Samagra Shiksha Kerala
Half Yearly Evaluation 2023 -24
SSLC MATHEMATICS
English Version.
Detailed Solutions with Questions.
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Question: 1

a) Which among the following coordinates is a point on the x axis?
$(0,-1), (2,5), (3,0), (-5,4)$

b) Find the distance from this point to the origin.

Solution:-

a) (3,0) [y coordinate = 0 be the x – axis].

b) Distance to the origin = 3.

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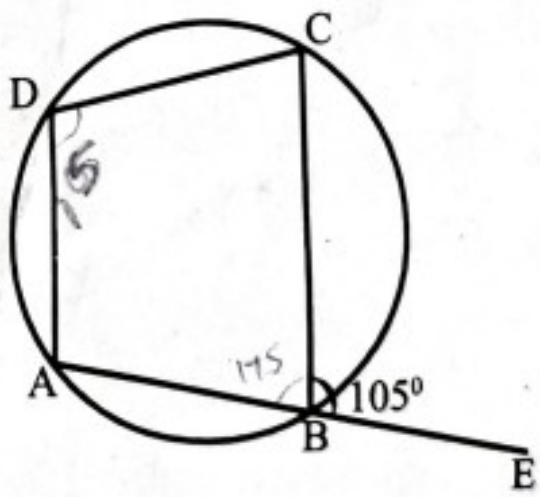
Question: 2.

In the figure $\angle CBE = 105^0$.

a) Find $\angle ADC$.

b) $\angle ADC + \angle ABC =$ _____



Solution:-

Given $\angle CBE = 105^0$,

a) $\angle ADC = 105^0$ **. [Exterior angle be equal to the interior opposite angle].**

b) $\angle ADC + \angle ABC = 105 + 75 = 180^0$ **.**

[$180 - 105 = 75^0$, sum of linear pair]

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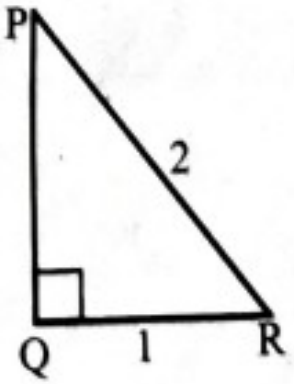
Question: 3.

In the figure ΔPQR is a right triangle.



a) What is the length of PQ ?

b) $\angle QRP =$ ____

$(30^0, 45^0, 60^0, 90^0)$

Solution:-

a) given $\angle$ PQR = 90^0 .

PQ = $\sqrt{2^2-1^2}$ = $\sqrt{4-1}$ = $\sqrt{3}$.

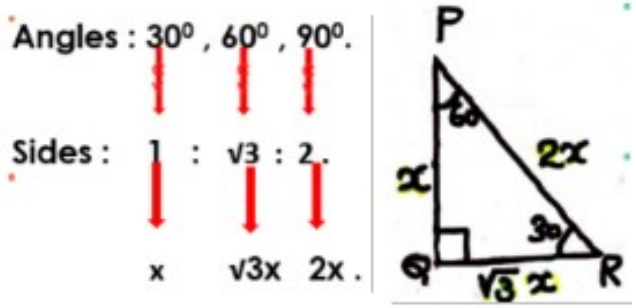
[Using Pythagoras].

b) Consider the angles be

30^0 , 60^0 , 90^0 .

ie., 1: √3:2.

$\angle$ QPR = 60^0 .



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Question: 4.

All edges of a square pyramid are equal. Total sum of length of all its edges is 48 centimetres. Find the base area of the pyramid.

Solution:-

Given, sum of all edges = 48 cm.

ie., 8a = 48

a = $\frac{48}{8}$ = 6 cm.

Hence the base area of the pyramid

= a^2

ie., $6^2 = 36$ cm^2 .

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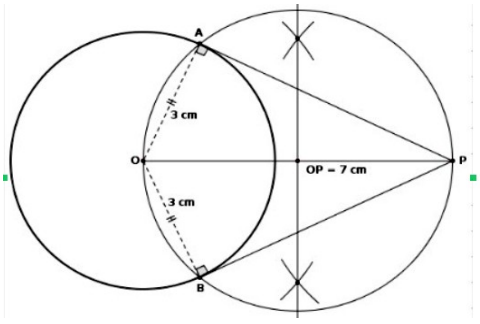
Question: 5.

Draw a circle of radius 3 centimetres. Draw a tangent to the circle from a point 7.5 centimetres away from the centre.

Solution:-

Draw the figure.



