

even in explaining the action of the common pump? Can any discipline be better adapted than the severe discipline of grammatical study to check the illiteracy of the rank and file of our coming citizens, and thereby to ensure the stability of our Canadian democracy?

TEACHER.

Mental Arithmetic.

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PROPORTION.

The variety of problems capable of solution by proportion is practically unlimited. For that reason I have, in mental mathematics, introduced this principle at an earlier stage than that assigned in the curriculum. In dealing with lower grades it is made very plain in the following way:

- (a) 2 is the same relation to 4 that 5 is to ?
 (b) 12 " " " 3 that 15 is to ?

Every member of the class after a short drill will give these answers very readily. Now, let us see if we cannot express the above in a shorter form:

- (a) 2 is to 4 in the relation that 5 is to ?

That is somewhat shorter; but it takes up a great deal of our valuable time to write all those words for every question. "How does the telegrapher talk over the wires?" "By dots and dashes." Well, let us talk by dots only. Let one dot stand for each word; and place one above another to save space:

- (a) 2 is to 4 in the relation that 5 is to ?

$$2 : 4 :: 5 : (?)$$

Now let us try a very simple question by this method:

If 8 apples cost 20 cents, how much will 16 apples cost?

$$8 : 16 :: 20\text{cts.} : (?)$$

If a man can pick 16 bbls. apples in 10 hours, in what time can he pick 48 bbls.?

$$16 : 48 :: 10 \text{ hours} : (?)$$

Advancing now to more difficult forms we have:

If 2 men in 3 days earn \$10, how much can 3 men earn in 8 days?

The wages depends on what? The pupils can be led to see that the wages depends on the product of the number of men and number of days. Then:

$$6 : 24 :: \$10 : (?)$$

Unitary problems will furnish abundant practice in mental drill for the lower grades. In the higher grades proportion can be used for the solution of all kinds of per cent problems. A coat cost \$40; it was sold for \$50; find the gain per cent? It is at once inferred that \$10 is the gain. Then:

$$\$40 : \$10 :: \$100 : (?)$$

A merchant sent his agent \$618 to be invested in goods after deducting his commission for buying at 3 per cent; find value of goods bought?

$$\$103 : \$618 :: \$100 : (?)$$

A bankrupt has \$6000; his debts amount to \$8000. How many cents can he pay on the dollar?

$$\$8000 : \$6000 :: \$1 : (?)$$

The thoughtful teacher can apply this principle to many other kinds of problems. Its conciseness is very pleasing to the pupil after he has learned the longer methods usually adopted. The form is also very attractive, and it will be observed that pupils who formerly took little, or no interest, in arithmetic, become quite enthusiastic over this very interesting method.

Arithmetical Problems—Grade VIII.

1. Find area in acres, etc., of a triangle whose base is 600 yds. and height 250 yds.
2. How high is a cylinder of 20 in. in basal diameter and holding 30 gals.?
3. Find volume of a cone 10 in. in basal radius and 30 in. high.
4. Find area of ring between the circumferences of two circles whose radii are 30 in. and 36 in. respectively
5. If the cost price is 2-3 of marked price and the discount 10 per cent, find gain per cent.
6. A note of \$300, dated May 10, at 3 mos., with interest at 4 per cent, was discounted May 30th at 7 per cent?
7. Find compound interest on \$450 for 1 yr. 6 mo. at 4 per cent, payable half yearly.
8. Divide \$60 among A, B and C, so that A may have half as much as B, and one-third as much as C.
9. Find area of the larger of two concentric circles when the radius of inner is 10 ft. and radius of outer 15 ft.
10. A room 12 ft. by 18 ft. is 10 ft. high, has 3 windows, 3 ft. by 8 ft., 4 doors 3 ft. by 7 ft., to be papered with paper 18 in., 8 yds. to roll, at 15c. a roll, covered with carpet 27 in. wide at \$3 a yd; find cost of each.
11. A house worth \$4500 is insured for three-fourths its value at $1\frac{1}{2}\%$; find net cost if it burns.
12. A ceiling 5.6 in. long, 4.8 in. wide, is plastered at 25c. a sq. yd.; find cost.

Answers—1, 15 ac. 79 rds. 10 yds. 2 ft. 36 in. 2, 26.47 inches. 3, 3141.6. 4, 1244.0736. 5, 35%. 6, \$303.12, \$298.76. 7, \$27.54. 8, \$10, \$20, \$30. 9, 706.86. 10, \$1.85, \$96. 11, \$1175.62½. 12, \$8.04.