CAT

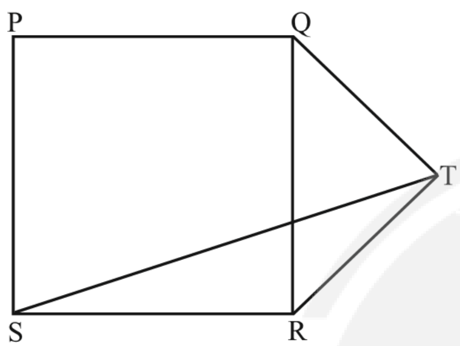
MBA PIONEER 2024

QUANTITATIVE APTITUDE

DPP:09

Quadrilaterals 2

Q1 Given below is a rhombus PQRS whereas QTR is an isosceles triangle with QR = RT. Angle RQT = 68° and angle PSR = 82°. Find the value in degrees of angle STR?

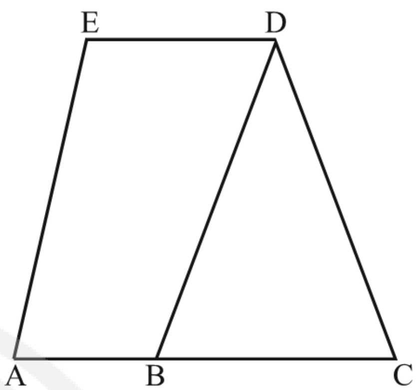


(A) 98
(B) 38
(C) 162
(D) 19

Q2 Find the area of an isosceles trapezium having a perimeter of 264 cm circumscribing a circle given that one of the parallel sides of the trapezium is five times as long as the other one.

(A) $726\sqrt{5}cm^2$
(B) $1452\sqrt{5}cm^2$
(C) $726\sqrt{10}\,cm^2$
(D) $1452\sqrt{10}\,cm^2$

Q3 Puneet bought a toy which is in the shape of a quadrilateral as shown below. If the area of the triangle BCD and the area of the trapezium ABDE are equal and AC = 68 cm, DE = 24 cm. Find the value of BC?



(A) 22 cm
(B) 26 cm
(C) 46 cm
(D) 28 cm

Q4 A table top runway at Kuala Lumpur is in the shape of a trapezium and has an area of 600 km^2. The distance between the two non-oblique sides of the runway is 20 km. Find the length (in km) of each of the parallel sides if one of them is shorter than the other by 4 km.

(A) 30 and 34
(B) 28 and 32
(C) 28 and 34
(D) 32 and 34

Q5 Three of the vertices of a rhombus lie on a circle with Centre at A such that A is one of the vertices of the rhombus. Find the radius of the circle given the area of the rhombus is $192\sqrt{3}cm^2$.

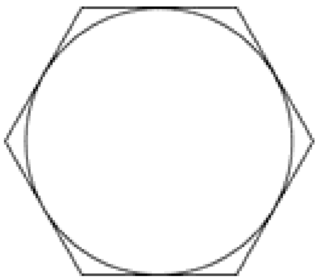
(A) $6\sqrt{6}cm$
(B) $10\sqrt{6}cm$
(C) $3\sqrt{6}cm$
(D) $8\sqrt{6}cm$

Q6 Let a circle of area 616 cm^2 be inscribed inside a rhombus of side 35 cm. Find the area of the rhombus?

(A) 980 cm^2 (B) 245 cm^2

(C) 490 cm^2 (D) 1080 cm^2

Q7 Given below is a diagram in which a circle is inscribed in a regular hexagon of side 24 cm. Find the area of the portion lying outside the circle but inside the hexagon.



(A) $\frac{2}{7}\left(6048\sqrt{3}-9504\right)cm^2$

(B) $\frac{1}{7}\left(3024\sqrt{3}-4752\right)cm^2$

(C) $\frac{1}{7}\left(6048\sqrt{3}-9504\right)cm^2$

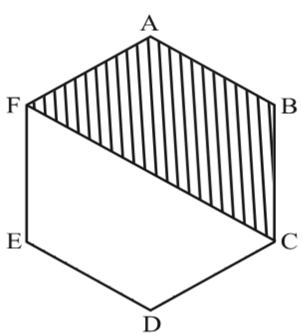
(D) $\frac{2}{7}\left(3024\sqrt{3}-4952\right)cm^2$

Q8 If the length of the smaller diagonal of a regular hexagon is given as 14 cm. Find the area of the hexagon.