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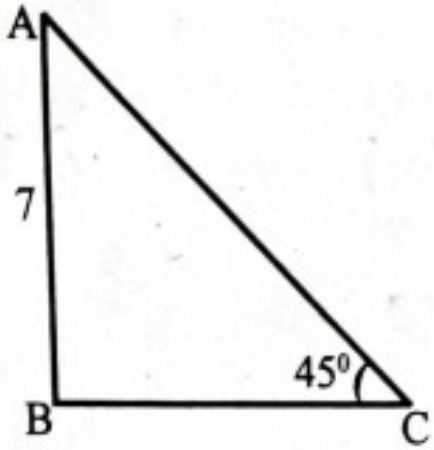
Question: 6.

In the figure $\angle ABC = 90^0$, $\angle ACB = 45^0$, AB = 7 centimetres.



a) Find AC.

b) If a square is drawn with the side AC, find its area.

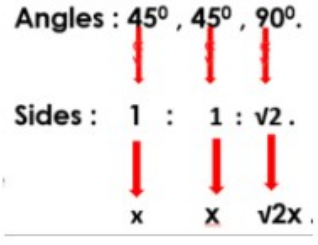
Solution:-

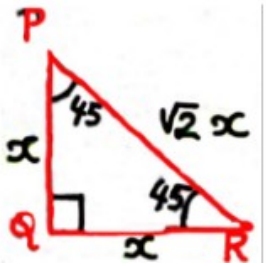
Given $\angle ABC = 90^0$, $\angle ACB = 45^0$.

So, $\angle A = 180 - (90 + 45) = 45^0$.

a) We know, hear the angles are

$45^0, 45^0, 90^0$.





ie., 1 : 1 : √2.

∵ AC = 7 √2 cm.

b) Area of the square = $(AC)^2$

$= (7\sqrt{2})^2 = 49 \times 2 = 98$ cm^2.

Question: 7.

The base edge of a square pyramid is 10 centimetres and its lateral edge is 13 centimetres.

a) What is the slant height of the pyramid ?

b) Find the lateral surface area of the pyramid.

Solution:-

Base edge of a square pyramid (a) = 10cm.

Lateral edgw (e) = 13cm.

a) Slant height ,

Here, $l^2 = e^2 - \left(\frac{a}{2}\right)^2$. $= 13^2 - \left(\frac{10}{2}\right)^2$

$= 169 - 25 = 144$

$\therefore l = \sqrt{144} = 12cm.$

b) LSA of the pyramid = 2al

$= 2 \times 10 \times 12$

$= 240cm^2$.

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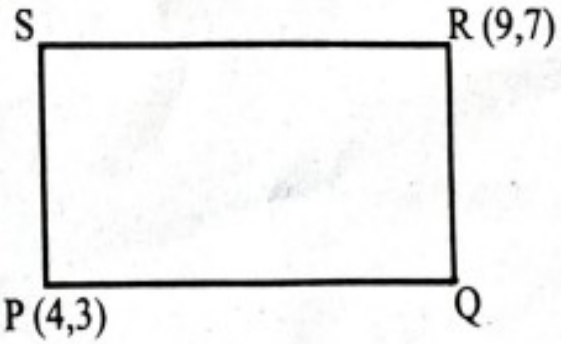
Question: 8.

In the figure, sides of the rectangle PQRS are parallel to the axes.



a) Write the coordinates of Q and S.

b) Find the length of PQ.

Solution:-

a) Q = (9, 3) , and S = (4, 7) .

b) Length of PQ = | 9 – 4| = 5 .

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Question: 9.

In an arithmetic sequence the difference between 5^{th} term and 8^{th} term is 12.

a) What is the difference between 15^{th} term and 9^{th} term ?

b) If 11^{th} term of this sequence is 45, find the 20^{th} term.

Solution:-

a) $X_8 - X_5 = 3d = 12$, $d = \frac{12}{3} = 4$.

$X_{15} - X_9 = 6d = 2 \times 3d = 2 \times 12 = 24$.

OR

$x_{15} - x_9 = 6d$

$= 6 \times 4 = 24$.

b) $X_{20} = X_{11} + 9d = X_{11} + 3 \times 3d$

$= 45 + 3 \times 12 = 81$

OR

Given $x_{11} = 45$.

$x_{20} = x_{11} + (20 - 11)d$

$= 45 + 9d$

$= 45 + 9 \times 4$

$= 45 + 36 = 81$.

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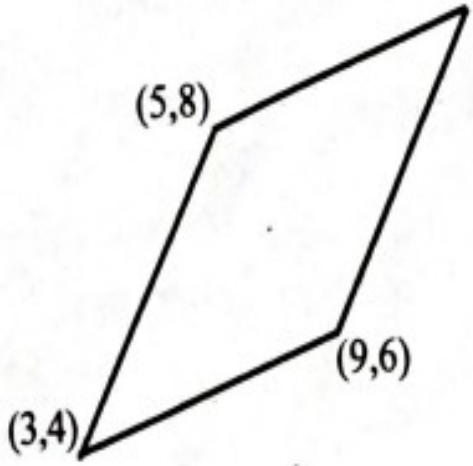
Question: 10.

