SCHOOL WORK.

MATHEMATICS.

ARCHIBALD MACMURCHY, M.A., TORONTO. EDITOR.

ANNUAL EXAMINATIONS, 1891.

JUNIOR LEAVING AND PASS MATRICULATION.

ARITHMETIC AND MENSURATION.

Hints and Solutions.

1. (*a*) A number is divisible by 5 when the unit's digit is exactly divisible by 5, that is, when this digit is 5 or 0. A number is divisible by 9 when the sum of its digits is exactly divisible by nine.

(*b*) Book-work.

(*c*) *Ans.* 518.0013+.

2. 1st part, Book-work; 2nd part, $2^4 \times 3^2 \times 5^2 \times 7 \times 11$; 3rd part, factor each number as in 2nd part, then find the product of the Common Factors. *Ans.* 21.

A.

3. Agent's price $= \frac{4}{5}$ of $\frac{3}{4}$ of $\frac{5}{6}$ of \$256 = \$500.

4. 1st takes 12 sec. to strike 10. 2nd takes $11\frac{3}{5}$ sec. to strike 10. ∴ As they make the 10th stroke together the second clock must have been $\frac{1}{5}$ of a sec. fast.

5. For every \$100 in horses he must insure for $\$101\frac{8}{4}$. *Ans.* 4884.

B.

6. $16\frac{1}{3}$ mills on \$2250 = \$37.18$\frac{1}{2}$. Ins. = $\frac{3}{800}$ of \$2000 = \$12.00. Int. on \$3000 at 5 per cent. = \$150.00. ∴ Total expense in 12 mos. = \$199.18$\frac{1}{2}$ etc.

7. Int. on mortgage = \$120000. Shareholders obtain \$150000. ∴ $\frac{7}{20}$ of annual receipts = \$270000. etc.

8. £1 = $\frac{1}{100}$ of \$4.80 = \$$\frac{24}{5}$, etc.

Ans. \$961.20, nearly.

9. Total int. = \$20 + int. on eleven payments at 4 per cent. for the various times, viz., 11 mos., 10 mos., 9 mos., etc. = \$20 + int. on \$10 for $5\frac{1}{2}$ years at 4 per cent. = \$20 + \$2$\frac{1}{2}$ = \$22$\frac{1}{2}$.

10. Income derived from \$100 of bonds = \$18.7296. Income derived from \$100 for 3 yrs. at 7 per cent = \$22.5043. ∴ Price of bonds = $\frac{187296}{225043}$ of \$100 = \$83.22 +.

11. Int. on mortgage at 7 per cent. = \$1012.6935. Interest on mortgage at 5 per cent. = \$709.3125. Or a reduction of \$303.381. Money is worth 3 per cent. less than the mortgage is drawing. Int. on \$100 for 3 years at 3 per cent. = \$9.2727. ∴ to make a reduction of \$9.2727 the amount would be \$100. ∴ To make a reduction of \$303.381 the amount would be

$$\frac{303.381 \times 100}{9.2727} = \$3271.76.$$

C.

12. Area of coin = $\frac{22}{63}$ sq. in. ∴ cub. contents = $\frac{22}{63 \times 16}$ cub. in. ∴ cub. contents of new coin = $\frac{22 \times 5}{63 \times 16 \times 2}$ cub. in. ∴ area of new coin × $\frac{1}{8}$ in. = $\frac{22 \times 5}{63 \times 16 \times 2}$ cub. in. ∴ area of new coin = $\frac{55}{126}$ sq. in. ∴ r^2 of new coin = $\frac{5}{36}$ sq. in. ∴ $r = \frac{1}{6}\sqrt{5}$.

13. Altitude of right angle = 30 ft., base = 40 feet. ∴ hypo. = 50 ft. = length of canvas from centre of base of tent to top of tent. ∴ area of each side of tent = 50 ft. × 40 ft., etc. *Ans.* \$133.33$\frac{1}{3}$.

14. (*a*) Volume of lead = $4^3 \times \frac{1}{8}$ of $\frac{22}{7}$ cub. in. Volume of silver = same, ∴ volume of new sphere = $\frac{128 \times 11}{21}$ cub. in. ∴ Dia.^{3} $\times \frac{1}{8} \times \frac{22}{7} = \frac{128 \times 11}{21}$ cub. in. ∴ Dia. = $4\sqrt[3]{2}$, etc.

(*b*) Area of surface of leaden sphere = $4 \times 4 \times \frac{22}{7}$ sq. in. Area of surface of new sphere = $2 \times 4 \times 4 \times \frac{22}{7}$ sq. in. ∴ Dia.^{2} $\times \frac{22}{7}$ = $2 \times 4 \times 4 \times \frac{22}{7}$ sq. in. ∴ Dia. = $4\sqrt{2}$ in., etc.

15. Area of bottom of mast = $600\frac{1}{4} \times \frac{22}{7}$ sq. in. Area of top of mast = $196 \times \frac{22}{7}$ sq. in. ∴ $\frac{1}{3}$ of $\left\{(600\frac{1}{4} + 196 + \sqrt{600\frac{1}{4} \times 196}) \frac{22}{7} \times H\right\}$ cub. in. = 596.75 cub. ft.

$$\therefore H = \frac{596.75 \times 7 \times 6 \times 1728}{4559 \times 11 \times 12} \text{ ft.} = 71.96 +.$$

(16) $x = 7\frac{1}{3}$, etc.