(A) $198\sqrt{3}cm^2$ (B) $98\sqrt{3}cm^2$

(C) $196\sqrt{3}cm^2$ (D) $99\sqrt{3}cm^2$

Q9 Find the area (in sq. units) of the shaded portion of the regular hexagon given below given that the length of its longer diagonal is 5 units.



(A) $\frac{25\sqrt{3}}{16}$ (B) $\frac{75\sqrt{3}}{32}$

(C) $\frac{75\sqrt{3}}{16}$ (D) $\frac{75\sqrt{3}}{8}$

Q10 If the area of a regular hexagon is $96\sqrt{3}$ sq. units. Find the length (in units) of the diagonal connecting the 1st and the 4th vertex.

(A) 16 (B) 4

(C) 32 (D) 64

Q11 Find the length (in cm) of the smallest diagonal in a regular hexagon of perimeter 54 cm

(A) $18\sqrt{3}$ (B) $9\sqrt{3}$

(C) $6\sqrt{3}$ (D) $27\sqrt{3}$

Q12 A circle of radius 7 cm circumscribes a regular hexagon. Find the ratio of area which is not covered by the hexagon to the area covered by the hexagon

(A) $3\sqrt{3}:2\pi-3\sqrt{3}$ (B) $2-3\sqrt{3}:3\sqrt{3}$

(C) $\pi-3\sqrt{3}:3\sqrt{3}$ (D) $2\pi-3\sqrt{3}:3\sqrt{3}$

Q13 Which all of the following properties apply to an isosceles trapezium

(a) Diagonals bisect opposite angles

(b) Opposite sides are parallel to each other

(c) Diagonals are bisectors of each other

(d) Diagonals are congruent

(A) Both a and b (B) Both b and d

(C) Only d (D) Only b

Q14 There is an isosceles trapezium with the lengths of the parallel sides being 12 cm and 18 cm. If the area of the trapezium is $45\sqrt{5}cm^2$, then find the length (in cm) of each of its non-parallel sides.

(A) $4\sqrt{6}$ (B) $3\sqrt{6}$

(C) $2\sqrt{6}$ (D) $\sqrt{6}$

Q15 PQRS is a trapezium where PS is parallel to QR. The diagonals PR and QS intersect each other at the point O. If PO = 3, RO = x – 3, QO = 3x – 19 and SO = x – 5, find the value of x

(A) 7 and 8 (B) 8 and 10

(C) 8 and 9 (D) 7 and 10

Q16 ABCD is a rhombus whose side AB = 16 cm and Angle ABC = 60°. Find the length of diagonal BD (in cm)

(A) $16\sqrt{3}$ (B) $8\sqrt{3}$
(C) $24\sqrt{3}$ (D) $48\sqrt{3}$

Q17 PQRS is a cyclic trapezium whose sides PS and QR are parallel to each other. If Angle PQR = 63°. Find the measure of Angle QRS (in degrees)

(A) 27 (B) 117
(C) 63 (D) 116

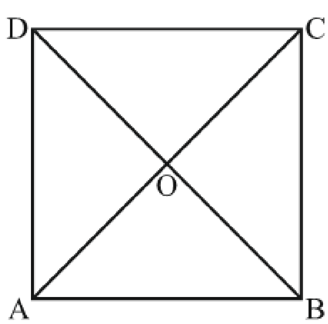
Q18 Let PQRSTUVW be a regular octagon inscribed in a circle with Centre at O. Find the ratio of Angle POQ to Angle OPQ

(A) 1 : 3 (B) 2 : 3
(C) 3 : 2 (D) 4 : 9

Q19 Find the value of 'x' given that the difference between an exterior angle of (x + 3) sided regular polygon and an exterior angle of (x – 2) sided polygon is 12 degrees.