In the figure coordinates of three vertices of a parallelogram are given.

a) Write the coordinates of the fourth vertex.

b) Find the coordinate of the point of intersection of the diagonals of the parallelogram.



Solution:-

a) Fpurth vertex (9+5, 8+6 – 4)

= (14- 3 , 14 – 4)

= (11 , 10)

b) Point of intersection of diagonals

$$= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) = \left(\frac{5+9}{2}, \frac{8+6}{2} \right)$$

$= \left(\frac{14}{2}, \frac{14}{2} \right) = (7, 7)$

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Question: 11.

A box contains 30 balls of white, black and red colours. Probability of getting a white ball is $\frac{7}{30}$ and probability of getting a red ball is $\frac{3}{10}$.

a) What is the number of white balls ?

b) What is the probability of getting a black ball from the box ?

c) What is the probability of getting a red ball, if 3 red balls are taken out from the box ?

Solution:-

Given, total number of ball = 30.

Probability of white ball = $\frac{7}{30}$.

a) Number of white balls = 7.

b) Probability of black ball

$$= 1 - \left(\frac{7}{30} + \frac{3}{10} \right) = \frac{14}{30}$$

OR

$$= \frac{30 - W - R}{30} = \frac{30 - 7 - 9}{30}$$

$$= \frac{30 - 16}{30} = \frac{14}{30}$$

c) Probability of red ball = $\frac{3}{10} = \frac{9}{30}$.

Number of red ball = 9.

If 3 red balls taken out , number of red balls in the box = 9 – 3 = 6. S

Now total number of balls in the box = 30 – 3 = 27.

∴ The probability of red balls = $\frac{6}{27}$.

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Question: 12.

In the arithmetic sequence 6, 10, 14, ...

a) What is the common difference ?

b) How many consecutive terms of the sequence starting from the first term gives the sum 510 ?

Solution:-

Given sequence = 6,10,14, ……

a) Com man difference = 10 – 6 = 4.

b) Sum = 510.

ie., $\frac{d}{2}n^2 + (f - \frac{d}{2})n = 510.$

$\frac{4}{2}n^2 + (6 - \frac{4}{2})n = 510.$

$2n^2 + 4n = 510$ dividing by 2

ie., $n^2 + 2n = 255.$

[Using square completion method]

$n^2 + 2n + 1 = 255 + 1.$

$(n + 1)^2 = 256.$

$n + 1 = \sqrt{256}$

$n + 1 = 16$

$n = 16 - 1 = 15.$

$\therefore$ The number be 15.

OR

$x_n = dn + (f - d)$

$= 4n + (6 - 4)$

$= 4n + 2$

$\text{Sum} = \frac{n}{2}[x_1 + x_n]$

$= \frac{n}{2}[6 + 4n + 2]$

$= \frac{n}{2}[4n + 8]$

$= \frac{n}{2} \times 4[n + 2]$

$= 2n^2 + 4 = 510$ dividing by 2

ie., $n^2 + 2n = 255.$

[Using square completion method]

$n^2 + 2n + 1 = 255 + 1.$

$(n + 1)^2 = 256.$

$n + 1 = \sqrt{256}$

$n + 1 = 16$

n = 16 – 1 = 15.

∴The number be 15.

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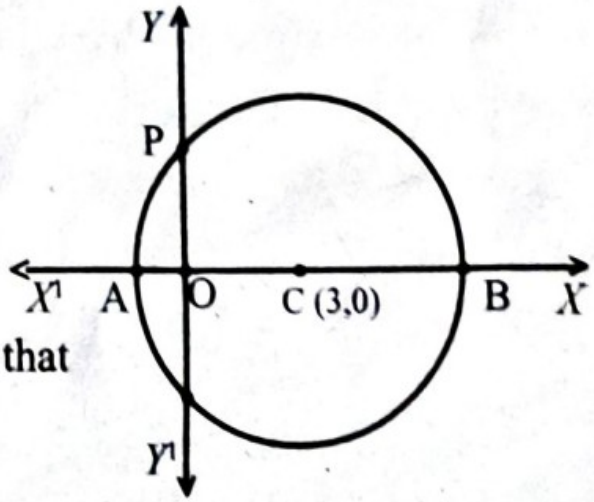
Question: 13.

In the figure C (3,0) is the centre of the circle and radius of the circle is 5 units.



a) Write the coordinates of the points that the circle cuts the x axis.

b) Find the co-ordinate of P.

Solution:-

Given center C(3,0)

Radius = 5.

a) B = (3 + 5 , 0)

(8 , 0) .

