

holders a dividend at the rate of $3\frac{1}{2}$ per cent on their shares, and the remainder, \$42525 is reserved. What was the paid-up capital of the company?

40 for working expenses.

54 for dividends.

$\therefore 6 = \text{remainder} = \$42525.$

$\therefore \text{Dividends} = 54 = \$42525 \times 9.$
 $= \$382725.$

But $3\frac{1}{2}$ on the shares = dividends.
 $= \$382725.$

$\therefore 100$ of the shares = $\frac{382725 \times 100}{3\frac{1}{2}} = \$10935000.$

T. E. McL. If two exterior angles of a triangle be bisected by straight lines which meet in F, prove that the perpendicular from F on the sides produced of the triangle are equal.

Let ABC be any triangle, and let the sides CA and CB be produced to D and E respectively. Let the exterior angle DAB be bisected by AF, and the exterior angle ABE be bisected by BF. Then the perpendicular FG on the side DC = the perpendicular FH on CE. From F let FK be drawn perpendicular to AB.

Then FH = FK. Euc. I, 26

FG = FK. "

$\therefore$ FH = FG. Q. E. D.

E. M. L.—(1) If a straight line is drawn through one of the angles of an equilateral triangle to meet the opposite side produced, so that the rectangle contained by the segments of the base is equal to the square on the side of the triangle, show that the square on the line so drawn is double of the square on a side of the triangle.

Let BAC be an equilateral triangle, and let E be any point in its base produced so that $AE, CE = BC^2$, then $BE^2 = 2 BC^2$.

Draw BD perpendicular to AC.

Then it may be shown by I, 26 that AC is bisected at D. Hence, by II, 6, $AE, CE + DC^2 = DE^2$.

To each of these equals add BD^2 .

$\therefore AE, EC + DC^2 + BD^2 = DE^2 + BD^2.$

$AE, EC + BC^2 = BE^2.$

But $AE, EC = BC^2$ (Hyp.)

$\therefore 2 BC^2 = BE^2.$

(2) ABCD is a quadrilateral, and x the middle point of the straight line joining the bisections of the diagonals; with x as a centre any circle is described, and P is any point upon this circle. Show that $PA^2 + BP^2 + PC^2 + PD^2$ is constant, being equal to $XA^2 + XB^2 + XC^2 + XD^2 + 4 XP^2$.

Let H and K be the middle points of the diagonals BD, AC.

Now $PA^2 + PC^2 = 2 AK^2 + 2 PK^2$. (By a previous ex.)
 and $PB^2 + PD^2 = 2 BH^2 + 2 PH^2$.

By addition $PA^2 + PB^2 + PC^2 + PD^2$

$= 2 AK^2 + 2 BH^2 + 2 PK^2 + 2 PH^2$

$= 2 AK^2 + 2 BH^2 + 4 XH^2 + 4 XP^2$

$= 2 AK^2 + 2 BK^2 + 2 XH^2 + 4 XP^2$

$= XA^2 + XC^2 + XB^2 + XD^2 + 4 XP^2$

L. A. DeW. (1) A uniform rod weighing 5 lbs. is 6 ft. long, at the ends are placed weights of 6 and 8 lbs. respectively. Where is the centre of gravity of the whole?

The centre of gravity for the rod will be 3 ft. The centre of gravity for the weights will be

$8x = 6(6-x), x = 2\frac{1}{2}.$

Again, the centre of gravity for 5 lbs. and 14 lbs. $\frac{1}{2}$ of a foot apart will be

$5x = 14(\frac{1}{2} - x), x = \frac{1}{6}.$

The correct answer, therefore, is $3\frac{1}{6}$.

(2) Demonstrate the following rule: To find the area of a quadrilateral when the four sides and the inclination of the diagonals is given. Add the squares of each pair of opposite sides together; subtract the less sum from the greater; then multiply the difference by the tangent of the angle formed by the diagonals, and one-fourth of this product is the area.

Let the sides of the quadrilateral be designated by a, b, d, c . Let w, y be the segments of the diagonal subtending a, b or c, d and z, x be the segments of the diagonal subtending the sides c, a or b, d , and i the angle contained by w, z or x, y .

Then area $= \frac{1}{2} wx \sin. (P-i) + \frac{1}{2} xy \sin. i + \frac{1}{2} yz \sin. (P-i) + \frac{1}{2} zw \sin. i$. Therefore $a^2 = w^2 + x^2 - 2wx \cos. (P-i)$

$w^2 + x^2 = \frac{a^2 - w^2 - x^2}{\cos. i}$

$wx \sin. i = \frac{1}{2} (a^2 - w^2 - x^2) \tan. i, xy \sin. i = \frac{1}{2} (x^2 + y^2 - b^2) \tan. i, yz \sin. i = \frac{1}{2} (d^2 - y^2 - z^2) \tan. i, zw \sin. i = \frac{1}{2} (z^2 + w^2 - c^2) \tan. i.$

Area $= \frac{1}{4} \{a^2 + d^2 - (b^2 + c^2)\} \tan. i.$

We know of no better rule than the above.

(3) Can ice have a lower temperature than 32° F. or 0° C.?

Certainly, ice in this respect differs from no other substance.

(4) and (5) The questions 23 (3), page 91, and 35, page 92, of Eaton's Prac. Math., are both defective.

QUESTIONS ASKED.

1. When and where was the crown at present worn by Queen Victoria made? Please give some of its interesting features—as size, weight, shape, composition, etc.

2. Was the crown lost by King John in crossing "the Wash" the same one that William the Conqueror won?

3. Can you print an old poem which I would suppose is entitled, "There's Life in the Old Flag Yet." I heard it at a lecture some two years ago and would like to see it in print.

G. E. S., P. E. I.

Will any of our readers please supply the desired information?