

9. In London 1 guil. = £ $\frac{4}{5}$. In Montreal £1 = \$ $\frac{40}{9} \times \frac{100}{100} \times \frac{100}{100}$. $\therefore$ 6000 guil. = \$2557.65+. By direct exchange 6000 guilders = \$2490; $\therefore$ by remitting through London gain = \$2557.65 - 2490 = \$67.65 +.

10. Solidity of vessel = $\frac{1}{8} \times \frac{1}{8} \times \frac{1}{8}$ cub. ft.; sol. of column of water = $\frac{2}{3} \times \frac{7}{8} \times \frac{3}{4}$ cub. ft. $\therefore$ $\frac{1}{8} \times \frac{1}{8} \times \frac{1}{8} - \frac{2}{3} \times \frac{7}{8} \times \frac{3}{4} = \frac{1}{8} \times \frac{1}{8} \times \frac{1}{8} - \frac{1}{2} \times \frac{7}{8} \times \frac{3}{4}$ cub. ft. iron. $\therefore$ wt. water = $\frac{2}{3} \times \frac{7}{8} \times \frac{3}{4} \times 62\frac{1}{2} = 86.369+$; wt. of iron = $\frac{1}{8} \times \frac{1}{8} \times \frac{1}{8} \times 62\frac{1}{2} \times 7\frac{1}{2} = 340.361+$, and total wt. = 426.73 + lbs.

IV.

FIRST CLASS.

1. For proof of rules see Canadian edition of Hamblin Smith's Arithmetic. By Sol. 4 preceding paper min. hands are together in 72 hrs., at which time the hr. hand of first clock has gained $\frac{1}{12}$ of round and that of second has lost $\frac{1}{12}$ do. Hence all will be together in $72 \times 12 = 864$ hrs.

2. $23\frac{1}{2}\% = \frac{47}{2}\%$. Fraudulent gain = $\frac{3}{15\frac{1}{2}} + \frac{5}{21} \times \frac{3}{15\frac{1}{2}} = \frac{26}{427} = \31.20 . $\therefore$ amt. = \$512.40, which divided by 40c. = 1281 lbs.

3. $\frac{a}{b} = \text{rt.} \div (1 + \text{rt.})$, or $(b-a) \text{ rt.} = a$. $\therefore$ $\text{rt.} = \frac{a}{b-a} = \text{int.}$ Or, $\text{int.} - \frac{a}{b} \text{ of int.} = \text{disct.} = \frac{a}{b}$. $\therefore$ $\text{int.} = \frac{a}{b} \div \left(1 - \frac{a}{b}\right) = \frac{a}{b-a}$

(1) $\frac{2\frac{1}{2}}{1\frac{1}{2}} = \frac{2\frac{2}{3}}{1\frac{1}{2}} = \frac{a}{b-a} \div \frac{a}{b}$ whence $b = 3\frac{2}{3}a$. $\therefore$ $\frac{2}{3}$ of principal = 261, or $p = 580$, whence rate = $7\frac{1}{2}\%$.

(2) $\frac{1\frac{8}{10}}{1\frac{5}{10}} = \frac{5}{8} = \frac{n+1}{n}$ (see No. 6, second class) $n = 5$, and $5 \times 180 = \$900$.

4. \$1118 cy. = 1050 gold; $1050 \div .06 = \$17500 = \text{cy. to purchase stock (par)}$. $\frac{8}{10}\%$ of this = $65\frac{8}{10}$. $\therefore$ amt. = \$17565.

5. After deduction there is $\frac{9}{10} = \frac{2}{3}$, p. w. of wh. = $\frac{1}{3}$ received for tea; and $\frac{1}{3} \times \frac{118\frac{1}{2}}{100} = \frac{1}{3}$ = selling price: but selling

price = p. w. of \$510.51 = \$500.50 = $\frac{1}{11}$ of price first charged, which $\therefore$ $\frac{1}{11} \times \$500.50 = \$45.879\frac{1}{2}$.

