

$$4. \text{Dividend} = a^{2n-3}(a^{n+1} + a - 1)(a^{n+1} - a + 1)$$

$$\text{Divisor} = a^{n-1}(a^{n-1} + a - 1)$$

$$\therefore \text{Quotient} = a^{n-2}(a^{n+1} - a + 1) = a^{2n-1} - a^{n-1} + a^{n-2}.$$

1	1+0+5+0+11	+0+19+0-36
+2	2+4+14+16	+24
-2	-2-4-14	-16-24
-2	-2-4	-14-16-24
+3	+3	+6+21+24+36
	1+2+7+8+12	0+0+0+0

$$\text{Ans. } x^4 + 2x^3 + 7x^2 + 8x + 12.$$

$$5. \text{Factoring, we have } 4x^2(x-a), 3(x-a)(x-2a), 2x(x-2x)(x+2a)$$

$$\therefore \text{L. C. M.} = 12x^2(x-a)(x-2a)(x+2a).$$

6. Sides of triangle are 3, 4, 5 inches $\therefore$ angle (3, 4) = right angle
i.e. hands are 15 min. apart, i.e. min. hand has gained 5 min., or
35 min. $\therefore$ times are $\frac{5}{55}$ and $\frac{35}{55}$ of an hour, = $5\frac{1}{11}$ min. and $38\frac{2}{11}$ min.
respectively.

7. (i) Transposing x , and squaring we get $2ax = a^2 - 1$, or $x = (a^2 - 1) \div 2a$.

(ii) For $12x$ and $13y$, write m and n , and we have
 $m - n = 7$; $m^2 - mn + n^2 = 4729$. Square the first and combine
with the second, and $mn = 4680$, i.e. $3mn = 14040$. Add this to $2nd$
and take sq. rt. $\therefore m + n = \pm 137$, $\therefore m = 72$ or -65 , $n = -72$ or 65
i.e. $x = 6$ or $-5\frac{2}{3}$, $y = 5$, or $-5\frac{2}{3}$.

(iii) Substitute $1st$ in $2nd$, and $3rd$ in the result, and we have
 $2x^4 - 17x^2 + 36 = 0 = (2x^2 - 9)(x^2 - 4) \therefore x = \pm \frac{3}{2}\sqrt{18}$ or ± 2 , from which
we may get corresponding values for y and z .

8, and 9 present no difficulty.

ARITHMETIC.

1. If a population is now ten millions, the births 1 in 20 and the
deaths 1 in 30, what will be the population in 5 yrs. ? *Ans.* 10791214.

2. Four men A, B, C and D undertook a piece of work for
£26 10s. Now A could finish it himself in 4 months, B in 6, C in
9, and D in 12 days. But B began to work a certain time after A ,
and C and D began together a certain time after B . A received
£13 3s. $11\frac{1}{2}d.$ more than C , and B and D received between them
£8 1s. $7\frac{1}{2}d.$ How long did A work before B began, and B before
 C and D began; what did each person receive for his work; and
how long was it in finishing?

SOLUTION. C received $\frac{1}{9}(18 \times 8 + 4\frac{1}{2}) = 13 \times 3 + 11\frac{1}{2} = £22 \text{ } 12 \text{ } 2\frac{1}{2}$
 $\therefore A$ received $£22 \text{ } 12 \text{ } 8\frac{3}{4} + 13 \times 3 + 11\frac{1}{2} = £15 \text{ } 16 \text{ } 2\frac{1}{4}$
 $\therefore$ Time of C and $D = (£26\frac{1}{2} \div £22 \text{ } 12 \text{ } 2\frac{1}{2}) \times 4 = 4\frac{2}{3}$ month
 $\therefore £26\frac{1}{2} \times (12 \div 4\frac{2}{3}) = £11 \text{ } 19 \text{ } 11\frac{1}{2} = \text{what } D \text{ received}$
 $\therefore B$ received $£8 \text{ } 1 \text{ } 7\frac{1}{2} - £11 \text{ } 19 \text{ } 11\frac{1}{2} = £6 \text{ } 2 \text{ } 5\frac{1}{2}$
 $\therefore B$'s time = $(£26\frac{1}{2} \div £6 \text{ } 2 \text{ } 5\frac{1}{2}) \times 6 = 11\frac{1}{2}$ months
 $\therefore 2\frac{1}{2} - 11\frac{1}{2} = -9 = 1$ month = A 's time before B began,
and $1\frac{1}{2} - 11\frac{1}{2} = -10 = 2$ month = B 's time before C and D began. Now
 A worked the whole time $\therefore$ work was completed in $21\frac{1}{2}$ months.

3. A and B agree to carry 292lbs. 3 miles for 2s. They set out
with the load suspended from a 6 feet pole at the distance of
3ft 4in. from A 's shoulder, and carry it 6 furlongs. After resting
they change places and carry it $1\frac{1}{2}$ mls. farther, when the load acci-
dentally slipped along the pole to 30 inches from B in which position
it was carried to its destination. Neglecting the weight of the pole,
divide the money fairly between them in proportion to the work
performed.