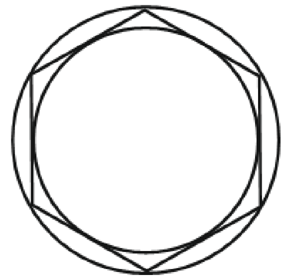
(A) 12
(B) –13
(C) 11
(D) 23

Q20 A rhombus ABCD has been given below where AC = 8 and BD = 12. Find the sum of the perimeter and the area of the given rhombus



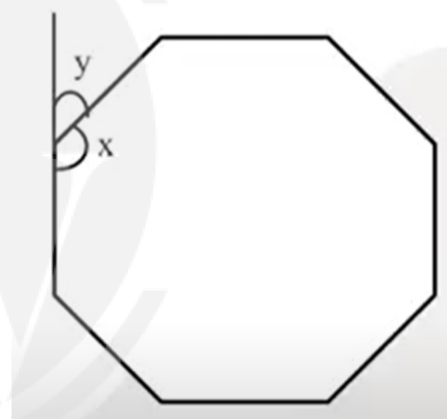
(A) $4\left(\sqrt{13}+6\right)$ (B) $\sqrt{13}\left(\sqrt{8}+6\right)$
(C) $6\left(\sqrt{13}+6\right)$ (D) $8\left(\sqrt{13}+6\right)$

Q21 In the figure given below, a circle is inscribed inside a regular hexagon and the hexagon itself is inscribed in another circle. Find the ratio of the circumradius of the regular hexagon to its inradius



(A) $\sqrt{3} : 2$ (B) $1 : \sqrt{6}$
(C) $2 : \sqrt{3}$ (D) $\sqrt{3} : 1$

Q22 Given below is a regular octagon, find the ratio of x : y



(A) 3 : 4 (B) 1 : 3
(C) 2 : 3 (D) 3 : 1

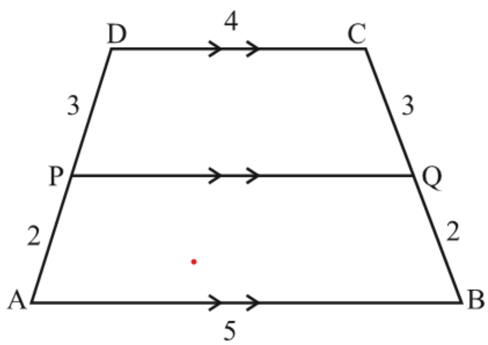
Q23 Find the number of diagonals of a polygon with 154 sides.

(A) 11327 (B) 11627
(C) 11127 (D) 11427

Q24 Each of the interior angles of a regular polygon containing 'n' sides is equal to 170. Find the value of 'n'

(A) 36 (B) 18
(C) 34 (D) 17

Q25 Given a trapezium ABCD with AB II CD II PQ. Find the length of PQ



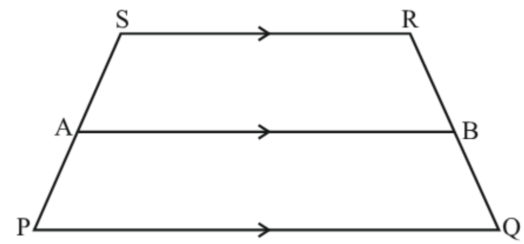
(A) 4.2 (B) 4.4
(C) 4.6 (D) 4.8

Q26 If each of the exterior angles of a regular polygon measures 24 degrees, find the absolute difference between each of the interior angles and the number of the sides of the said polygon

Q27 Find the sum (in degrees) of all the internal angles of a triskaidecagon.

Q28 The parallel sides of a trapezium measure 8 cm and 6 cm each whereas the distance between both these sides is 5 cm. Find the area of such a trapezium in square cm.

