, at $4 each	$60.00
3s., at 20c. "	.60
7d., at 1 4/9c."	.12
	$60.72)
+ 1/8 of $60.72 =	12.14) = $4.80 basis
+ 1/12 of $12.14 =	1.18
	$74.04

In this case, we take 7 1/2/80 or 1/12 of $12.14 to bring the value up to $4.87 1/2 quotation. When exchange stands at par (£=$4.86 2/3), 1/12 of $12.14 would be used, as given in first illustration.

DRILL 117

Date *Name*
Time *Seat No.*

Use short method of reducing British currency to Canadian currency in finding the cost of each of the following London (Eng.) drafts. On an attached sheet of paper, show full solutions. Write answers only, opposite each question, on this sheet.

		£	s.	d.		
(1)	Face of draft,	72	5	7,	exchange 109½.	Ans. .....
(2)	" "	47	15	4,	exchange 109½.	Ans. .....
(3)	" "	195	17	8,	exchange 109½.	Ans. .....
(4)	" "	240	6	9,	exchange 109½.	Ans. .....
(5)	" "	475	18	10,	exchange 109½.	Ans. .....
(6)	" "	374	7	6,	exchange 108½.	Ans. .....
(7)	" "	193	6	8,	exchange 109¼.	Ans. .....
(8)	" "	836	17	6,	exchange 110 .	Ans. .....
(9)	" "	385	19	5,	exchange 108¾.	Ans. .....
(10)	" "	638	14	7,	exchange 109¾.	Ans. .....

Aim to get 100%

LESSON 118

Pay Rolls

Pay rolls give excellent tests in horizontal and vertical addition, cross multiplication, and aliquot parts. The person in charge of the cash should be most careful and accurate. Some firms pay their employees by cheques, while others pay in cash. If the cash is required for the various pay envelopes, a definite requisition form should be filled out and then a summary slip can be handed to the cashier of the bank containing the desired information concerning the number of $10 bills, $5 bills, etc.

A time card is usually provided for each workman in the factory, on which a record is kept of his time and the purpose for which it was employed. From the time cards, the pay roll and pay roll distribution sheets are made. A pay roll is not infrequently bound in book form, and is sometimes combined with a form of time card. In other cases, the time shown by time cards is recorded in a time book, from which the pay roll is later made. Some firms use time clocks which register the hours of beginning and leaving work.

The following pay roll illustrates a form that is very generally used:

PAY ROLL FOR WEEK ENDING JUNE 30, 19—

Names	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Hours	Rate per hr.	Amount	
Acton, James	8	8	9	8	9	5	47	.75	$35	25
Barnes, Alex.	8½	9	8½	9	8½	5	48½	.75	36	38
Cameron, John	9	7½	8½	9	8½	5		.85		
Dixon, Fred.....	9	8½	9	8½	8½	5		.82		
Eaton, Chas.....	8	9	8½	8½	8½	5		.75		
French, Wm.....	8	7½	8	9	8	5		.76		
								Total		

For practice, kindly complete the above pay roll.

Requisition Form

Assuming that cash is put into the pay envelopes at the end of the week, and desiring the necessary denominations of money to pay the men, the following schedule may be made out:

DENOMINATIONS OF CASH FOR WEEK ENDING JUNE 30, 19—

Accuracy first, then speed

Names	$10	$5	$2	$1	50c	25c	10c	5c	1c	Total	
Acton, J.	3	1				1				$35	25
Barnes, A.	3	1		1		1	1		3	36	38
Cameron, J.											
Dixon, F.											
Eaton, C.											
French, W.....											
Totals....											

Kindly complete the above Requisition Form, and make out a Summary Slip, showing the total number of each denomination and the total value according to Requisition Form. In actual business, always fill the pay envelopes with the actual denominations shown on cash Requisition Form, then you will have no trouble in making change.

DRILL 118

Date
Time

Name
Seat No.

(1) Extend the following Pay Rolls:

Names	Mon.	Tues.	Wed.	Thurs	Fri.	Sat.	Hours	Rate	Amount
Aitken, Wm.	8	7½	8	9	8½	7½		$.72	$
Carter, Ralph	9	8	9	8	8	8		87½	
Dalton, John	9	8	8	7	9	8		.66⅔	
Easton, Frank	8	8	9	8	8½	9		.70	
Farmer, Alex	9	8½	8	9	9	8		.87½	
Gain, Fred	8	8	8½	8½	8½	8		.75	
Harvey, Leo	8	9	8	8½	9	9		.85	
Innes, Cecil	9	8½	9	8	8			.83⅓	
							Total	$	

(2)

Names	Mon.	Tues.	Wed.	Thurs	Fri.	Sat.	Hours	Rate	Amount
Jessop, James	8	8	9	8½	8	8		$.87½	
King, Robert	8	9	8½	9	9	9		.75	
Long, Melvin	8	9	9	8½	8½	8½		.78	
Morris, Chas.	9	8½	8	8	9	9		.82½	
Newton Alfred	8	8½	9	8¾	9	8		.82¾	
Oliver, Wilfrid	9	8	8¼	9	8½	8½		.85	
Palmer, Albert	8	8½	8½	9	8¼	8		.83¾	
Quanty, Henry	9	8¼	9	8½	8½	8½		.76¾	
							Total	$	

