

Majesty's pleasure, annexed to and made part and parcel of the province of Quebec as created and established by the royal proclamation of the 7th October, 1763."

The contention of the Dominion Government now is that the word "northward" must be held to mean "due north," and that the old province of Quebec never legally extended further west than the meridian of the mouth of the Ohio, which strikes the north shore of Lake Supérieur in the neighbourhood of Prince Arthur's Landing. The contention of the Ontario Government is that "northward" must be held to mean in a northerly direction along the Mississippi to its source and then along a line due north from that point. The latter is the view taken unanimously by the arbitrators, who also located the source of the Mississippi in Lake Itasca in Minnesota, which is almost due south of the north-west angle of the Lake of the Woods. Of course the treaty of Paris, under which Great Britain recognized the independence of the United States and agreed to the upper lakes as an international boundary, did away with that part of the one above defined which lay south of Lake Erie. It did not, however, alter the position of the starting point by which to determine the western boundary of Ontario, which is by common consent the western boundary of old Quebec.

PROVINCIAL AREAS.

It will make a great difference in the area of Ontario whether she secures or fails to secure the territory covered by the award.

By an Act of the Dominion Parliament, passed in 1881, the province of Manitoba was greatly enlarged, its eastern boundary being made to coincide with the western boundary of Ontario. As the latter is still unsettled it follows that part of the disputed territory will fall into Manitoba if Ontario loses it. This part has been computed to contain 39,000 square miles. With the addition of this territory the area of Manitoba would be about 154,000 square miles. If Ontario loses the 39,000 square miles to the west she will also lose the territory north of the height of land—that is, about 95,000 square miles in all—leaving her with an area of about 110,000 square miles. It is a matter of some interest to know that Quebec comprises nearly 200,000 square miles and British Columbia nearly 400,000. By reference to the "Notes" in the June number of the *School Journal* it will be seen that the four districts into which the Northwest territory has been divided—probably with a view to their ultimate erection into new provinces—have areas, respectively, of 95,000, 114,000, 100,000, and 122,000 square miles.

Mathematical Department.

INTERMEDIATE EXAMINATIONS.

JULY, 1882.

ARITHMETIC.

TIME—THREE HOURS.

1. The fore and hind wheels of a carriage are 9 and 12 feet in circumference respectively. There are two points, one in each circumference, at present in contact with the ground. Shew that as the carriage moves on, these points can never at the same time be the highest points of each wheel.

2. Reduce $\left\{ \frac{51 - \frac{1}{2} \text{ of } 2\frac{3}{4}}{\frac{2}{3} \text{ of } 4\frac{1}{2} + \frac{1}{2}} - \frac{859}{1085} \right\}$ of 3 lbs. to the fraction of 5 tons.

3. Prove that $\cdot 48732$ is equal to $\frac{48684}{99900}$.

4. Find the present value of \$320.00, due two years hence, at 8 per cent. per annum, compound interest.

5. Find approximately in how many years a given sum of money will double itself at 15 per cent. per annum, compound interest.

6. How large a bill of exchange on Paris can be bought for \$1600.00 currency, exchange being at the rate of \$1 for 6.25 francs, and gold at a premium of $8\frac{1}{2}$ per cent.?

7. On July 10th a banker discounts a note for \$500.00, made May 10th, at six months, at the rate of 8 per cent. per annum. At what rate does he receive interest on his money?

8. A sells an article at a certain advance per cent. on the cost to B, who, in turn, at the same advance per cent., disposes of it for \$19, finding that had he sold for \$13 he would have lost per cent. $1\frac{1}{2}$ of what he now gains per cent. What did A pay for the article?

9. Equal weights of gold and silver are in value as 20 to 1; and equal volumes are in value as 1284 to 35. A certain volume is composed of equal weights of gold and silver; find how many times more valuable the same amount would be were it composed wholly of gold.