Q29 A trapezium PQRS has been given below with PQ = 12, RS = 8 and PQ II RS. A line segment AB is drawn inside the trapezium as shown below. If the area of ASRB = 4 and the length of AB is $4\sqrt{3}$. Find the area of the region PABQ.



Q30 A regular polygon has been drawn as shown below. Find the sum of all its exterior angles.

Answer Key

Q1	(D)
Q2	(B)
Q3	(C)
Q4	(B)
Q5	(D)
Q6	(A)
Q7	(C)
Q8	(B)
Q9	(C)
Q10	(A)
Q11	(B)
Q12	(D)
Q13	(C)
Q14	(B)
Q15	(C)
Q16	(A)
Q17	(C)
Q18	(B)
Q19	(A)
Q20	(D)
Q21	(C)
Q22	(D)
Q23	(B)
Q24	(A)
Q25	(C)
Q26	141
Q27	1980
Q28	35
Q29	6
Q30	360

Hints & Solutions

Q1 Text Solution:

Given QR = RT.

Therefore, Angle RQT = Angle RTQ = 68

Thus, Angle QRT = 180 – (68 + 68)

Angle QRT = 44.

Angle PSR = 82, therefore SPQ = 180 – 82 = 98.

Therefore, Angle SRT = 98 + 44 = 142

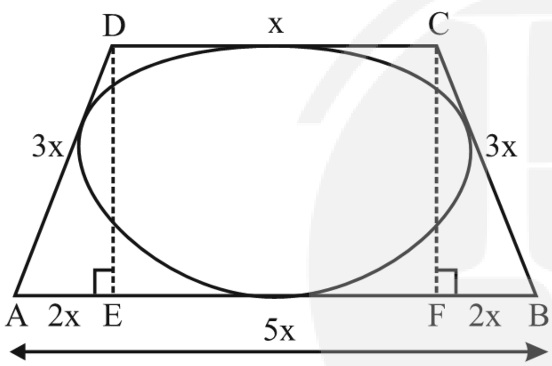
As PQRS is a rhombus, QR = RS = RT.

Therefore, Angle RST = Angle STR

$= \frac{(180-142)}{2}$

= 19.

Q2 Text Solution:



Let ABCD be a trapezium such that AB || CD.

Also, AD = BC since it is an isosceles trapezium

Let the length of CD= x, then AB = 5x

Also, AB + CD = AD + BC

6x = 2AD

AD = BC = 3x.

Therefore, the Perimeter of the trapezium

12x = 264

x = 22

Let DE and CF be the heights of the trapezium,

Then AE = FB = 2x.

$DE^2 = AD^2 - AE^2$

$DE^2 = 5x^2$

DE = $\sqrt{5}x$

The area of the trapezium will be

$\frac{1}{2}(sum\ \text{of paarllel sides}) \times height$

$\frac{1}{2}(6x)(\sqrt{5}x)$

$3\sqrt{5}x^2$

$= 1452\sqrt{5}cm^2$.

Q3 Text Solution:

Let the height of the trapezium and the triangle be h.

Given that AC = 68 cm.

Let AB = x, then BC = 68 – x

Also, we have been given DE = 24.

Area of the trapezium will be

$\frac{1}{2}(sum\ \text{of parallel sides}) \times height$

$= \frac{1}{2}(24 + x)h$

Area of the triangle BCD will be

$= \frac{1}{2} \times base \times height$

$= \frac{1}{2} \times (68 - x)h$

Equating both the areas obtained above,

$\frac{1}{2}(24 + x)h = \frac{1}{2} \times (68 - x)h$

24 + x = 68 – x

2x = 44

x = 22

Therefore, BC = 68 – x

BC = 46 cm.

Q4 Text Solution:

Given that the distance between two non-oblique sides is 20 km, therefore the height of the runway will be 20.

Let the length of the smaller of the parallel sides x, then the length of the larger parallel side will be x + 4.

