The Most Comprehensive
Preparation App For All Exams

MENSURATION-2D

Part-6

Agenda

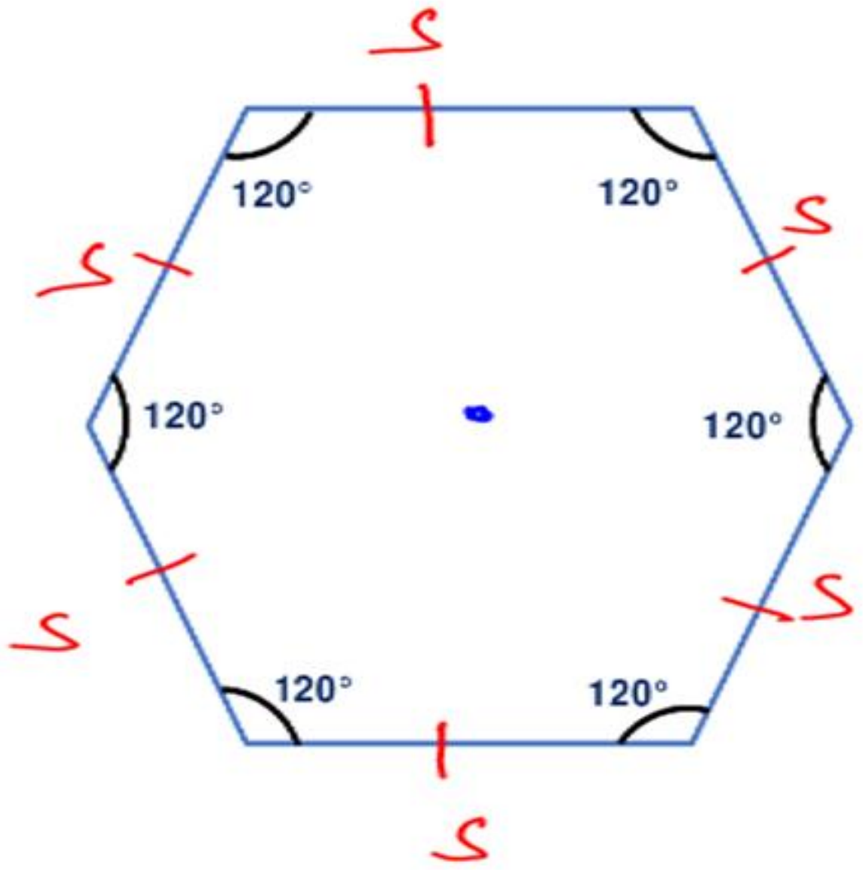
- Regular Polygon → 30 Min - 35 Min
- → Practice → (15 - 18) Q

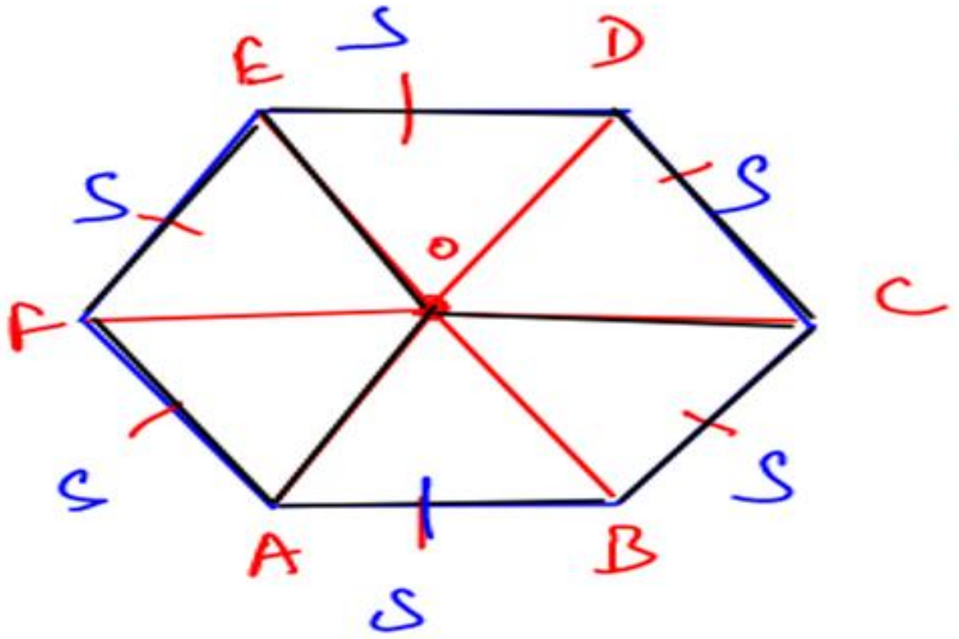
Regular Hexagon

Def: 6 sided regular polygon is called as REGULAR HEXAGON.

