

12. An ellipse is inscribed in any triangle, and the polars of the middle points of the sides are drawn; the triangle formed by the three polars is a constant area.

13. Through any two points  $A$  and  $B$  on an equilateral hyperbola lines are drawn parallel respectively to the polars of  $B$  and  $A$ : a circle may be described passing through the intersection of these lines, through  $A$  and  $B$ , and through the centre of the hyperbola.

14. The locus of the foot of the perpendicular drawn from the focus of a parabola on the normal is another parabola.

### PROBLEMS IN ARITHMETIC,

for Entrance and Teachers' Examinations, by  
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I. When a man pays  $11\frac{1}{2}$  cents for 17 eggs, what are they selling at per dozen? If on the average 7 eggs weigh 1 lb., what should be the selling price per lb.?

8c. and  $4\frac{3}{4}$ c.

II. If 4 bushels of wheat occupy 5 cubic feet, how many bushels could be stored in a cubical bin 5 ft. each way, and what weight, in tons, would the floor have to support if this bin were full of wheat?

100 bush; 3 tons.

III. Second class fare on the Grand Trunk Railway is  $2\frac{1}{2}$  cts. per mile, 1st class fare being  $1\frac{1}{2}$  times as much as 2nd class. How much will it cost a man to travel from Toronto to Montreal (333 miles), if he takes a 1st class ticket to Cobourg (70 miles), a 2nd class from there to Brockville (130 miles), then a 1st class the rest of the way? \$10.01 $\frac{3}{4}$ .

IV. A man can purchase a hat of one kind for \$2.00 which he can wear for 8 months, or he can get one of another kind for \$2.37 $\frac{1}{2}$  that he can wear for 10 months, which will be the more profitable purchase, and how much will be saved in 10 years by constantly wearing that kind of hat rather than the other? The 2nd kind; \$1.80.

V. Two numbers are resolved into their

prime factors, one number contains 4 factors, the other 5, and three of these factors are common to both numbers. Shew from this how you could find the G. C. M. and the L. C. M. of the numbers.

VI. Water expands  $\frac{1}{10}$  of its own volume in freezing. How many cubic feet of ice would be formed by the freezing of the water that would just fill a rectangular cistern, 5 ft. long, 4 ft. wide and 3 ft. deep. 66 ft.

VII. In the previous question if the cistern was filled with ice, how many cubic feet of water would be formed by the melting of this ice? 54 $\frac{1}{4}$  ft.

VIII. If  $\frac{1}{11}$  of  $A$ 's, money =  $\frac{1}{3}$  of  $B$ 's, and if  $A$  and  $B$  together have \$59, how much has each?  $A$ , \$44;  $B$ , \$15.

IX. Three men and 5 boys can do a piece of work in 7 days, 3 men and 4 boys can do it in 8 days, how long would it take 4 boys to do it? 14 days.

X.  $A$  owns  $1\frac{1}{2}$  times  $\frac{2}{3}$  of a ship, and gives  $\frac{1}{3}$  of his share for a  $\frac{2}{3}$  partnership in a house and lot. If the ship is worth \$15,000 and the house is worth half as much again as the lot, find the value of the lot. \$4500.

XI.  $A$  and  $B$  run a race of one mile.  $A$  gives  $B$  a start of 20 yards, and wins by 40 yards.  $A$  ran the mile in 7 minutes. Find where  $A$  passed  $B$ , and how long  $B$  was in running the mile.

$A$  passed  $B$  586 $\frac{2}{3}$  yards from the start, and  $B$  ran the mile in 7'14 $\frac{1}{4}$ ".

XII. Prove that the G. C. M. multiplied by the L. C. M. of two numbers will give the product of the numbers.

XIII. Is it possible for the product of two non-terminating decimals ever to become a terminated decimal? Yes.

XIV. There are two notes, the face value of one being  $1\frac{1}{2}$  times that of the other. Now if true discount is taken on the first, and bank discount on the second, the sum of the discounts is greater by \$0.381 + than if bank discount had been reckoned first and true discount on the second, 5 per cent. being the