Therefore,

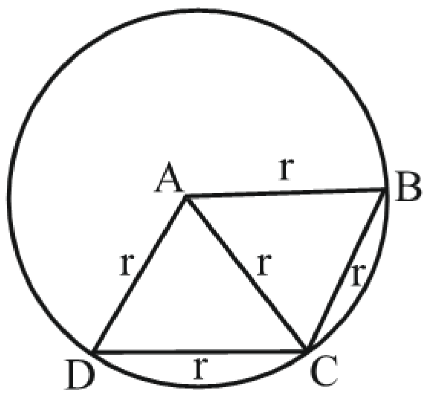
$\frac{1}{2}(x + x + 4) \times 20 = 600$

2x + 4 = 60

x = 28.

Therefore, the two parallel sides will measure 28 and 32 kms.

Q5 Text Solution:



Let there be a rhombus ABCD with centre at A.

Therefore, AB = BC = CD = DA (sides of a rhombus)

Also, AB = BC = AC = radius of the circle (r)

Therefore, Triangle ABC is equilateral, similarly Triangle ACB will also be equilateral and the sum of the areas of these two triangles will be the area of the rhombus

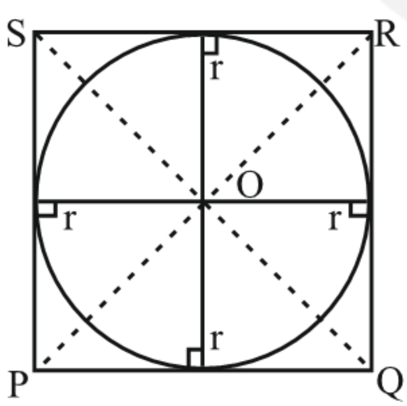
Therefore area of the rhombus $= \frac{\sqrt{3}}{4}r^2 + \frac{\sqrt{3}}{4}r^2$

$192\sqrt{3} = \frac{\sqrt{3}}{2}r^2$

$r^2 \ = \ 384$

$r = 8\sqrt{6}cm$

Q6 Text Solution:



Given that the area of the circle is 616, therefore the radius of the circle 'r' will be

$\frac{22}{7} \times r^2 = 616$

r = 14 cm.

Also, the side of the rhombus is given as 35 cm.

Now, the sides of the rhombus will be tangents to the circle, thus the radius drawn on the sides will be perpendicular to the sides.

Therefore, the rhombus can be divided into four triangles all of whose height will be the radius of the circle and the base will be the side of the rhombus.

Area of a triangle will be

$= \frac{1}{2} \times 35 \times 14$

= 245 cm^2

Thus, the area of the rhombus will be

= 4 × 245

= 980 cm^2

Q7 Text Solution:

Given that each side of the regular hexagon is 24 cm.

Therefore, the radius of the circle inscribed in it will be

$\frac{\sqrt{3}}{2} \times 24$

$= 12\sqrt{3}cm$

Area of the hexagon will be

$\frac{3\sqrt{3}}{2} \times (24)^2$

$= 864\sqrt{3}cm^2$

Area of the circle will be

$\frac{22}{7} \times \left(12\sqrt{3}\right)^2$

$= \frac{9504}{7}cm^2$

Thus, the area of the portion lying outside the circle will be

$864\sqrt{3} - \frac{9504}{7}$

$= \frac{1}{7}\left(6048\sqrt{3} - 9504\right)cm^2$

Q8 Text Solution:

Area of a regular hexagon when the length of the smaller diagonal is given

$= \frac{\sqrt{3}}{2}(smaller\ diagonal)^2$

$$= \frac{\sqrt{3}}{2}(14)^2$$
$$= \frac{\sqrt{3}}{2} \times 196$$
$$= 98\sqrt{3}cm^2$$

Q9 Text Solution:

Given the length of the longer diagonal as 5, therefore FC = 5.

Also Area of ABCF = Area of FCDE

Therefore, Area of ABCF $= \frac{1}{2}$ Area of the hexagon

Area of the hexagon when the length of the longer diagonal is given

$$= \frac{3\sqrt{3}}{8}(5)^2$$
$$= \frac{75\sqrt{3}}{8}$$

Therefore Area of ABCF $= \frac{1}{2} \times \frac{75\sqrt{3}}{8}$

$$= \frac{75\sqrt{3}}{16}.$$

Q10 Text Solution:

Let ABCDEF be a regular hexagon with area $= 96\sqrt{3}$,

also let the side of the hexagon be 'a'.