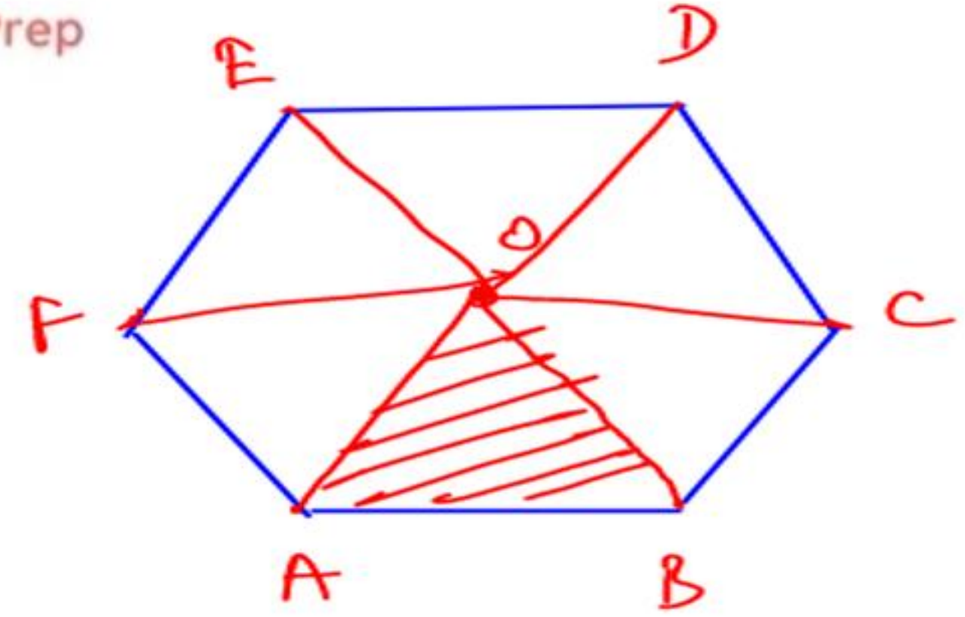
Perimeter $= 6s$

Area $= \frac{3\sqrt{3}s^2}{2}$

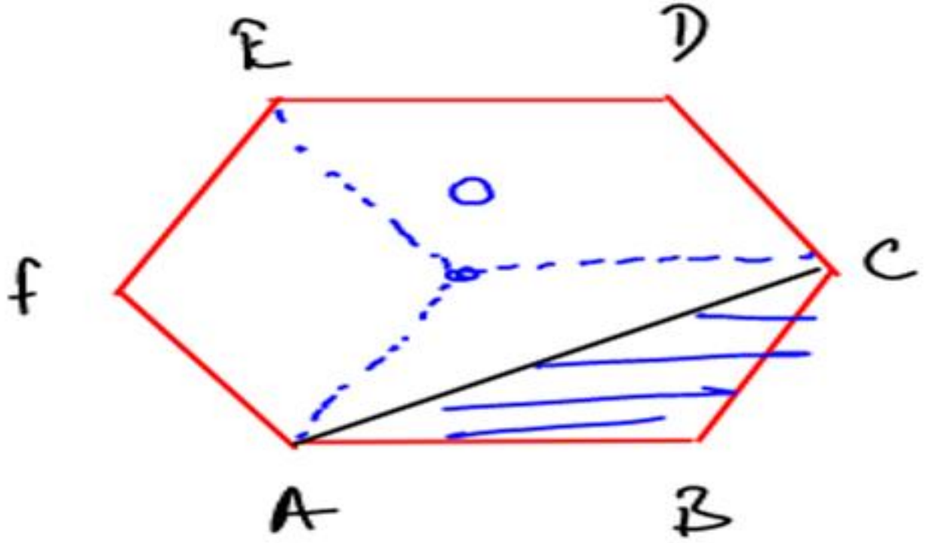




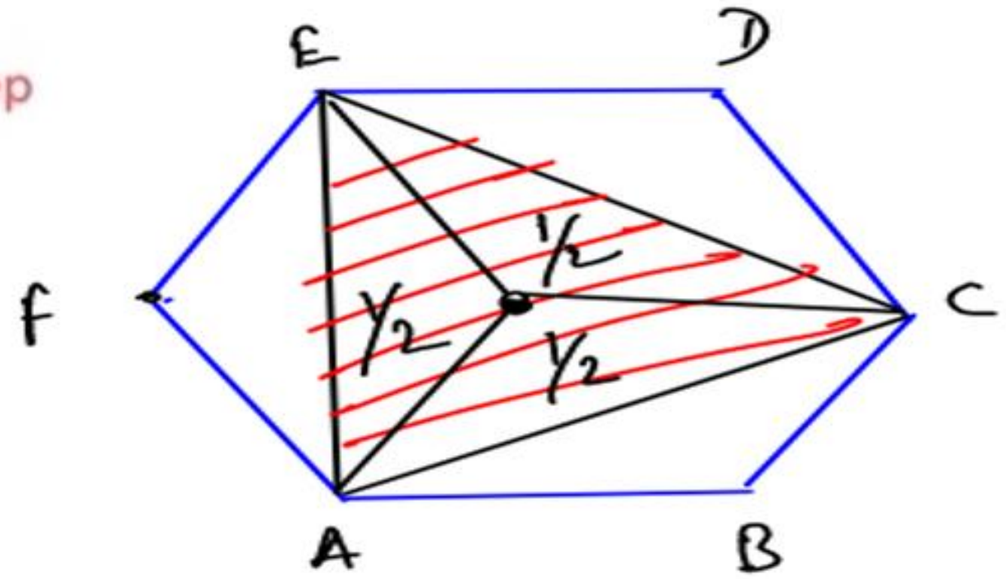
Area :- $6 \cdot \frac{\sqrt{3}}{4} s^2$



$$\frac{\text{Shaded Area}}{\text{Area of Regular Hexagon}} = \frac{1}{6}$$



$$\frac{\text{Shaded Area}}{\text{Area of Regular Hexagon}} = \frac{1}{6}$$

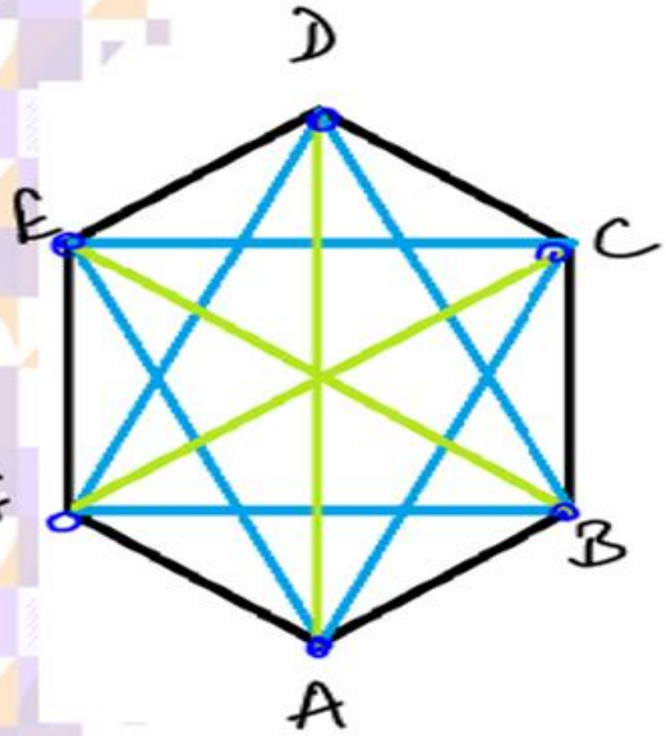


Area of shaded Region

Area of Regular Hexagon

$$\frac{1\frac{1}{2}}{3} = \frac{1}{2}$$

DIAGONALS OF A REGULAR HEXAGON



There are 6 smaller diagonals and 3 longer diagonals

Length of smaller diagonal = $\sqrt{3} \cdot S$

Length of ~~smaller~~ longer diagonal = $2 \cdot S$

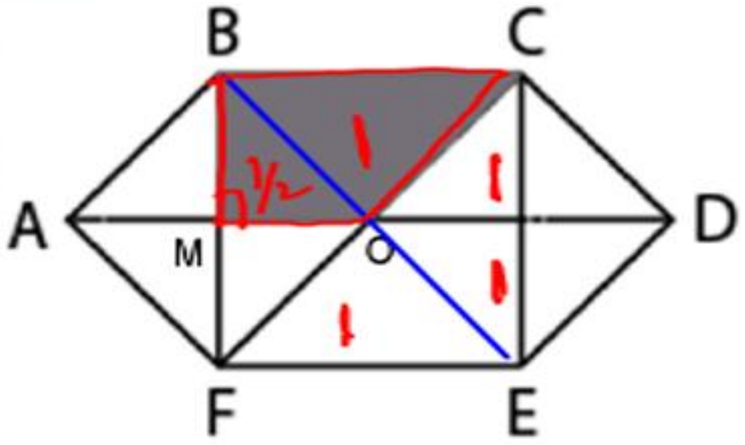
No. of diagonals in a polygon of n sides

$$= \frac{n(n-3)}{2} \Rightarrow \frac{6 \cdot 3}{2} = 9$$

Longer Diagonals $\longrightarrow$ AD, BE, CF = 3

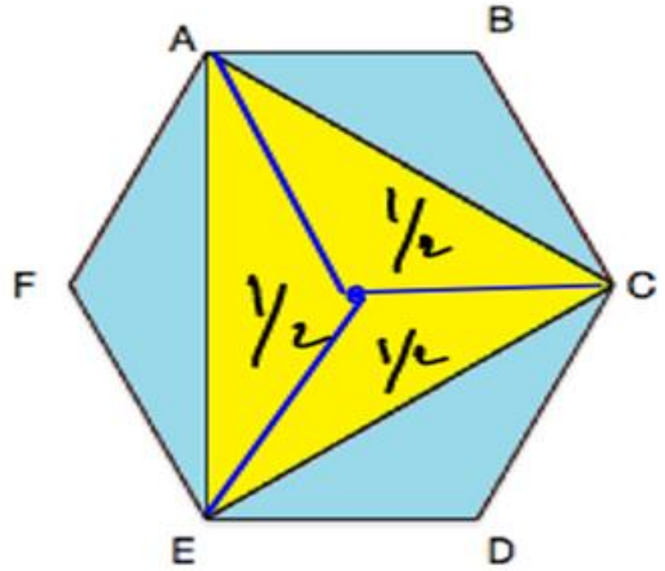
Smaller Diagonals $\longrightarrow$ AC, BD, CE, DF, EA, FB = 6