A = (3 – 5, 0)

= (- 2, 0)

b) We know that OA x OB = OP^2 .

$$2 \times 8 = OP^2 .$$

$$16 = OP^2 .$$

$\because$ $OP = \sqrt{16} = 4$.

Hence the co-ordinate of P = (0, 4) .

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Question: 14.

A person standing 80 metres away from a tower sees the top of the tower at an angle of elevation 45^0. From the opposite direction, another person sees the top of the tower at an angle of elevation 50^0. (The tower and the persons are on the same line)

Angle	sin	cos	tan
40^0	0.64	0.77	0.84
50^0	0.77	0.64	1.19

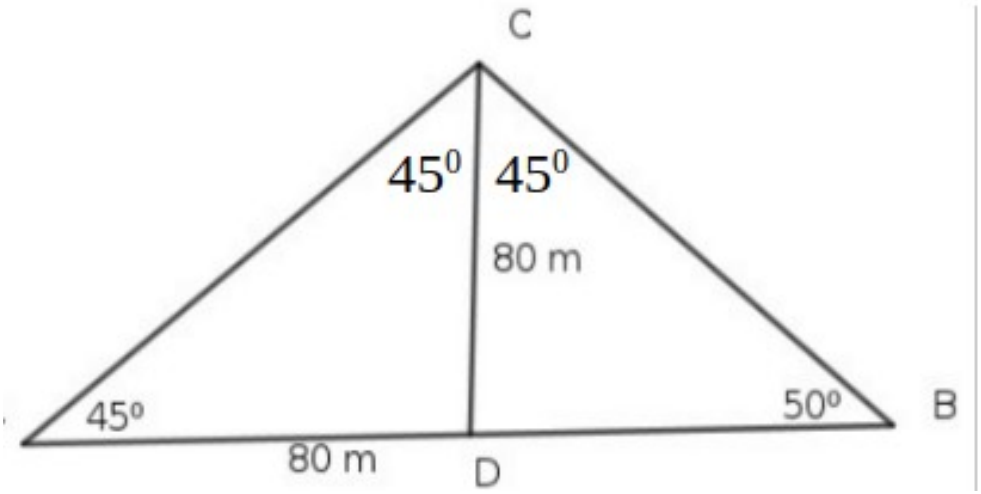
a) Draw a rough figure.

b) Find the height of the tower.

c) Find the distance between the two persons.

Solution:-

a)



b) In ΔADC angles are 45^0 , 45^0 , 90^0 .
ie., 1: 1: √2.
since OA = 80.
∴ Height of the tower = 80m.
c) In Δ DBC,

$$\textbf{tan A} = \frac{opp\ .sid\ e}{adj\ .sid\ e}$$

$$\textbf{tan 40} = \frac{DB}{DC} \textbf{ ; ie., 0.84} = \frac{DB}{80} \textbf{ ,}$$

DB = 0.84 x 80 = 67.20.
Distance n/w the two persons
= AD + BD = 80 + 67.23 = 147. 23 m

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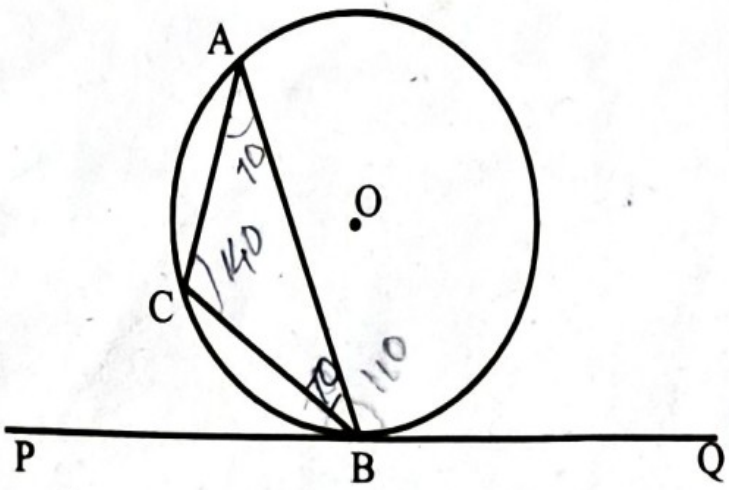
Question: 15.

In the figure O is the centre of the circle. PQ is a tangent at the point B.

$\angle ABP = 70^0$, AC = BC.



a) What is $\angle ABQ$?

b) Find the measures of all angles of triangle ABC.

Solution:-

Given $\angle$ ABP = 70^0 , AC = BC.

a) $\angle$ ABQ = 180 – 70 = 110^0 .

b) $\angle$ C = $\angle$ B = 110^0 .

[Angle b/w tangent and chord be equal in the opposite arc].

So AC = Bc

Hence Δ OAB be an isosceles

$\angle$ A = $\angle$ B

$$= \frac{180-110}{2} = \frac{70}{2} = 35^0 .$$

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Question: 16.