6. See "Exam. Papers," page 13, q. 10, which gives $\frac{7000 \times 12 \times 21 \times 89 \times 92}{5760 \times 24 \times 2 \times 11} = 619.4602318$ lbs. copper = 1 gold.

7. Amt. = $4000(1.1)^3 = 4000(1.1)^3 \times \sqrt[3]{1.1} = 5583.81$. $\therefore$ Int. = \$1583.81 +.

8. 1 invested in B. C., $\frac{3}{5}$ in D. B., $\frac{7}{10}$ in C. Bank; $\frac{1}{5}, \frac{3}{10}, \frac{1}{10}$ are rates (per unit) paid by respective banks. $\therefore$ Income from B. C. = $\frac{1}{5}$, from D. B. = $\frac{3}{10}$, from C. B. = $\frac{1}{10}$. Hence $\frac{1}{5} + \frac{3}{10} + \frac{1}{10} = \frac{1}{2} = \frac{1}{2} \times \$2760 = \$1380$. $\therefore$ Amount in B. C. = \$1875, in D. B. \$2760, in C. B. \$1140.

9. A, B and C do $\frac{1}{3}$ in 1 day, and since B takes $2\frac{1}{2}$ as long as A and C, $\therefore$ these do $2\frac{1}{2}$ as much as B. $\therefore$ $B's + 2\frac{1}{2}B's = \frac{3}{8}$, $B's = \frac{3}{8}$ in one day. So $C's + 4\frac{1}{2}C's = \frac{3}{8}$, $\therefore$ C does $\frac{3}{8}$; $A \frac{1}{8}$. $\therefore$ money is to be divided in proportion of 18, 9, 6, or 6, 3, 2. $A \frac{1}{11} \times 120$, $B \frac{2}{11} \times 120$, $C \frac{2}{11} \times 120$.

10. (1) Presents no difficulty. Ans. is $8\sqrt{3}$.

(2) Find radius of circumscribed circle = $\frac{20 \times 25 \times 30}{4 \times \text{area}} = 20 \times 80 \times 25 \div 4 \times \sqrt{\frac{5}{2} \times \frac{2}{5} \times \frac{3}{5} \times \frac{1}{5}} = 40 \div \sqrt{7} = 15.12 +$

It will be seen that quantity under the radix sign = $5^6 \times 3^2 \times 7 \div 2^4$.

Examination Questions.

Under this head will be published from month to month the papers set at the examination for entrance into the High Schools of Ontario, the Intermediate High School Examination, the examination of candidates for Public School teachers' certificates, and the Junior and Senior Matriculation examinations of the University of Toronto. The Mathematical papers will in all cases be accompanied by analytical solutions of the more difficult problems and hints on the best methods of solving the others.

PAPERS FOR JULY, 1877.

ARITHMETIC.

Examiner: J. A. McLELLAN, LL.D.

ADMISSION TO HIGH SCHOOLS.

1. What is the least number that must be added to five millions to make the sum exactly divisible by seven thousand and nineteen?

2. Simplify $\frac{20}{21} - \left(\frac{48\frac{1}{2} + 7\frac{3}{4} - 16\frac{1}{4}}{16\frac{1}{2} \times 14\frac{1}{2} \times 12\frac{1}{2}} \div \frac{5\frac{1}{2}}{7\frac{1}{2}} \right)$

3. Simplify $\frac{£14. 12s. 11d. \times £10. 10s. 10d.}{10\frac{1}{2} - 3\frac{5}{8}} \times \frac{10s. 9\frac{1}{2}d.}{10s. 9\frac{1}{2}d.}$

4. A man bought a quantity of hay at \$15 for 20 cwt. He sold it 85 cents per cwt., gaining \$22.25. How many cwt. did he buy?

5. $3\frac{3}{4}$ yards of cloth cost \$12.50; what will $23\frac{7}{8}$ yards cost?