Eg. Find the area of shaded region : area of regular hexagon



$$\frac{1\frac{1}{2}}{6} = \frac{1}{4}$$

Eg. Find the area of ΔACE : area of regular hexagon

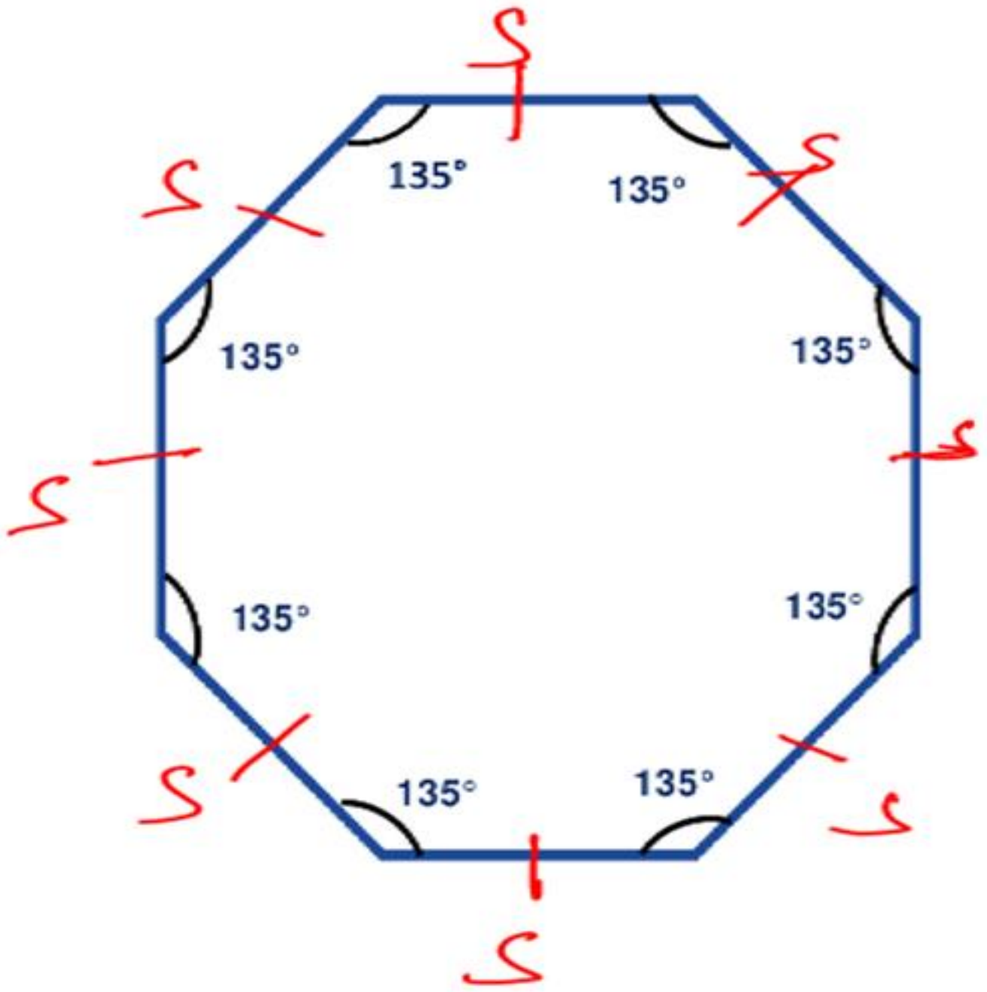


$$\frac{\frac{1}{2}}{3} = \frac{1}{2}$$

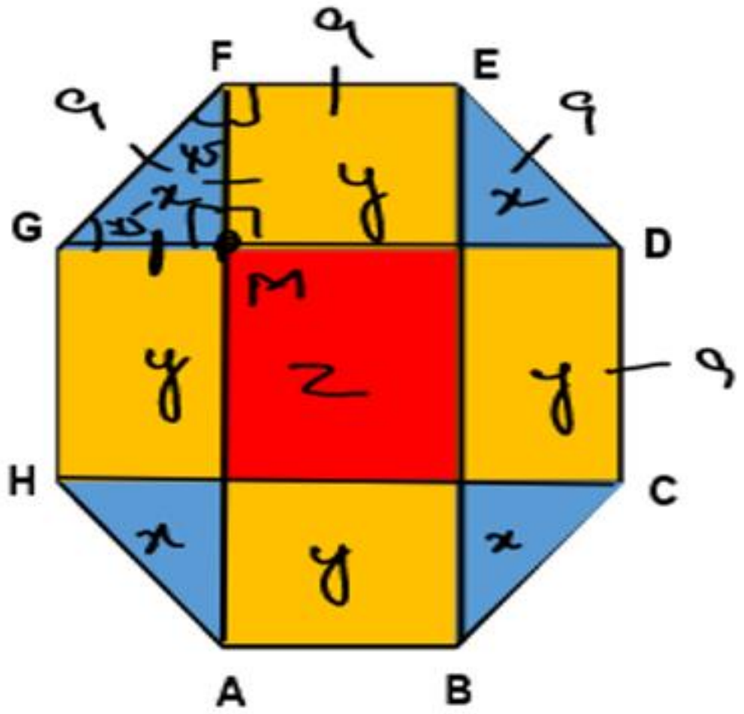
$$\rightarrow \frac{1}{2}$$

Regular Octagon

Def: 8 sided regular polygon is called as REGULAR Octagon.