10. The volume of a sphere is found by multiplying the cube of the radius by $4 \cdot 1888$; and the area of a circle by multiplying the square of the radius by $3 \cdot 1416$. Find the area of a circle which by rotating about a diameter will describe a sphere whose volume is 1 cubic foot.

Values:—1, 10; 2, 8; 3, 7; 4, 8; 5, 9; 6, 9; 7, 10; 8, 13; 9, 13; 10, 13.

SOLUTIONS.

1. Let A be the given point in the fore-wheel and B in the hind wheel. B will be at the top when the carriage has moved on 6 feet, at which point A will have passed the top; B will again be at the top after 18 feet advance, at which point A will be on the ground; B will next arrive at the top after 30 feet advance, A will have passed the top; and after 36 feet progress, A and B will both be in the initial position in contact with the ground; and the same relative positions will be repeated over and over, through every 36 ft. forever, so that A and B can never be at the top simultaneously.

2. Fraction within brackets = 1. $\therefore$ Ans. = $\frac{3}{10000}$

3. Book-work.

4. P. W. = $320 \div (1 \cdot 08)^2 = 290000 \div (9 \times 9 \times 9) = \274.348 .

5. Amt. of \$1 = $1 \cdot 73 +$, at end of 4th year

" " $31 = 2 \cdot 011 +$, at " " 5th year. Ans. 5 yrs., nearly.

6. \$1085 currency = \$1000 gold, \$100 gold = 525 francs, x francs = \$1500 currency $\therefore x = \frac{1000 \times 525 \times 1500}{1085 \times 100} = 7258$ francs " 7 centimes, nearly.

7. Banker pays \$52 and receives back \$100, i. e. int. = $\frac{48}{52} = 8 \cdot 7\%$ nearly.

8. B's cost + B's gain = \$19

B's cost $-\frac{1}{4}$ B's gain = \$13

$\therefore \frac{3}{4}$ B's gain = \$6, or B's gain = \$8

$\therefore$ B's cost = $19 - \$8 = \$11 = A$'s selling price

i. e. B gains 8 on 49, or $\frac{8}{49}$ per dollar invested.

$\therefore \frac{4}{49}$ A's cost = \$4 $\frac{2}{49}$

A's cost = \$14 $04 \frac{10}{49}$.

The phrase "lost per cent. $1\frac{1}{2}$ of what he now gains per cent.," we have taken to mean " $1\frac{1}{2}$ times what he now gains &c."

9. The mixture is evidently worth 21 times the silver in it. It contains a certain volume of silver; if this volume of silver were converted into gold it would be worth $1\frac{1}{3}$ of the silver now in the mixture; and the gold already present is worth 20 times the silver now in the mixture. Hence if all were gold the mass would be worth $(1\frac{1}{3} + 20)$ times the silver now in the mixture = $13\frac{1}{3}$ times the silver in mixture.

Hence $13\frac{1}{3} \div 21 = 2\frac{2}{3}$ times more valuable.

10. Observe that $4 \cdot 1888 = \frac{4}{3}$ of $3 \cdot 1416$. Let $3 \cdot 1416 = \pi$, and radius of sphere and circle = r. Then we have given $\frac{4}{3} \pi r^3 = 1728$ cub. in., to find πr^2 .

We get $r = 6\sqrt[3]{6} \div \sqrt[3]{\pi}$

$\therefore \pi r^2 = 36\sqrt[3]{36\pi} = 36\sqrt[3]{36 \times 3 \cdot 1416} = 216\sqrt[3]{5236}$

$= 216 \times 80593 = 174 \cdot 085 + 14$ inches.

ALGEBRA.

TIME—TWO HOURS AND A HALF.

1. Form an expression symmetrical with respect to x, y, z, u similar to $x^2 + y^2 + z^2 - 3xyz$; and write down the quotient on dividing it by $x + y + z + u$.

2. Factor $ax^2 - (a + b)(x - y)xy - by^2$.