A tent is in the shape of a cone with base radius 20 metres and height 15 metres.

a) What is the slant height of the tent ?

b) How much squaremetres of canvas is needed to make the tent ?

c) Calculate the total cost of the canvas needed to make the tent at the rate of rupees 60 per squaremetre.

Solution:-

Given radius = 20m , h = 15m

$l^2 = r^2 + h^2$.

$= 20^2 + 15^2 = 400 + 225 = 625.$

$l = \sqrt{625} = 25$

∴ slant height = 25m.

b) required canvas = πrl

$= \pi \times 20 \times 25$

$= 500\pi \ m^2$

c) Total cost = 500π x 60 = Rs.94200/-

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Question: 17.

The coordinates of three vertices of ΔABC are A(1,2), B(3,6), C(5,5).

a) Find the length of the sides of the triangle.

b) What kind of triangle is ΔABC ?
(equilateral triangle, isosceles triangle, right triangle)

Solution:-

Given vertices of the triangle

A(1,2), B(3,6), C(5,5).

a) Length of $AB^2 = (3-1)^2 + (6-2)^2$

$= 4 + 16 = 20$

$AB = \sqrt{20}$

Length of $BC^2 = (5-3)^2 + (5-6)^2$

$= 4 + 1 = 5$

$BC = \sqrt{5}$

Length of $AC^2 = (5-1)^2 + (5-2)^2$

$$= 16 + 9 = 25$$

$$AC = \sqrt{25}$$

b) Hear, $AB^2 + BC^2 = 20 + 5 = 25$

$$= AC^2 .$$

Hence this is a right triangle.

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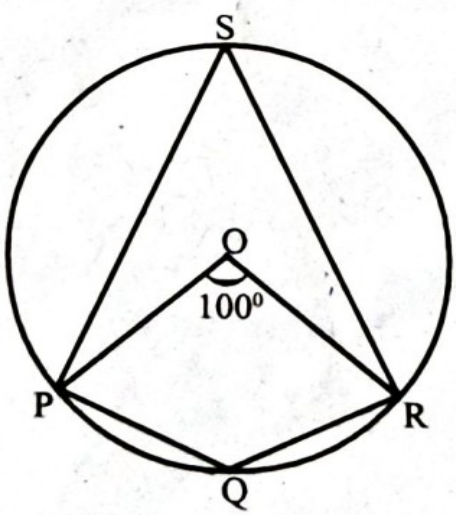
Question: 18.

In the figure, O is centre of the circle.
Central angle of arc PQR is 100^0.



a) What is the central angle of arc PSR ?
(210^0, 180^0, 260^0, 200^0)

b) Find $\angle PSR$ and $\angle PQR$.

c) $\angle OPS + \angle ORS =$ _____

Solution:-

Given ∠ POR = 100^0 .

a) Center angle of arc PSR

$$= 360 - 100 = 260^0 .$$

b) $\angle PSR = \frac{100}{2} = 50^0$.

$\angle PQR = 180 - 50 = 130^0$.

c) $\angle OPS + \angle ORS = \angle PSR = 50^0$

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Question: 19.

A cone of base radius 12 centimetres and height 15 centimetres is melted and recast into spheres of radius 3 centimetres, find the number of spheres can be made by melting the cone.

Solution:-

Given radius of cone = 12cm

Height of cone = 15cm

Radius of the spear = 3cm.

Number of spheres

$$= \frac{Volume\ of\ cone}{Volume\ of\ a\ sphere}$$

Volume of cone $= \frac{1}{3}\pi r^2 h$.

$$= \frac{1}{3} \times \pi \times 12 \times 12 \times 15$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3 .$$

$$= \frac{4}{3} \times \pi \times 3^3$$

.

Number of spheres

$$= \frac{1}{3} \times \pi \times 12 \times 12 \times 15 \div \frac{4}{3} \times \pi \times 3^3$$

= 20.

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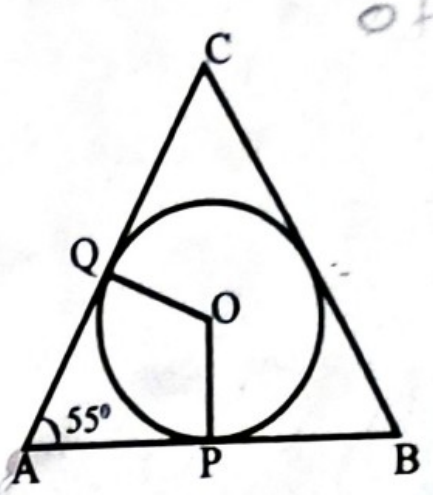
Question: 20.

a) In the figure O is the centre of the circle. Sides of triangle ABC are tangents of the circle. What is $\angle POQ$?

