. . . .

$$7^2 - 5^2 = 6.7^2 - 12.7 + 8$$
$$5^2 - 3^2 = 6.5^2 - 12.5 + 8$$
$$3^2 - 1^2 = 6.3^2 - 12.3 + 8$$
$$1^2 - (-1)^2 = 6.1^2 - 12.1 + 8$$

Let S designate sum required,

$$\therefore \overline{2n-1} + 1 = 6S - 12 \left\{ 1 + 3 + 5 + \dots + \overline{2n-1} \right\} + 8n$$

$$\therefore S = \tfrac{1}{6}\left\{ \overline{2n-1} + 1 + 12n^2 - 8n \right\}$$
$$= \tfrac{1}{6}(2n-1)2n(2n+1)$$

PROBLEMS IN ARITHMETIC.

I. A man bought a farm, containing 360 acres; for part of it he paid $20 per acre, and for the rest, $35 per acre. The whole firm cost him $9,750; find the number of acres bought at each price.
Ans. 190 and 170.

II. One pair of boots costs $7 and can be worn for 12 months, another pair costs $4 and lasts for 7 months; which kind will be the more advantageous for the purchaser? If A wears one of these kinds of boots continuously, and B the other kind, at the end of what time will each require a new pair of boots on the same day?
Ans. 2nd; 7 yrs.

III. If 20 men can move 20 cub. yds. of rock in 20 minutes, how long will 8 men be in moving 8 cub. yds.? *Ans.* 20 min.

IV. The driving wheel of a locomotive is 7 ft. across, and rests with a mark at the under side of it just at the end of a rail; how fast will this engine be going when this same spot touches the end of a rail twice in a minute; a rail being 25 ft. long, and the circumference of a circle, $3\frac{1}{7}$ times its diameter.
Ans. $12\frac{1}{2}$ miles per hour.

V. When the driving wheel is 7 ft. in diameter, and the truck wheel 3 ft., and the smaller wheel turns 20 times a minute more than the larger wheel, how fast is the engine going? *Ans.* $3\frac{3}{4}$ miles per hour.

VI. A bought a farm of 160 acres at $15 per acre; he kept part of it for himself and

sold the rest—half at $20 per acre, and half at $18 per acre, thus getting $260 more than he paid for the whole farm; how much did he keep for himself? *Ans.* 20 acres.

VII. A mechanic cut $\frac{1}{4}$ off the length of a piece of board, and then $\frac{1}{3}$ off the breadth of it, and said he had $\frac{1}{2}$ left; what was the amount of his error? *Ans.* $\frac{1}{12}$.

VIII. A bought 3 doz. eggs, 4 lbs. butter, and 5 lbs. cheese for $1.74. B bought 4 doz. eggs, 3 lbs. butter, and 5 lbs. cheese for $1.65; and C bought 4 doz. eggs, 5 lbs. butter, and 3 lbs. cheese for $1.71; from this, find the price per lb. of butter and cheese, and per doz. of eggs.
Ans. Eggs, 9c.; butter, 18c.; cheese, 15c.

IX. On a certain day of the year the sun is above the horizon for 12 hours at that parallel on which a degree of longitude measures 50 miles. Suppose that on this particular day, at sunrise, two vessels pass each other close to this parallel, one sailing due east, the other due west, the rate of each being 15 miles per hour; what number of hours of sunlight would each have?
Ans. $11\frac{1}{4}\frac{?}{?}$, and $12\frac{1}{4}\frac{?}{?}$.

X. Multiply .3417652 by 5.123, getting the answer correct to 4 decimal places, using contracted multiplication.

XI. $\frac{1}{11}$ will reduce to a pure circulating decimal; $\frac{1}{2}\frac{1}{3}$, to a mixed circulating decimal; yet their product becomes a terminated decimal. Explain why.

XII. A merchant throws 5 per cent. off marked price for cash payment; charges the marked price if the goods are paid for within 3 months; and adds 5 per cent. if the bill runs over three months. What sum will settle the following account on July 1st, 1882?— January 1st, 1882, bought goods marked at $350, paid $150; February 1st, paid $150. March 1st, bought goods marked at $600, and paid $200. May 15th, paid $300.
Ans. $138.15.

XIII. Conditions of payment same as in previous problem, it being understood that each payment is applied to the most recently contracted debt. January 1st, bought goods