Then $96\sqrt{3} = \frac{3\sqrt{3}}{2}a^2$

a = 8.

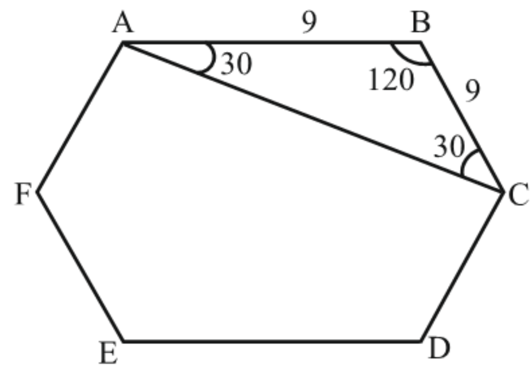
Now, let A be the 1st vertex, then D will be the 4th vertex,

We are required to find the length of AD which is nothing but the longer diagonal of the hexagon.

Length of the longer diagonal in a hexagon is twice the length of each of the sides of the hexagon.

Therefore, AD = 2 × 8 = 16.

Q11 Text Solution:



Let ABCDEF be a regular hexagon of perimeter 54 cm.

Then, the length of each of the sides of the hexagon will be

$\frac{54}{6} = 9cm.$

Also, Angle B = 120 (internal angle of a regular hexagon)

Therefore, Angle BAC = Angle BCA = 30 (as all the sides are equal)

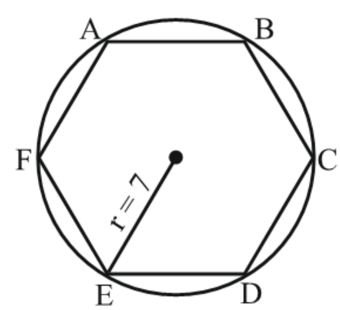
In Triangle ABC,

$$\frac{AC}{\sin}120 = \frac{9}{Sin}30$$
$$\frac{AC}{Sin} = 120 = 8$$
$$AC = \frac{\sqrt{3}}{2} \times 18$$
$$AC = 9\sqrt{3}$$

Thus, the length of the smallest diagonal will be

$9\sqrt{3}cm.$

Q12 Text Solution:



Here, the radius of the circle = side of the hexagon = r.

Area of the circle will be πr^2

Area of the hexagon will be $\frac{\sqrt{3}}{4}r^2 \times 6 = \frac{3\sqrt{3}}{2}r^2$

Thus, the area of the remaining part of the circle which is not covered by the hexagon will be

$\pi r^2 - \frac{3\sqrt{3}}{2}r^2 = \frac{(2\pi r^2 - 3\sqrt{3}r^2)}{2}$

Therefore, the required ratio will be

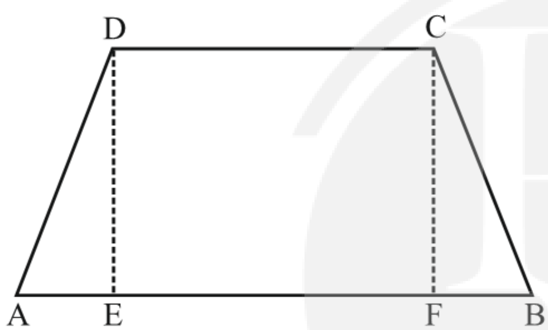
$\frac{(2\pi r^2 - 3\sqrt{3}r^2)}{2} : \frac{3\sqrt{3}}{2}r^2$

$= 2\pi - 3\sqrt{3} : 3\sqrt{3}$

Q13 Text Solution:

In an isosceles trapezium, the diagonals are equal or congruent, therefore the correct answer will be Only d.

Q14 Text Solution:



Let ABCD be an isosceles trapezium with AB II CD, AB = 18 and CD = 12.