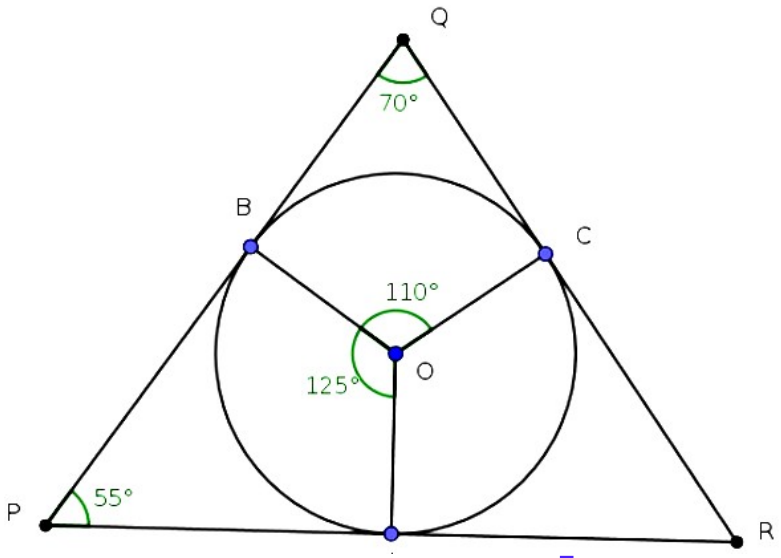


b) Draw a circle of radius 2.5 centimetres. Draw a triangle of angles 55^0 and 70^0 with all its sides touching the circle.

Solution:-

a) $\angle POQ = 180 - 55 = 125^0$.

b) Draw its by yourself.



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Question: 21.

In a circle the coordinates of the end points of a diameter are (2,8), (10,14).

a) Find the coordinatės of the centre of the circle.

b) Find the radius of the circle.

c) Is (9,15) is a point on the circle ? Why ?

Solution:-

Given points, (2,8), (10,14).

a) Center $= \left(\frac{x_1+x_{¿2}}{2}, \frac{y_1+y_2}{2}\right)$

$= \left(\frac{2+10}{2}, \frac{8+14}{2}\right)$

$= \left(\frac{12}{2}, \frac{22}{2}\right) = (6, 11)$

b) Radius $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(6-2)^2+(11-8)^2}$

$= \sqrt{4^2+3^2} = \sqrt{16+9}$

$= \sqrt{25} = 5.$

c) Find the distance b/w the center (6,11) and the given point (9,15)

ie., $\sqrt{+(9-6)^2+(15-11)^2}$

= $\sqrt{3+4^2}$ **=** $\sqrt{9+16}$

= $\sqrt{25}$ **= 5.**

Here we can see that distance 5 be equal to the radius 5. Hence the given point (9,15) be on the circle.

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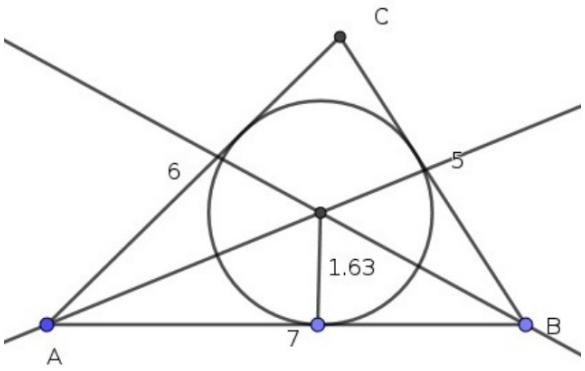
Question: 22.

Draw a triangle of sides 7 centimetres, 6 centimetres and 5 centimetres. Draw its incircle. Measure and write the radius.

Solution:-

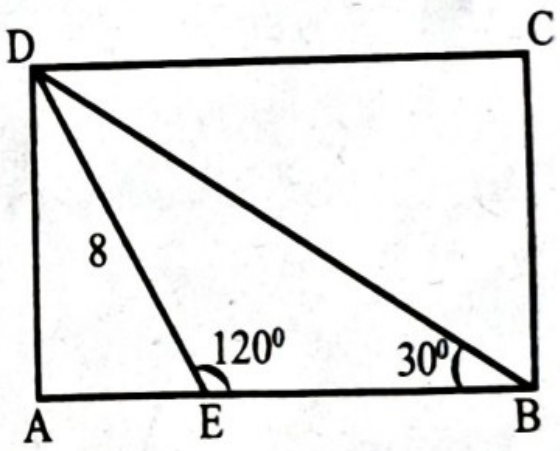


Question: 23

In the figure ABCD is a rectangle.

$\angle BED = 120^0$, $\angle DBE = 30^0$,

DE = 8 centimetres.



a) $\angle AED$ = _____

b) What is the length of a AD ?

c) What is the length of BE ?

d) Find the area of the rectangle ABCD.