Area of Regular Octagon = $2(1+\sqrt{2})a^2$



ΔGFM

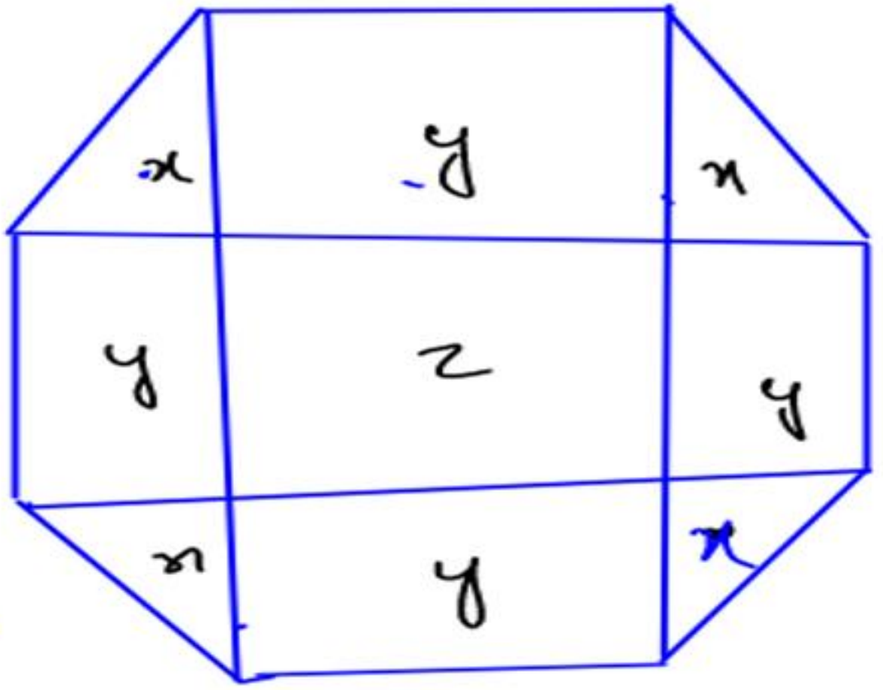
$GF = a$

$GM = MF = \frac{a}{\sqrt{2}}$

$x \rightarrow \frac{1}{2} \cdot \frac{a}{\sqrt{2}} \cdot \frac{a}{\sqrt{2}} = \frac{a^2}{4}$

$y = a \cdot \frac{a}{\sqrt{2}} = \frac{a^2}{\sqrt{2}}$

$z = a \cdot a = a^2$



$$x = \frac{a^2}{4}$$

$x : y : z$

$1 : 2\sqrt{2} : 4$

$$y = \frac{a^2}{\sqrt{2}}$$

$$z = a^2$$

$$\boxed{4x = z}$$

layer (1+3)

$\longrightarrow$ $4x + 2y$

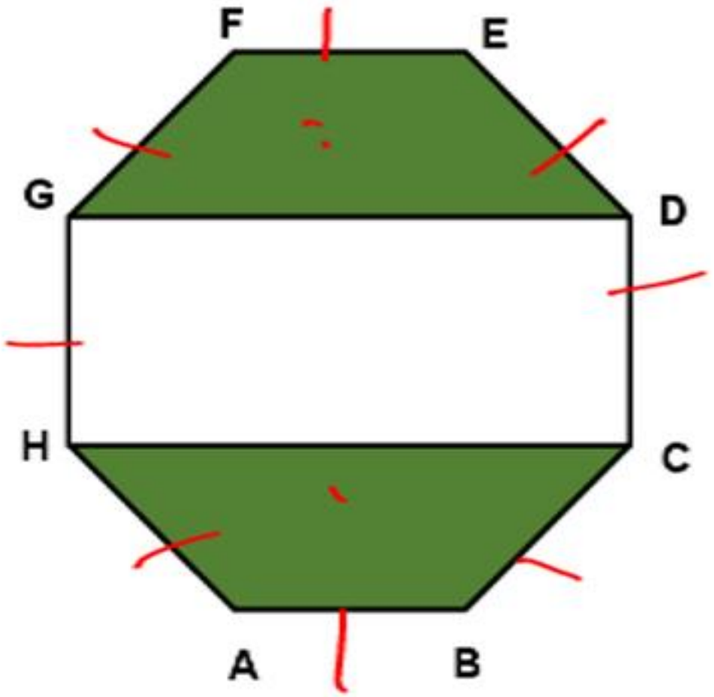
layer 2

$2y + z$

Q10. Each of the sides of this regular octagon has length 2 cm. What is the difference between the area of the shaded region and the area of the unshaded region (in cm^2)?

(a) 0 (b) 1

(c) 2 (d) $2\sqrt{2}$



Shaded = Unshaded

PRACTICE QUESTIONS

Q1. What is the maximum area of a rectangle, the perimeter of which is 18 cm?

(a) 20.25 cm^2
(b) 20.00 cm^2
(c) 19.75 cm^2
(d) 19.60 cm^2

Ans. (a)

Q2. A rectangular carpet has an area of 120 m^2 and a perimeter of 46 metre. The length of its diagonal is

(a) 17 meter (b) 21 meter

(c) 13 meter (d) 23 meter

Ans. (a)

Q3. A path of uniform width runs round the inside of a rectangular field 38 m long and 32 m wide, If the path occupies 600 m^2, then the width of the path is

(a) 30 m
(b) 5 m
(c) 18.75 m
(d) 10 m

Ans. (b)

Q4. A street of width 10 metres surrounds from outside a rectangular garden whose measurement is 200 m × 180 m. The area of the path (in square metres) is

(a) 8000 (b) 7000

(c) 7500 (d) 8200

Ans. (a)

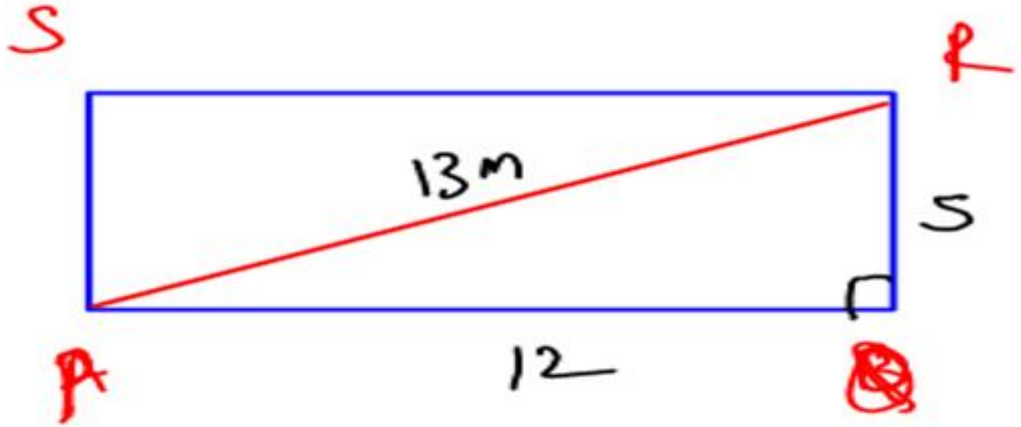
Q5. A took 15 sec. to cross a rectangular field diagonally walking at the ~~ratio of~~ speed of 52 m/min and B took the same time to cross the same field along its sides walking at the rate of 68 m/min. The area of the field is:

(a) $30\ m^2$ (b) $40\ m^2$

(c) $50\ m^2$ (d) $60\ m^2$

Time 75sec

$PR = 52 : \frac{1}{4} = 13m$

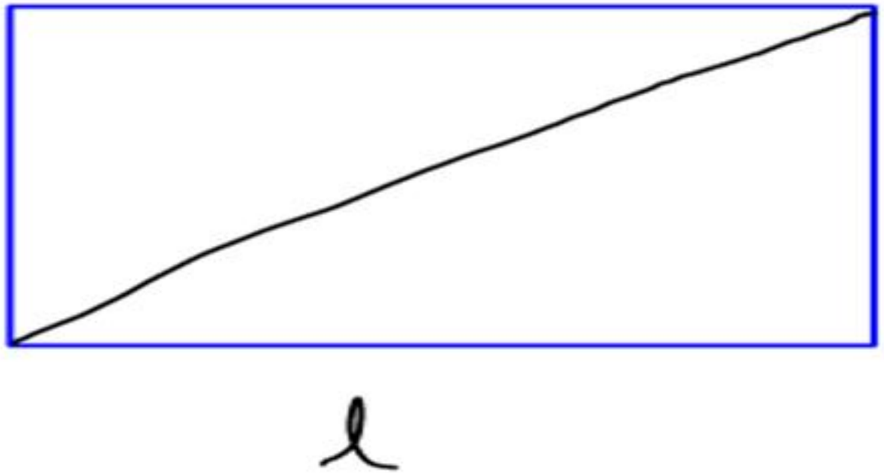


$PQ + QR = 68 \cdot \frac{1}{4} = 17m$

$Area = 12 \cdot 5$

$= 60\ m^2$

Ans. (d)



$$\sqrt{l^2+b^2} = 13$$

$$l^2+b^2 = (13)^2 \quad -(1)$$

$$l+b = 17 \quad -(2)$$

$$\underline{l^2+b^2} + 2lb = 289$$

$$169 + 2lb = 289$$

$$2lb = 120$$

$$lb \longrightarrow 60\,m^2$$

Q6. There is a rectangular tank of length 180 m and breadth 120 m in a circular field, If the area of the land portion of the field is 40000 m^2, what is the radius of the field ? (Take $\pi = 22/7$)

(a) 130 m
(b) 135 m
(c) 140 m
(d) 145 m

Ans. (c)

Q7. A rectangular park is 60 m long and 40 m wide. There are two paths in the middle of the plot parallel to its sides. The width of path is 4 meter. These paths cuts to each of the at right angle. Then find the cost of cementing the path at the rate of 7.50 Rs./m^2?

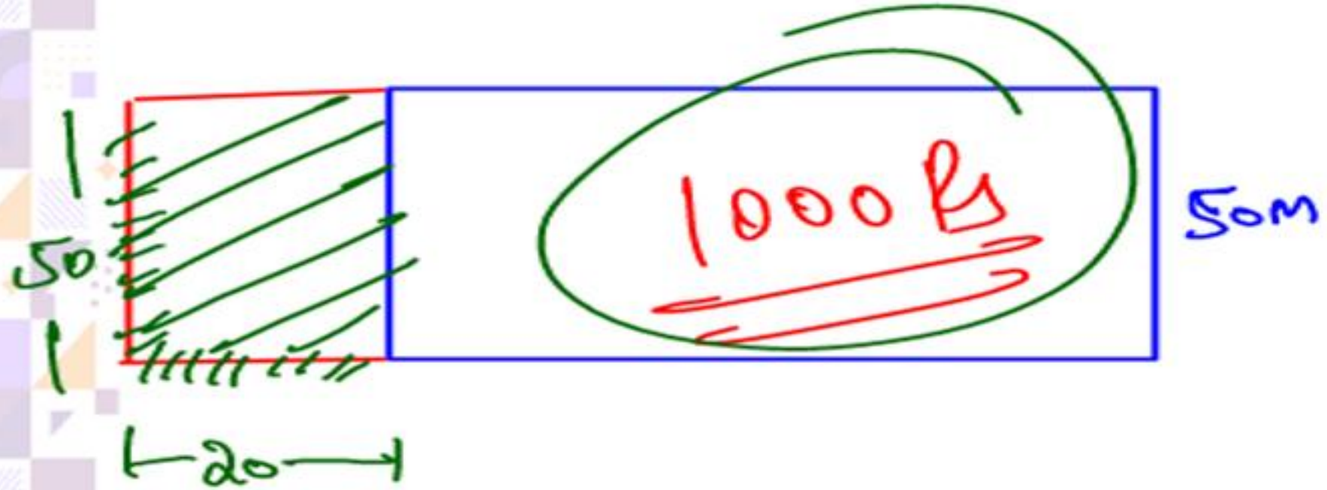
(a) Rs. 25780
(b) Rs. 2880
(c) Rs. 2650
(d) Rs. 2000

Ans. (b)

Q8. A playground is in the shape of rectangle. A sum of Rs. 1000 was spent to make the ground usable at the rate of 25 paise per sq. m. The breadth of the ground is 50 m. If the length of the ground is increased by 20 m. What will be the expenditure (in rupees) at the same rate per sq. m?

(a) 1250
(b) 1000
(c) 1500
(d) 2250

PYQ of SSC



extra Area

→ 20 × 50

1000 m²

1000 × .25 ₹

→ 250 ₹

Ans. (a)

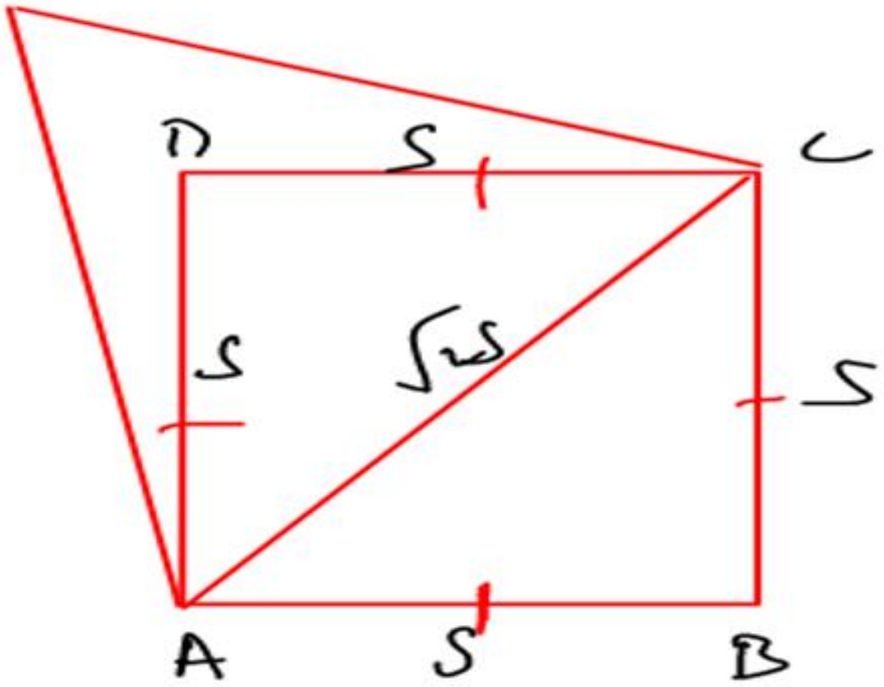
Q9. An equilateral triangle is made on the diagonal of a square. Then find the ratio of their areas.