Also, AD = BC

Area of a trapezium $= \frac{1}{2}$ (sum of parallel sides) × height

$45\sqrt{5} = \frac{1}{2}(30) \times height$

Height $= 3\sqrt{5}cm$

Thus, DE = CF $= 3\sqrt{5}$

AB = AE + EF + FB

18 = 2AE + 12 (Since FB = AE and EF = CD)

AE = 3

Further, $DA^2 = DE^2 + AE^2$

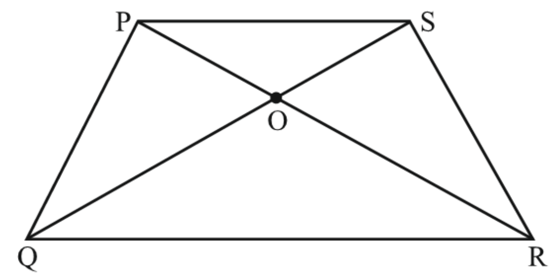
$DA^2 = 45 + 9$

$DA^2 = 54$

DA $= 3\sqrt{6}$

Thus, the length of each of the non-parallel sides will be $3\sqrt{6}cm.$

Q15 Text Solution:



PO × QO = SO × RO

3(3x − 19) = x − 5 (x − 3)

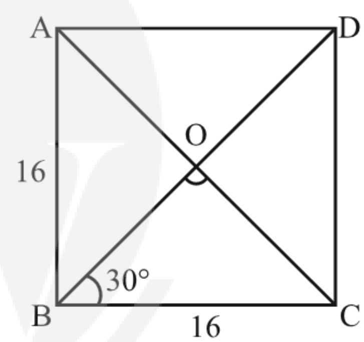
$9x - 57 = x^2 - 8x + 15$

$x^2 - 17x + 72 = 0$

(x − 8) (x − 9) = 0

Therefore x = 8 and 9.

Q16 Text Solution:



As AB = 16 cm, BC = 16 cm as all the sides of a rhombus are equal.

Further, Angle BOC = 90° and BO = OD as the diagonal bisect each other at right angles.

Also, angle OBC will be = 30°

Now, from triangle BOC,

$Cos\ 30 = \frac{BO}{16}$

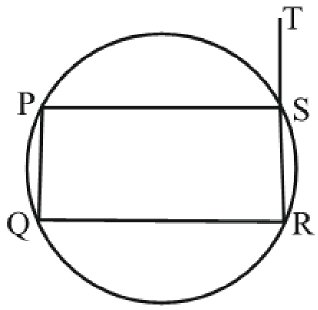
$BO = 16 * \frac{\sqrt{3}}{2}$

$BO = 8\sqrt{3}$

Therefore, BD = 2 * BO

$BD = 16\sqrt{3}$

Q17 Text Solution:



Let us extend RS to T

Given a cyclic trapezium with PS || QR

Angle PQR = 63, this means that angle PSR will be 180 – 63 = 117

Therefore, Angle PST will be 180 - 117 = 63.

Thus, Angle QRS = PST = 63

Q18 Text Solution:

Let Angle POQ = x

Then 8x = 360,

x = 45

Also, angle OPQ = 90 - Angle $\frac{POQ}{2}$

Angle OPQ = 90 – $\frac{45}{2}$

$= \frac{135}{2}$

Therefore, the required ratio will be

$45 : \frac{135}{2}$

= 2 : 3

Q19 Text Solution:

On the basis of the above, the following equation can be formed

$\frac{360}{x-2} + \frac{360}{x+3} = 12$

$\frac{1}{x-2} + \frac{1}{x+3} = \frac{1}{30}$

$\frac{x+3-x+2}{(x-2)(x+3)} = \frac{1}{30}$

(x – 2)(x + 3) = 150

$x^2 + x - 156 = 0$

(x + 13) (x – 12) = 0

x = –13 and x = 12

Since x cannot be negative, x = 12

Q20 Text Solution:

We know that the diagonals of a rhombus bisect each other at right angles.