6. A person having an annual income of \$1400 spends a sum equal to \$625.50 more than he saves. Find his daily expenditure (year = 365 days).

7. A lady had in her purse just money enough to buy a certain quantity of silk; but she spent $\frac{1}{5}$ of the money in flannel, $\frac{2}{3}$ of the remainder in calico, and had then only enough money left to buy $10\frac{1}{2}$ yards of silk; How many yards of silk could she have bought at first?

8. A room 15 feet wide and 18 feet long is covered with matting at a cost of \$25; what would be the expense of covering, with the same quality of matting, a room a yard longer and a yard wider?

9. The average of four quantities is $18\frac{3}{5}$; the first is 26.207 , the second 3.592 , and the third is 38.06 . Find the fourth.

10. A bankrupt owes to A \$1039.84, and to B \$612.80: if A receives \$357.44, what will B receive?

Note.—10 marks to each question.

II.

THIRD CLASS TEACHERS.

1. If 69 German Thalers, of which 9 parts in 10 are fine silver, weigh 41 ounces, what is the value of a Thaler in English money when standard silver, of which 37 parts in 40 are fine, is worth 5s. 1 $\frac{1}{2}$ d. per ounce?

2. A, B, and C can do a piece of work in 2 days, A and C in

$$6 \left(\frac{7\frac{1}{2} \text{ of } 12\frac{3}{4}}{2\frac{1}{2} \text{ of } 15\frac{3}{4}} \right) - 3 \left(\frac{2\frac{1}{4} \text{ of } 4\frac{1}{4}}{2\frac{1}{4} \text{ of } 2\frac{1}{4}} \right) \text{ days};$$

in what time can B do it alone?

3. A certain kind of brass is made by fusing together old brass, refined copper, and zinc, in the proportion of 33, 55, and 24; how much of each must be taken to produce 170 lbs. of brass, after allowing 2 $\frac{1}{2}$ per cent. for waste?

4. March 21st, 1877; sterling exchange is quoted at 9 $\frac{1}{2}$ for demand bills what must be paid for a demand bill for £18 5s.?

5. What will be the cost of insuring a ship worth \$48628 $\frac{1}{2}$, at 3 $\frac{1}{2}$ per cent., so that in case of loss the owner may recover the value of the ship, and the amount paid for insurance?

6. The numerator of a certain fraction is a fifth as much again as its denominator, and the sum of the numerator and denominator is 352. Find the fraction.

7. A room whose height is 12 feet, and length $1\frac{1}{2}$ times its width, takes 178 $\frac{1}{2}$ yards of paper 1 ft. 9 in. wide to cover its walls; what will it cost to cover the floor with carpet 27 in. wide and costing \$1.75 a yard?

8. The L. C. M. of two numbers is 634938944494, and their G. C. M. is 9187: one of the numbers is 85044059; find the other.

9. The difference between the interest and the discount of a sum of money for 1 year and 9 months, at 8 per cent., is \$9.80: find the sum.

10. A rectangular field whose length is three times its breadth, contains 6 acres 900 yards: find its length and breadth.

Note.—20 marks to be allowed for each question.

III.

SECOND CLASS TEACHERS AND INTERMEDIATE.

1. Prove the rule for reducing a mixed circulating decimal to an equivalent vulgar fraction.

Find accurately what fraction $\frac{1}{5}$ of $(\frac{1}{5} - .512)$ of $3.6\frac{7}{12}$ ac., is of 2.662801 acres.

2. Show how to find the L. C. M. of two or more numbers.

Find the L. C. M. of 483 bushels, 472 bushels, 2 pecks; 258 bushels, 3 pecks.

3. A merchant buys flannel at 32 cents per yard; at what profit per cent. must he sell it in order that the money he receives for 220 yards may be equal to his gain on \$480 of outlay?

4. Three watches hang side by side, and all show 12 o'clock at the time of observation; the first is known to gain 10 minutes, and the second to lose 10 minutes in 12 hours, while the third keeps