SOLUTION. 24 furlongs for $24d. = 1d.$ per furlong.
They carried the weight 6 fur. and then changed places $\therefore$ at the
end of 12 furlongs each would have earned $6d.$ But for the other
4 furlongs before they rested the second time the weight was 32in.
from B and 40in. from A . Hence for this distance A should get
 $\frac{3}{8}$ and B $\frac{5}{8}$ of $4d. = 1\frac{1}{2}$ and $2\frac{1}{2}d.$, respectively. Similarly for the
last stage, the weight was 30in. from B and 42in. from $A \therefore A$
should get $\frac{3}{7}$ and B $\frac{4}{7}$ of the $8d. = 1\frac{1}{2}$ and $1\frac{1}{2}d.$ respectively.
Thus A should receive $11\frac{1}{2}d.$ and B $12\frac{1}{2}d.$

4. £3 17 10 $\frac{1}{2}$ English standard gold weighs 1 ounce Troy, or
31.1 French grammes. Now the value of English gold : value of the
same weight of French gold $\therefore 91.5 : 90$, and a gramme of the latter
is worth 31.1 francs. Convert 1000 English sovereigns into francs.
Ans. 25172

5. Specific gravity of tin = 7.299 of lead = 11.352. The weight of
a regular figure of tin = 318.4767 ozs., its axis are 8in., 6in., and 8in.,
and its volume increases in the same proportion as any one axis in-
creases when the other two remain the same. Find the weight of
another similar figure of lead whose axes are 18in., 9in., and 2in.
respectively. *Ans.* 1114.4826oz.

ANSWERS TO CORRESPONDENTS.

C. MCN.—For First Class Grade C. read McLELLAN'S HAND-
BOOK. You will find *Wentworth's Algebra*—Boston 1882, the best
introductory book, and *Pott's*—Cambridge 1879 the best collection
of examples for your purpose.

J. J. T.—We have found *Byerly's Differential and Integral Cal-
culus* the most lucid and simple. As a beginner, they will probably
suit you better than Gregory, or Williamson's. *Wheeler's Plane
and Spherical Trigonometry* is also a very fine book for your purpose.
These are all Boston, 1882 and might be ordered through any book-
seller.

P. N. DAWSON.—Your contribution though excellent in itself
would not be interesting to the majority of our readers.

J. E. JACKSON.—Our limited space, two pages, forbids your
"Miscellaneous Rules." Please accept thanks.

Special Articles.

GRAMMAR AND COMPOSITION IN ELEMENTARY SCHOOLS.

The revolt against formal grammar in elementary classes is
spreading more widely on this continent every day. The old
heresy, that "English grammar teaches the art of speaking and
writing the English language with propriety" is no longer believed.
Experience has abundantly demonstrated that this art is acquired
in high perfection by those who have a very limited acquaintance
with technical grammar, but who have a loving acquaintance with
the words of some favorite authors, masters of expression and
models of beauty in style. Mr. Hodgson's recent book, "Errors
in the Use of English," on the other hand, shows conclusively
that many of the great scholars of the century who have spent
their lives in the study of languages have often fallen into error
and ambiguity in the use of their mother-tongue.

We no longer set our little pupils to learn by heart the list of
adverbs, nor even the old, interminable rules of syntax. But for
a long time we have, under the influence of grammars of the dead
languages, dealt too much with dry, abstract names, and too little
with the living realities of our speech. Chiefly we have gone far
astray in our method of beginning at the wrong end of the subject.
We have taken elementary sounds, words, genealogies of words,
etc., as the starting point, whereas we ought to commence with the
complete thought, the sentence. Even in our study of sentences
we have generally eviscerated all meaning out of them by a com-
plicated and exceedingly wearisome and technical system of analy-
sis. Analysis has been the all in all; synthesis, production of
sentences, has been almost ignored.

Our text-books have been written from the wrong stand-point.
We hail with pleasure "The Essentials of English Grammar," a
short, clear, easy book, written by Prof. Whitney, of Yale, the
most distinguished philologist on the continent. This book starts
with the sentence, and everywhere calls for direct, practical appli-
cations in the building of sentences by the pupil. We have here
the promise of something more useful than "the adjunct to the
completion of the predicate," and other dry bones of that ilk. As
the little volume is adopted in our normal schools, we may hope
very soon to find grammar and composition happily wedded in all
our schools, and a living interest developed in putting words to-
gether, which will outweigh the benefits to be derived from minute
dissections of involved passages. Let us hope that thought and
meaning will no longer be buried under mausoleums of technical
terms.

Formerly, boys and girls used to be set to "write a composition"
on subjects far above their comprehension, on the "Improvement
of Time," "Duty," and such-like themes. Pupils came to have a