Therefore, OC = 4 and OD = 6.

Also, $CD^2 = OC^2 + OD^2$

= 16 + 36

= 52

$CD = 2\sqrt{13}$

Therefore, perimeter will be

$4 * 2\sqrt{13} = 8\sqrt{13}$

Also, the area of the rhombus is $\frac{1}{2}$ times the product of its diagonals

Therefore, the area will be

$\frac{1}{2} * 8 * 12$

= 48.

So, the required sum will be

$8\sqrt{13} + 48$

$= 8\left(\sqrt{13} + 6\right)$

Q21 Text Solution:

Let the side of the given regular hexagon be equal to 'x'

Then the inradius of the hexagon will be $\frac{\sqrt{3}x}{2}$

Also, the circumradius of the hexagon will be equal to the side of the hexagon, therefore it will be x

Thus, the required ratio of circumradius to inradius will be

$x : \frac{\sqrt{3}x}{2}$

$= 2 : \sqrt{3}$

Q22 Text Solution:

Here 'x' represents the interior angle of the given octagon and thus each interior angle of the octagon will measure

$(8 - 2) \times \frac{180}{8}$

$= 6 \times \frac{180}{8}$

= 135

Also, y represents the exterior angle of the given octagon and thus each exterior angle of the

octagon will measure
$\frac{360}{8}$
= 45

Therefore, the required ratio of x : y will be

135 : 45

= 3 : 1

In general, the ratio of measure of an interior angle to that of an exterior angle of a polygon of 'n' sides is given by (n – 2) : 2.

Q23 Text Solution:

The number of diagonals in a polygon with 'n' sides is given by
$\frac{[n(n-3)]}{2}$

Therefore, a polygon with 154 sides will have
$\frac{[154(154-3)]}{2}$
diagonals

$= 154\frac{(151)}{2}$

= 11627

Q24 Text Solution:

We know that each interior angle of a regular polygon having 'n' sides is given by
$\frac{[(n-2)180]}{n}$

Therefore we have,

$\frac{[(n-2)180]}{n} = 170$

180n – 360 = 170n

10n = 360

n = 36.

Q25 Text Solution:

Length of PQ

$PQ = \frac{(DP \times AB + PA \times CD)}{DP + PA}$

$PQ = \frac{23}{5}$

PQ = 4.6

Q26 Text Solution:

Sum of the interior and the exterior angles of the given polygon will be 180.

Therefore, each interior angle will be 180 – 24 = 156.

Further, the number of sides in the polygon will be

Therefore, the required difference

156 – 15

= 141.

Q27 Text Solution:

A triskaidecagon is nothing but a 13-sided polygon.

Further, the sum of all the internal angles of a polygon of a n sides is given by (n – 2) * 180.

Therefore, the sum of all the internal angles of the given 13 sided polygon will be

= (13 – 2) × 180

= 11 × 180

= 1980.

Q28 Text Solution:

The distance between the parallel sides will be the height of the trapezium which is given as 5 cm.

Also, the parallel sides are given as 8 cm and 6 cm, therefore the sum of the parallel sides will be 14 cm.

So, the required area of the trapezium

$\frac{1}{2} \times \left(sum\ of\ parallel\ sides\right) \times height$

$= \frac{1}{2} \times 14 \times 5$

= 35 sq. cm

Q29 Text Solution:

We know that

$AB = \frac{\sqrt{(Area\ of\ ASRB \times PQ^2 + Area\ of\ PABQ \times RS^2)}}{PQ + RS}$

$4\sqrt{3} = \sqrt{4} \times 144 + PABQ \times \frac{64}{20}$

Squaring both the sides we have

$48 = 576 + 64\frac{PABQ}{20}$

960 – 576 = 64 PABQ

384 = 64 PABQ

Area of PABQ = 6.

Q30 **Text Solution:**

The sum of all the exterior angles of a polygon having n sides is always equal to 360 irrespective of the number of sides it has.

Therefore, the sum of all the exterior angles of the given nonagon (a nine sided polygon) will also be 360.