(a) $\sqrt{3} : 2$

(b) $\sqrt{2} : \sqrt{3}$

(c) $2 : \sqrt{3}$

(d) $1 : \sqrt{2}$



$$\frac{\sqrt{3}}{4} \cdot \frac{(\sqrt{2}S)^2}{S^2}$$

$$\frac{\sqrt{3}}{4} \cdot 2$$

$$= \frac{\sqrt{3}}{2}$$

Ans. (a)

BYJU'S ExamPrep

Randy

Relationship b/w Perimeter & Diagonals of Rhombus

$$D_1^2 + D_2^2 = \left(\frac{P}{2}\right)^2$$

Q10. Four equal sized maximum circular plates are cut from a square paper sheet of area 784 sq. cm. The circumference of each plate is ;

(a) 22 cm (b) 44 cm

(c) 66 cm (d) 88 cm

Ans. (b)

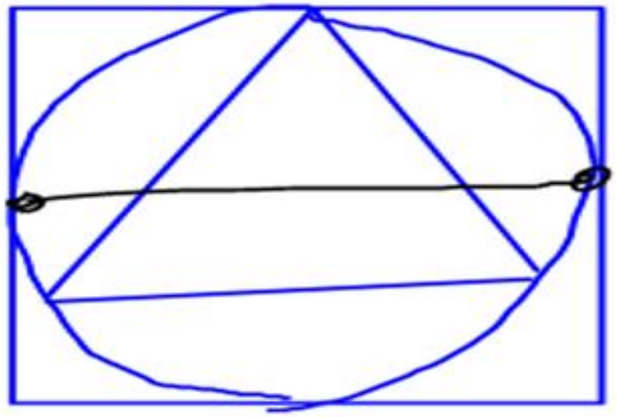
Q11. A circle is inscribed in a square whose diagonal is $12\sqrt{2}$ cm. An equilateral triangle is inscribed in that circle. The length of the side of the triangle is ;

(a) $4\sqrt{3}$ cm

(b) $8\sqrt{3}$ cm

(c) $6\sqrt{3}$ cm

(d) $11\sqrt{3}$ cm



$\sqrt{2}S = 12\sqrt{2}$

$S = 12$

$D = 12\text{cm}$

$R = 6\text{ cm}$

$\frac{\text{side}}{\sqrt{3}} = 6$

$\text{side} = 6\sqrt{3}$

Ans. (c)

Q12. The length of one side of a rhombus is 6.5 cm and its altitude is 10 cm. If the length of its one diagonal be 26 cm, the length of the other diagonal will be ;

(a) 5 cm (b) 10 cm

(c) 6.5 cm (d) 26 cm

Ans. (a)

Q13. The measure of each of two opposite angles of a rhombus is 60° and the measure of one of its sides is 10 cm. The length of its smaller diagonal is:

(a) 10 cm

(b) $10\sqrt{3}$ cm

(c) $10\sqrt{2}$ cm

(d) $\frac{5}{2}\sqrt{2}$ cm

$\theta \rightarrow$ Acute Angle

Length of shorter diagonal $= 2s \sin\theta/2$

Length of longer diagonal $= 2s \cos\theta/2$

Shorter Diagonal $= 2 \cdot 10 \cdot \frac{1}{2}$

$= 10\text{cm}$

Ans. (a)

Q14. Perimeter of a rhombus is 2p unit and sum of the lengths of diagonals is m unit, then the area of the rhombus is

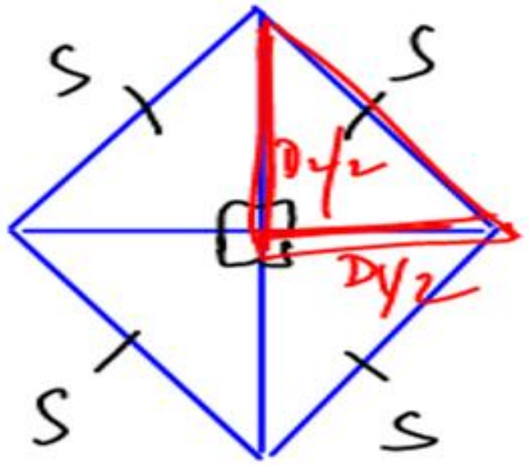
Time 75sec

(a) $\frac{1}{4}m^2p$ sq. unit

(b) $\frac{1}{4}mp^2$ sq. unit

(c) $\frac{1}{4}(m^2-p^2)$ sq. unit

(d) $\frac{1}{4}(p^2-m^2)$ sq. unit.



$4S = 2p$ $\quad 2S = p$

$D_1 + D_2 = m$ — (1)

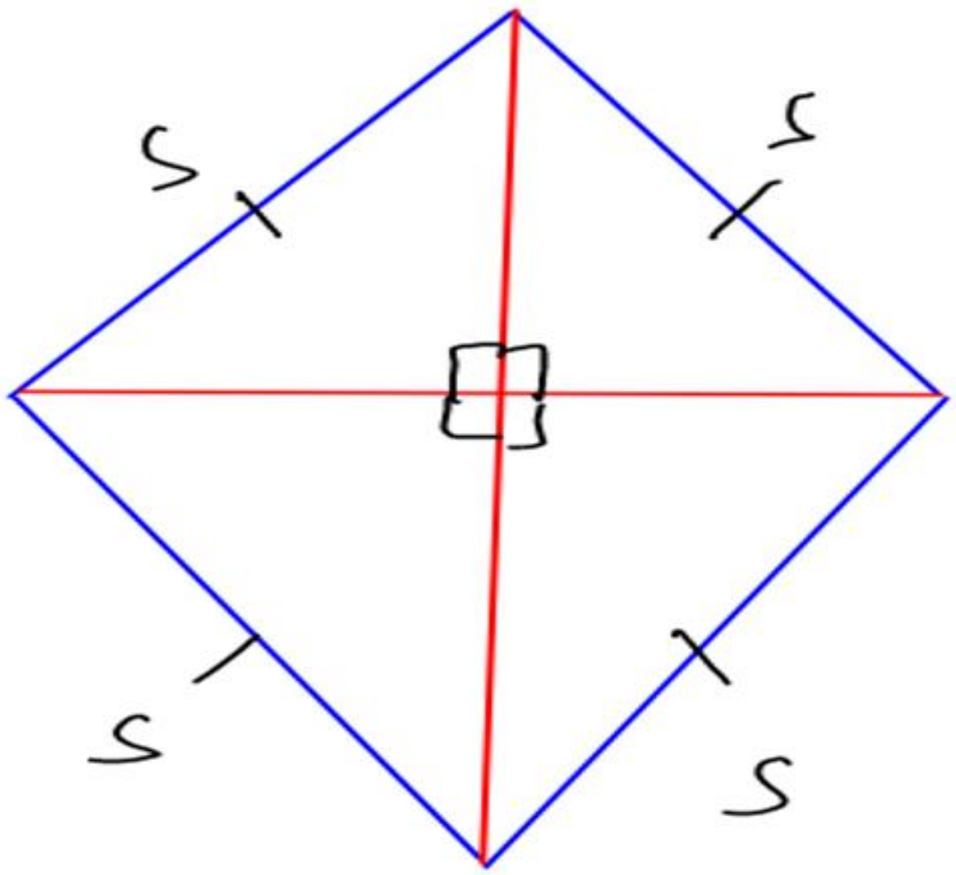
$D_1^2 + D_2^2 + 2D_1D_2 = m^2$

$4S^2 + 2D_1D_2 = m^2$

$2D_1D_2 = m^2 - p^2$

$\frac{1}{2}D_1D_2 = \frac{1}{4}(m^2-p^2)$

Ans. (c)