Solution:-

Given $\angle BED = 120^0$, $\angle DBE = 30^0$

DE = 8cm.

a) $\angle AED = 180 - 120 = 60^0$.

b) In ΔAED angles are

30^0 , 60^0 ,90^0 . and the ratios are

1: $\sqrt{3}$: 2.

ie., $\frac{AD}{DE} = \frac{\sqrt{3}}{2}$

$$\frac{AD}{8} = \frac{\sqrt{3}}{2}$$

AD = $\frac{\sqrt{3}}{2}$ **x 8 = 4√3 cm.**

Also AE = $\frac{8}{2}$ **= 4cm**

c) In ΔBED , the angles are 30^0 , 30^0 , 120^0 . Hence it 9s an isosceles triangle.

So, BE = DE.

ie., BE = 8cm.

d) Area of the rectangle = l × b

ie., AB x AD

AE + EB x AD

4 + 8 x 4√3= 12 x 4√3

= 48√3 cm²

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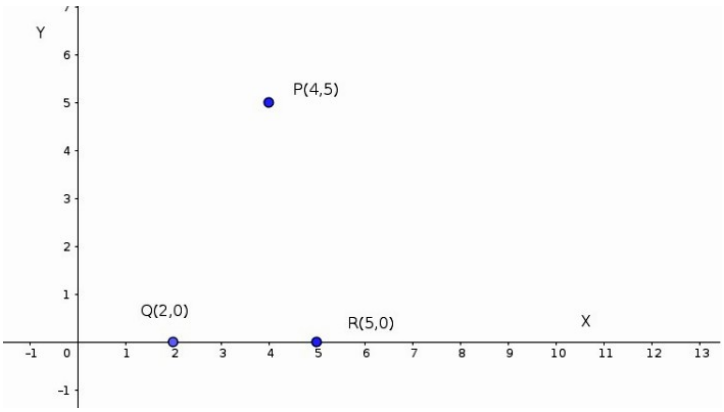
Question: 24.

a) Draw the axes and mark the points P(4,5), Q(2,0), R(5,0)

b) If a parallelogram PQRS is drawn with 'S' as forth vertex. Write the coordinates of 'S'.

Solution:-

a)



b) (5+2,5)

= (7,5).

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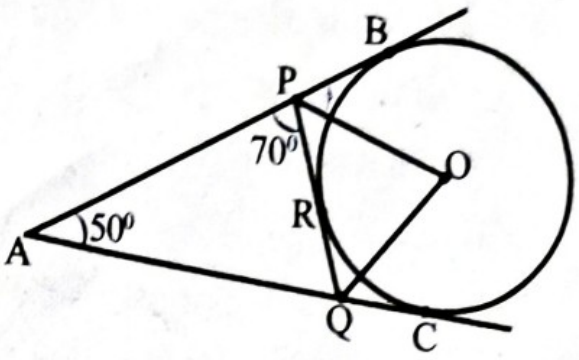
Question: 25.

In the figure AB, AC are the tangents of the circle.
The line PQ touches the circle at R.

$\angle APQ = 70^0$, $\angle BAC = 50^0$



a) What is $\angle BPQ$?

b) Find $\angle OPQ$, $\angle OQP$.

c) Is quadrilateral APOQ cyclic ? Why?

Solution:-

$\angle APQ = 70^0$, $\angle BAC = 50^0$.

a) $\angle BPQ = 180 - 70 = 110^0$.

[Linear pair]

b) $\angle OPQ = \frac{110}{2} = 55^0$.

$\angle AQP = 180 - (50+70)$

$= 180 - 120 = 60^0$.

$\angle CPQ = 180 - 60 = 120^0$.

$\angle OQP = \frac{120}{2} = 60^0$.

c) Here $\angle APO + \angle AQO$

$= (70+55) + (60+60)$

$= 125 + 120 = 245^0$.

We can see that the sum of opposite angles are not

supplementary. Hence the quadrilateral is not cyclic.

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Question: 26.

The first term of an arithmetic sequence is 12.

Sum of first three terms is 51.

a) What is the second term of the arithmetic sequence ?

b) Find the 8th term of the arithmetic sequence.

a) Find the sum of first 15 terms.

Solution:-

Given $x_1 = 12$.

Sum of first three terms = 51.

a) $x_1 + x_2 + x_3 = 51$.

ie., mid term (x_2)

$$= \frac{Sum}{Number\ of\ terms} = \frac{51}{3} = 17.$$

b) $d = X_2 - X_1 = 17 - 12 = 5$

$X_8 = X_1 + 7d = 12 + 7 \times 5 = 47$.

c) Sum the first 15 term

[Number of terms X x_n]

= 15 X X_8 = 15 X 47 = 705 .