Summary Slip for #1

x $10 =	
x $5 =	
x $2 =	
x $1 =	
x 50¢ =	
x 25¢ =	
x 10¢ =	
x 5¢ =	
x 1¢ =	
Total $	

Summary Slip for #2

x $10 =	
x $5 =	
x $2 =	
x $1 =	
x 50¢ =	
x 25¢ =	
x 10¢ =	
x 5¢ =	
x 1¢ =	
Total $	

LESSON 119

Billing or Invoicing

A Bill or Invoice is a detailed statement of merchandise sold or services rendered. A bill or invoice of goods sold usually gives the following information: Place and date of the sale; the names of the buyer and the seller; the terms of sale; the identifying marks, if any, of case, package, barrel, etc., in which goods are shipped; the quantity, name, and price of each article; the extension of each item; and the total amount of the whole bill.

A bill or invoice is receipted by writing at the bottom the words, "Received payment," followed by the signature of the seller of the goods or someone authorized to sign for him.

A Credit Note is a bill or invoice used as an offset to a previous bill or invoice. Thus, where goods are once billed and part of the goods are returned, the credit note is intended to show the items which were returned and for which credit is being given.

A Statement of Account is an exhibit of the dates and totals of the bills or invoices for a period, say of a month. A statement may be receipted as a bill or invoice is receipted.

The Work of Billing requires good writing and quick and accurate figuring. There is no commoner introduction to the general work of any office than this work of billing. Any young man or woman contemplating engaging in office work should, therefore, make certain that the requisites for success are thoroughly mastered. The rapid figuring will require not only a thorough knowledge of the simple rules, vulgar and decimal fractions, but also the application of many short rules, which will be found to both quicken and simplify the work. A bill clerk should also see to it that in every case possible, extensions are made direct, without the necessity of working the extension on a scratch pad, and then transferring the result to the bill or invoice.

Complete the following invoice:

J. M. FRASER,
Stratford, Ont.,

Toronto, Dec. 1, 1919.

Bought of
JOHN McDONALD & CO.

Terms: 90 days, 30 days 5%.

Case			Yds.	Price	Items	Amount
No. 19	12	pcs. Muslin 37¼ 32½ 33 35⅝ 35½ 37 38¼ 36 32 35 34 36		43¾c.		
31	15	pcs. Bleached Cotton 44½ 45⅝ 47¼ 44 47 45½ 43¼ 42⅝ 45⅝ 42 41 45½ 43⅝ 41 42		25c.		
7	6	pcs. E. Lining 40¼ 52½ 50½ 54 55¼ 54		37½c.		

Note.—The small figures represent quarter yards.

DRILL 119

Date *Name*

Time *Seat No.*

Complete the following Invoices:

(1) THE T. EATON CO., Limited, Toronto, March 1, 1919.
Bought of THE FURNITURE MANUFACTURERS ASSOCIATION.
Terms: Cash 5%, 10 days 2%.

2	doz. Kitchen Tables (each).....	$4 20	$100	80		
	Less 10%		10	08	$90	72
4	doz. Common Lounges (each).....	9 00				
	Less 15%					
15	10 ft. Walnut Extension Tables.....	16 00				
	Less 12½%					
6	doz. Dining Room Chairs (per doz.).....	11 25				
¾	doz. Cottage Bedsteads (each).....	4 75				
7	Walnut Marble Top Centre Tables.....	12 50				
	Less 20%					
3	doz. Antique Oak Bedroom Sets (each).....	25 00				
	Less 15%					
1	doz. Cherry Bedroom Sets (each).....	32 00				
	Less 25%					
½	doz. Bird's-eye Maple Bedroom Sets (each).....	75 00				
	Less 33⅓%					
7	Office Desks, Oak (each).....	24 00				
	Less 2-10's					
¾	doz. Rockers, Upholstered (per doz.).....	36 00				
	Less 20%					
3	doz. Fancy Baby Cabs (each).....	11 50				
	Less 25%					

What is the net of the bill? How much would settle the bill on date of sale? How much would settle the bill March 11, 1919?

(2) RICE LEWIS & SON, Limited, Toronto, May 1, 1919.
Terms: 90 days net Sold to D. MYERS & CO., Stratford.

	Or. No.	Quan.	Size	Description	Price	Gross		Net	
	11146	348'-9"	1 inch	Pipe..... 47½, 4-10's, 5%	11¾	$40	98	$13	40
		109'-4"	5 inch	Pipe..... 57½, 3-10's, 7½%	1 42				
		16	1 inch	Globe Valves..... 67½, 10, 5%	2 90				
		60	1×8	Nipples..... 85, 7½%	47				
		75	2 inch	Couplings..... 65, 5%	60				
		25	1×6	Flanges..... 80, 10%	95				
		125	1¼	Ells..... 75, 10%	35				
		55	2½×2×1	Tees..... 65, 10, 5%	1 75				
		6		Fin. Water Gauges..... 55, 10, 2½%	12 00