(2) $\frac{28}{x-4}-\frac{20}{x-3}=\frac{9}{x-5}-\frac{1}{x-1}$.

(3) $\begin{cases} x^4+x^2y^2+y^4=21, \\ x^2+xy+y^2=7. \end{cases}$

(1) $x=-\frac{1}{2}$.

(2) $x=7$ or $\frac{1}{2}$.

(3) By division, $x^2-xy+y^2=3$,

$\therefore\ x^2+y^2=5,\ xy=2 \Big\}\ x=\pm 2 \text{ or } \pm 1,\ y=\pm 1 \text{ or } \pm 2.$

8. Solve the equations

$$\left.\begin{array}{l} x+y+z=6 \\ 3x+2y-z=4 \\ x+3y+2z=13 \end{array}\right\}\quad \left.\begin{array}{l} x=1 \\ y=2 \\ z=3 \end{array}\right\}.$$

$$\left.\begin{array}{l} 3x-2y+5z=4 \\ x-4y+z=1 \\ 4x-6y+6z=5 \end{array}\right\}.$$

Equations, in this case, not being independent, values of x, y and z are indeterminate.

9. The edge of a cube is 3 feet. What must be taken as the unit of length that the number expressing the sum of the areas of the faces may be the same as that which expresses the sum of the lengths of the edges?

Let x be unit of length in feet, then

$\frac{3}{x}$ = number of units in edge, per question

$$6\left(\frac{3}{x}\right)^2=8\left(\frac{3}{x}\right),\quad x=\frac{9}{4}.$$

10. The hour, minute and second hands of a watch are on concentric axes, the same divisions on the dial answering for both minutes and seconds. Find when first between 3 and 4 o'clock the second hand will equally divide the interval between the minute and hour hands.

Let x be the time after 3 o'clock in minutes, then

$$15+\frac{x}{12}+x=2(60x),\quad x=\frac{180}{1427}.$$

ARITHMETIC.

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. Show that as the carriage moves on these points can never at the same time be the highest points of each wheel.

By the nature of the L. C. M. the points come together again when they are at the bottom, therefore they cannot come together elsewhere.

2. Reduce $\left\{\frac{5\frac{1}{2}-\frac{1}{2}\text{ of }2\frac{2}{3}}{\frac{2}{3}\text{ of }4\frac{1}{6}+1\frac{1}{2}}-\frac{859}{1085}\right\}$ of 3 lbs. to the fraction of 5 tons.

$\frac{3}{10000}$.

3. *Prove* that $.48\dot{7}3\dot{2}$ is equal to $\frac{48684}{99900}$.

See "Advanced Arithmetic," p. 132.

4. Find the present value of $320, due two years hence, at 8 per cent. per annum, compound interest.

$(1.08)^2=\$320$, $\therefore$ P. V. $=\$274.348$.

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

Divide 2 by 1.15, divide quotient by 1.15, and so on until quotient becomes unity; number of divisions will give number of years, which by trial we find to be between 4 and 5; $\therefore$ number of years is between 4 and 5.

6. How large a bill of exchange on Paris can be bought for $1500 currency, exchange being at the rate of $1 for 5.25 francs, and gold being at a premium of $8\frac{1}{2}$ per cent.?

$\$1.085$ currency $=5.25$ francs; $\therefore$ $\$1500 = 7258.064+$ francs.

7. On July 10th a banker discounts a note for $500, 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?

Banker receives $\$4\frac{80}{3}$ for use of $\$1\frac{480}{3}$ for 4 months, note having 4 months to run, which is at the rate of $\$8\frac{8}{17}$ per cent.

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. $1\frac{1}{4}$ 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