$4S = 2p$

$2S = p$

Perimeter $= 2p$

$D_1 + D_2 = M$

Area $= ??$

$D_1^2 + D_2^2 + 2D_1D_2 = M^2$

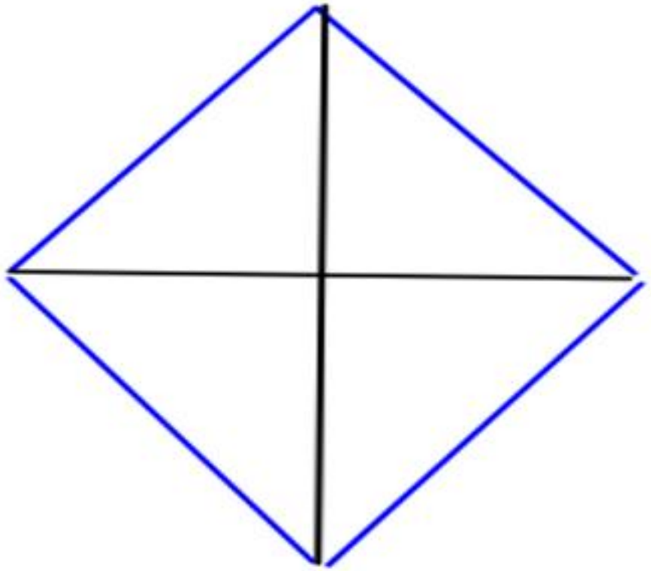
$4S^2 + 4\left(\frac{1}{2}D_1D_2\right) = M^2$

$p^2 + 4 \text{Area} = M^2$

$\text{Area} \Rightarrow \frac{M^2 - p^2}{4}$

Q15. The two diagonals of a rhombus are of length 55 cm and 48 cm. If p is the height of the rhombus, then which one of the following is correct?

(a) 36 cm < p < 37 cm
(b) 35 cm < p < 36 cm
(c) 34 cm < p < 35 cm
(d) 33 cm < p < 34 cm



$D_1 = 55$ cm $\quad D_2 = 48$ cm

$$\frac{1}{2} D_1 D_2 = S \cdot h$$

$$D_1^2 + D_2^2 = 4S^2$$

$$3025 + 2304 = 4S^2$$

$$5329 = 4S^2$$

$$73 = 2S$$

$$S = 73/2$$

$$\frac{1}{2} \cdot 55 \cdot 48 = \frac{73}{2} \cdot h$$

$$h = \frac{2640}{73} = 36.$$

Ans. (a)

Q16. Area of a rhombus is 2016 cm² and one of its sides is 65 cm. Find its smaller diagonal.

(a) 10 cm
(b) 32 cm
(c) 20 cm
(d) 1.5 cm

$\frac{1}{2} D_1 D_2 = 2016$

$2 D_1 D_2 = 8064$

$D_1^2 + D_2^2 = 4(65)^2$

$D_1^2 + D_2^2 = 16900$

$(D_1 + D_2)^2 = D_1^2 + D_2^2 + 2 D_1 D_2$

$(D_1 + D_2)^2 = 24964$ (8836)

$(D_1 - D_2)^2 = 16900 - 8064 =$

$D_1 + D_2 = 158$ — (1)

$D_1 - D_2 = 94$ — (2)

$2 D_2 = 64$

$D_2 = 32$

Ans. (b)

Q17. The area of an isosceles trapezium is 176 cm^2 and the height is 2/11 of the sum of its parallel sides. If the ratio of the length of the parallel sides is 4 : 7, then the length of a diagonal (in cm) is

(a) $2\sqrt{137}$

(b) 24

(c) $\sqrt{137}$

(d) 28

Ans. (a)

Q18. Side AB = 24 of a parallelogram ABCD is 24cm and side AD = 16 cm. The distance between AB and CD is 10 cm, then find the distance between AD and BC.

(a) 16 cm
(b) 18 cm
(c) 15 cm
(d) 26 cm

Ans. (c)

Q19. Two sides of a plot measuring 32m and the angle between them is a perfect right angle. The other two sides measure 25m each and the other three angles are not right angles. The area of the plot in m^2 is

(a) 786
(b) 534
(c) 696.5
(d) 684

Ans. (d)

Q20. The perimeter of a triangle is 24 cm and the circumference of its in-circle is 44 cm. Then the area of the triangle is (Take $\pi = 22/7$)

(a) 56 sq. cm (b) 48 sq. cm

(c) 84 sq. cm (d) 68 sq. cm

Ans. (c)

Q21. The perimeter of a triangle is 30 cm and its area is 30 cm^2. If the largest side measures 13m, what is the length of the smallest side of the triangle?

(a) 3 cm
(b) 4 cm
(c) 5 cm
(d) 6 cm

$p = 30cm$

$Area = 30cm^2$

Largest side = 13

Smallest side = ?

$a^2 - 17a + 60 = 0$

$a = 5, 12$

let a, b are other 2 sides

$a + b = 17 \quad b = 17 - a$

a, b, 13 $\quad Area = 30$

$Area = \sqrt{15(15-a)(15-b)(2)} = 30$

$15(15-a)(15-b)(2) = 30 \cdot 30$

$(15-a)(a-2) = 30$

$15a - 30 - a^2 + 2a = 30$

Ans. (c)

Q22. If ΔPQR, the line drawn from the vertex P intersects QR at a point S. If QR = 4.5 cm and SR = 1.5 cm, then the ratio of the area of ΔPQS and ΔPSR is

(a) 4 : 1
(b) 3 : 1
(c) 3 : 2
(d) 2 : 1

Ans. (b)

Q23. The perimeter of an isosceles, right-angled triangle is 2p unit. The area of the same triangle is

(a) $\left(3-2\sqrt{2}\right)p^2$ sq. unit

(b) $\left(2+\sqrt{2}\right)p^2$ sq. unit

(c) $\left(2-\sqrt{2}\right)p^2$ sq. unit

(d) $\left(3-\sqrt{2}\right)p^2$ sq. unit

Ans. (a)

Q24. The altitude drawn to the base of an isosceles triangle is 8 cm and its perimeter is 64 cm. The area (in cm^2) of the triangle is

(a) 240
(b) 180
(c) 360
(d) 120

Ans. (d)

Q25. The perimeter of an isosceles triangle is 544 cm and each of the equal sides is 5/6 times the base. What is the area (in cm^2) of the triangle?

(a) 12,378 (b) 18,372

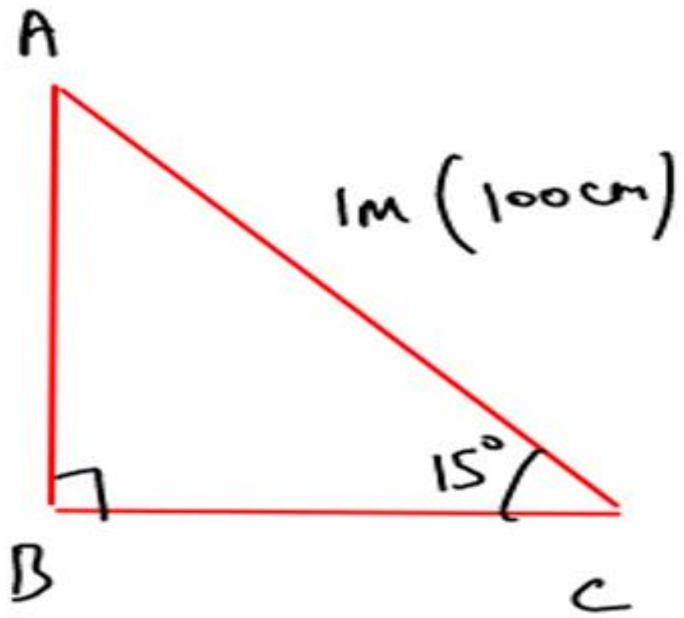
(c) 17,832 (d) 13872

Ans. (d)