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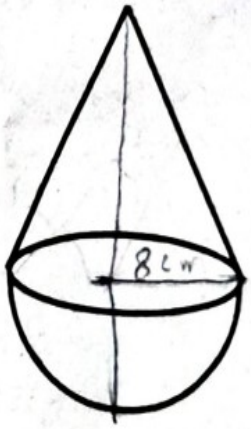
Question: 27.

7. A toy is in the shape of a hemisphere attached to the base of a cone. Common radius is 8 centimetres. Total height of the toy is 23 centimetres.

a) What is the height of the cone ?

b) Find the slant height of the cone.

c) Calculate the surface area of the toy.



Solution:-

Given common radius = 8cm.

Total height = 23 cm.

a) Height of the cone = 23 – 8

= 15cm.

b) $l^2 = h^2 + r^2$

= 152 + 82

= 225 + 64

= 289

l = √289 = 17 cm.

c) TSA = Curved surface area of the hemisphere + Curved surface area of the cone

⇒ $\pi rl + 2\pi r^2$

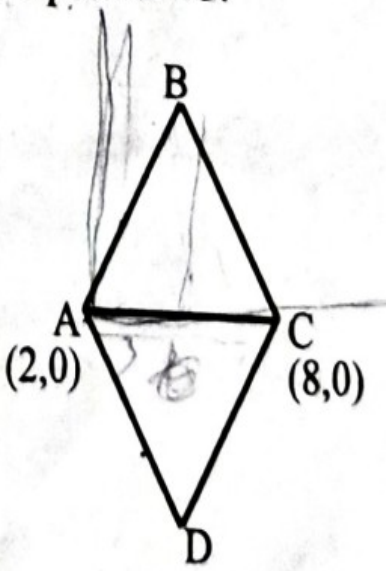
= π x 8 x 17 + 2 x π x 82

= 136π + 128π = 264π cm^2 .

.....drvsr

Question: 28.

The figure ABCD is a rhombus. Sides of the rhombus are equal to AC.



a) Find the length of AC.

b) Write the coordinates of the midpoint of AC.

c) Find the coordinates of B and D.

Solution:-

a) AC = |8 – 2) = 6.

b) Midpoint = $\left(\frac{12+8}{2}, \frac{0+0}{2}\right)$

[Using midpoint formula]

$= \left(\frac{10}{2}, \frac{0}{2}\right)$ **= (5, 0) .**

c)

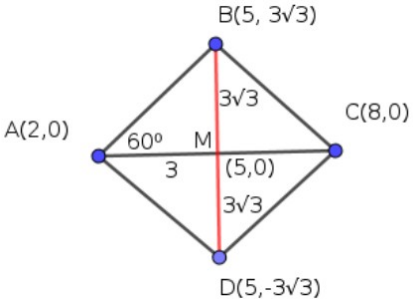
AB = BC = AC

ie $\angle BAC = 60^0$

AM = 3 BM = $3\sqrt{3}$

ie B(5, $3\sqrt{3}$)

D (5, $-3\sqrt{3}$)



Question: 29.

Look at the number pattern given below.

$$1^3 = 1^2 = \left(\frac{1\times 2}{2}\right)^2$$

$$1^3+2^3 = (1+2)^2 = \left(\frac{2\times 3}{2}\right)^2$$

$$1^3+2^3+3^3 = (1+2+3)^2 = \left(\frac{3\times 4}{2}\right)^2$$

$$1^3+2^3+3^3+4^3 = (1+2+3+4)^2 = \left(\frac{4\times 5}{2}\right)^2$$

.....

.....

.....

Sum of the cubes of the consecutive natural numbers starting from 1 are shown above. Analysing the number pattern answer the questions.

a) Write the next line.

b) If $1^3+2^3+3^3+.....+7^3=(1+2+3+...+x)^2$, find x.

c) If $1^3+2^3+3^3+.....+8^3=\left(\frac{8\times y}{2}\right)^2$, find y.

d) $1^3+2^3+3^3+.....+100^3$ = ____

e) $1^3+2^3+3^3+.....+n^3$ = ____

Solution:-

a) $1^2 + 2^2 + 3^2 + 4^2 + 5^2$

$=(1 + 2 + 3 + 4 + 5)^2$

$=\left(\frac{5\times 6}{2}\right)^2$.

b) x = 7.

c) y = 9 .

d) $\left(1+2+3+4+....\right)^2$ **OR** $\left(\frac{100+101}{2}\right)^2$

e) $\left(1+2+3+4+....n\right)^2$ **OR** $\left(\frac{n(n+1)}{2}\right)^2$

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Samagra Shiksha Kerala
Half Yearly Evaluation 2023 -24

SSLC MATHEMATICS

English Version.

Detailed Solutions with Questions.

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