Q26. One of the angles of a right-angled triangle is 15° and the hypotenuse is 1 m. The area of the triangle (in sq. cm.) is

(a) 1220 (b) 1250

(c) 1200 (d) 1215



$$\text{Area} = \frac{H^2}{4}\sin 2\theta$$

$$= \frac{(100)^2}{4}\cdot \sin 30$$

$$= 1250\ \text{cm}^2$$

Ans. (b)

Q27. ΔABC is an equilateral triangle, P and Q are two points on $\overline{AB}$ and $\overline{AC}$ respectively such that $PQ \parallel \overline{BC}$. If $PQ = 5$ cm, then area of ΔAPQ is :

(a) $\frac{25}{4}$ cm^2

(b) $\frac{15}{\sqrt{3}}$ cm^2

(c) $\frac{25\sqrt{3}}{4}$ cm^2

(d) $25\sqrt{3}$ cm^2

Ans. (c)

Q28. In an equilateral triangle ABC of side 10 cm, the side BC is trisected at D & E. Then the length (in cm) of AD is

(a) $3\sqrt{7}$

(b) $7\sqrt{3}$

(c) $\frac{10\sqrt{7}}{3}$

(d) $\frac{7\sqrt{10}}{3}$

Ans. (c)

Q29. The sides of a triangle are 50 cm, 78 cm and 112 cm then find its smallest altitude.

(a) 20 cm (b) 30 cm

(c) 40 cm (d) 50 cm

Ans. (b)

Q30. In the ΔABC, the base BC is trisected at D and E. The line through D, parallel to AB, meets AC at F and the line through E parallel to AC meets AB at G. If EG and DF intersect at H, then what is the ratio of the sum of the area of parallelogram AGHF and the area of the ΔDHE to the area of the ΔABC.

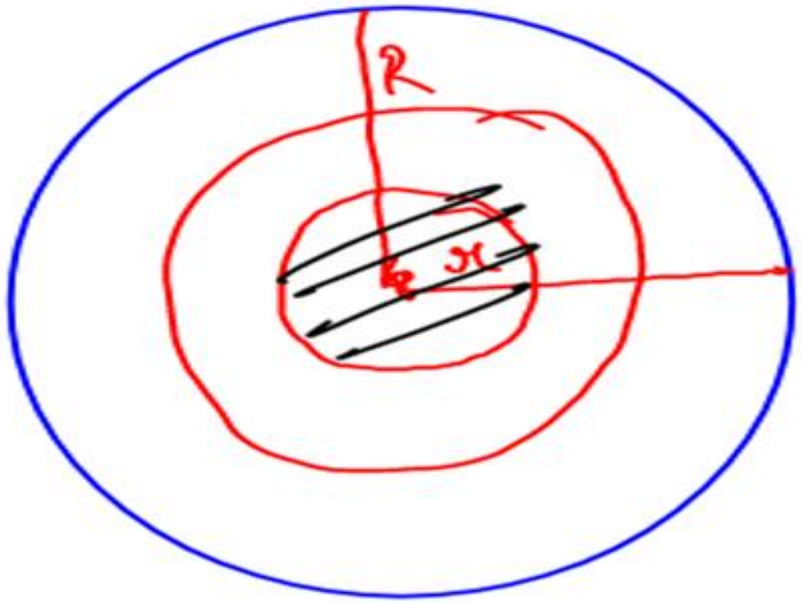
(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{6}$

Ans. (b)

Q31. The area of circle whose radius is 6 cm is trisected by two concentric circles. The radius of the smallest circle is

(a) $2\sqrt{3}$ cm (b) $2\sqrt{6}$ cm

(c) 2 cm (d) 3 cm



$R = 6$ cm

Area of Biggest Circle $= 36\pi$

$\pi r^2 = 12\pi$

$r = 2\sqrt{3}$

Ans. (a)

Q32. A person rides a bicycle around a circular path of radius 50m. The radius of the wheel of the bicycle is 50 cm. The cycle comes to the starting point for the first time in 1 h. What is the number of revolutions of the wheel in 15 min?

(a) 20
(b) 25
(c) 30
(d) 35

Ans. (b)

Q33. What is the area of the larger segment of a circle formed by a chord of length 5 cm subtending an angle of 90° at the centre?

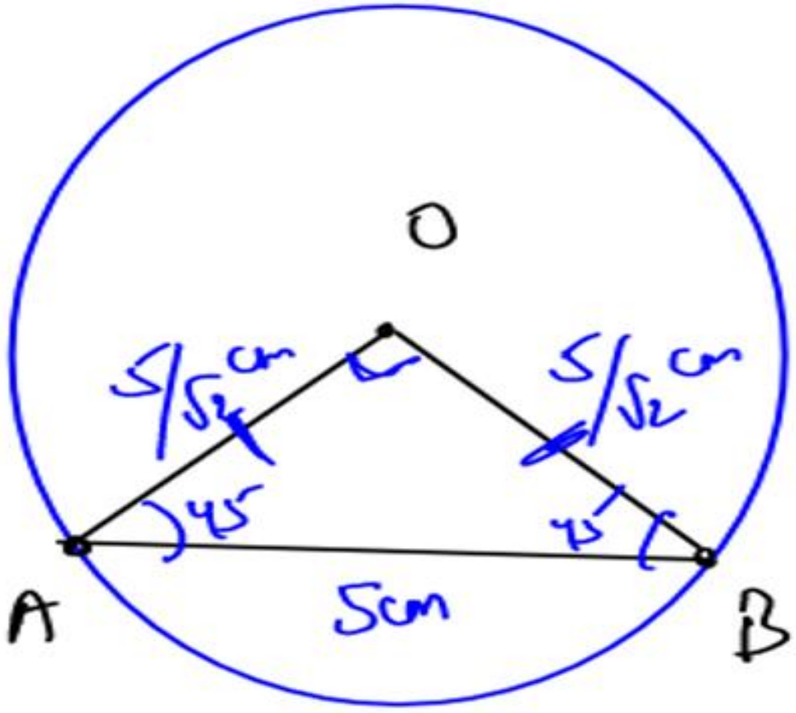
(a) $\frac{25}{4}\left(\frac{\pi}{2}+1\right)$ cm²

(b) $\frac{25}{4}\left(\frac{\pi}{2}-1\right)$ cm²

(c) $\frac{25}{4}\left(\frac{3\pi}{2}+1\right)$ cm²

(d) None of these

Ans. (c)



$$\frac{75\pi+50}{8}$$

$$R = 5/\sqrt{2} \text{ cm}$$

Area of Minor segment

$$\pi \cdot \frac{25}{2} \cdot \frac{90}{360} - \frac{1}{2} \cdot \frac{25}{2} \cdot 1$$

$$\frac{25\pi}{8} - \frac{25}{4}$$

$$\text{Area} = \frac{\pi \cdot 25}{2} - \left[\frac{25\pi}{8} - \frac{25}{4}\right]$$

$$= \frac{25\pi}{2} - \frac{25\pi}{8} + \frac{25}{4}$$

$$= \frac{100\pi - 25\pi + 50}{8}$$

Ans. (b)

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* Doubts → Telegram

Basic Arithmetic