SECOND TERM EVALUATION 2022 - 2023
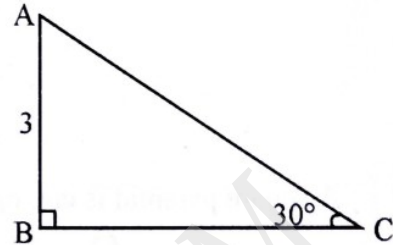
A	X - MATHEMATICS - DETAILED ANSWER KEY	E 1003

Each questions from 1 to 4 carries 2 scores.

1

In the figure, $\angle B = 90°$, $\angle C = 30°$, $AB = 3$ centimetres

a) What is the measure of $\angle A$?

b) Find the length of BC.

Answer

a) $\angle A = 60^0$

b) $BC = 3\sqrt{3} \; cm$

2

When each side of a square is increased by 1 metre, the area becomes 49 squaremetres. What is the length of one side of the original square?
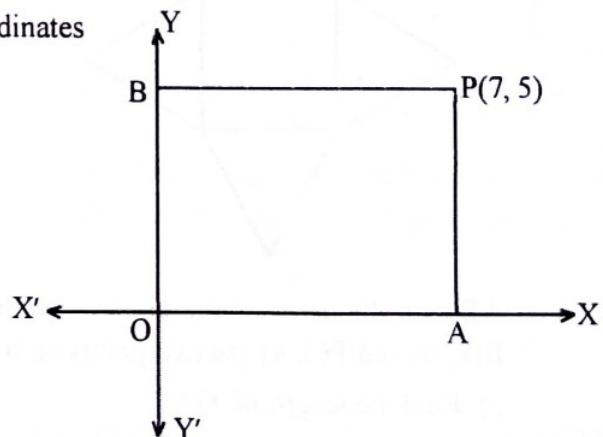
Answer

$$(x + 1)^2 = 49$$

$$x + 1 = \sqrt{49} = 7 \implies x = 7 - 1 = 6 \; m$$

3

In the figure, OAPB is a rectangle. The coordinates of the point P are (7, 5).

a) Write the coordinates of A.

b) Write the coordinates of B.

Answer

a) $(7 , 0)$

b) $(0 , 5)$

4	PT and PS are tangents of a circle with centre at O. $\angle SPT = 60°$. a) Find the measure of $\angle SOT$ b) Find the measure of $\angle POT$
	Answer a) $\angle SOT = 120^0$ (**The centre of a circle touching two lines meeting at a point** b) $\angle POT = 60^0$ **is on the bisector of the angle formed by the lines**)

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Each questions from 5 to 10 carries 3 scores.

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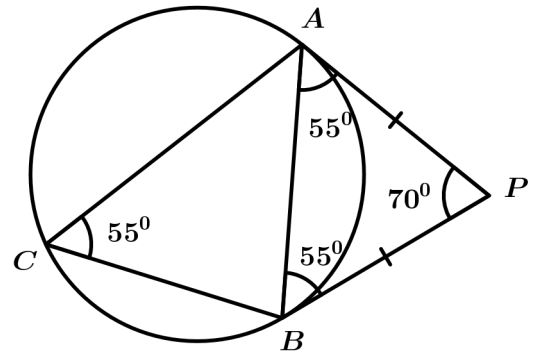| 5	In triangle ABC, $\angle B = 90°$, AB = 3 centimetres, BC = 4 centimetres. a) What is the length of AC? b) Find sin A and cos A.
	Answer a) $AC = \sqrt{4^2 + 3^2} = \sqrt{16 + 9} = \sqrt{25} = 5\ cm$ b) $\sin A = \dfrac{BC}{AC} = \dfrac{4}{5}$ $\cos A = \dfrac{AB}{AC} = \dfrac{3}{5}$
6	In the figure, tangents through A and B meet at P. $\angle ACB = 55°$. a) What is the measure of $\angle PAB$? b) What is the measure of $\angle P$?

Answer

a) $\angle PAB = \angle ACB = 55^0$
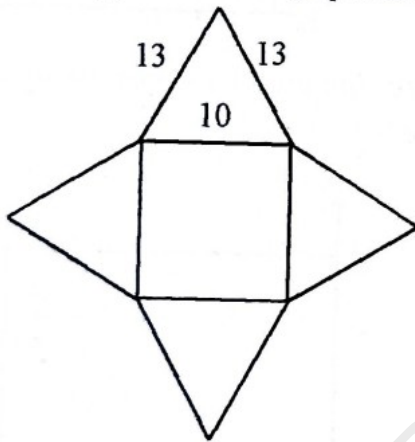
b) $\angle PBA = \angle PAB = 55^0 \quad (PA = PB)$

$\angle P = 180^0 - (55^0 + 55^0)$

$= 180^0 - 110^0 = 70^0$

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7 A square pyramid is cut, open and lay it flat as shown in the figure.

13 /\ 13
10

a) What is the length of its base edge?
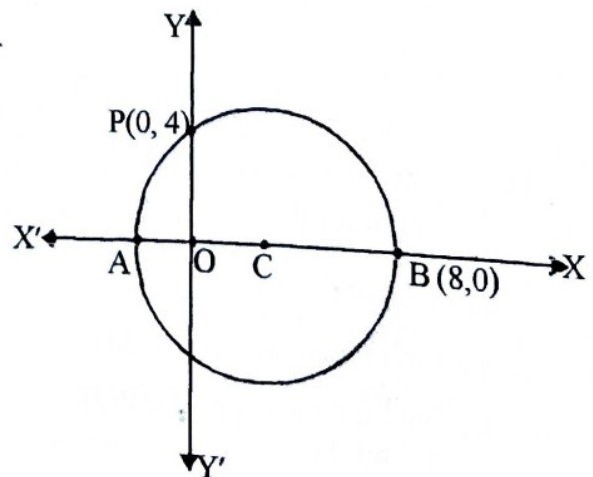b) Find the slant height of the pyramid

Answer

a) $a = 10$

b) $\left(\dfrac{a}{2}\right)^2 + l^2 = e^2 \implies \left(\dfrac{10}{2}\right)^2 + l^2 = 13^2 \implies 5^2 + l^2 = 13^2$

$25 + l^2 = 169 \implies l^2 = 169 - 25 = 144 \implies l = \sqrt{144} = 12$

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8 AB is a diameter of the circle with centre C. B(8, 0) and P(0, 4) are two points on it.
a) Find the length of OA.
b) Write the coordinates of A.

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|	
	Answer a) $OA \times OB = OP^2 \implies OA \times 8 = 4^2 \implies OA \times 8 = 16$ $OA = \dfrac{16}{8} = 2$ b) Coordinates of $A = (-2, 0)$
9	x represents a natural number. a) What number should be added to $x^2 + 8x$ to make it a perfect square? b) If $x^2 + 8x = 20$, then which number is x?
	Answer a) $\left(\dfrac{8}{2}\right)^2 = 16$ b) $(x + 4)^2 = 20 + 16 \implies (x + 4)^2 = 36 \implies x + 4 = \sqrt{36} = 6$ $x = 6 - 4 = 2$
10	a) PQ is a tangent to the circle with centre at O. What is the measure of $\angle OAQ$? b) Draw a circle of radius 3.5 centimetres. Mark a point A on it. Draw tangent to the circle through A.
	Answer a) 90^0 b) 3.5 cm

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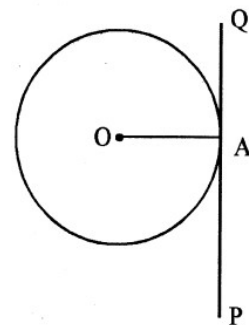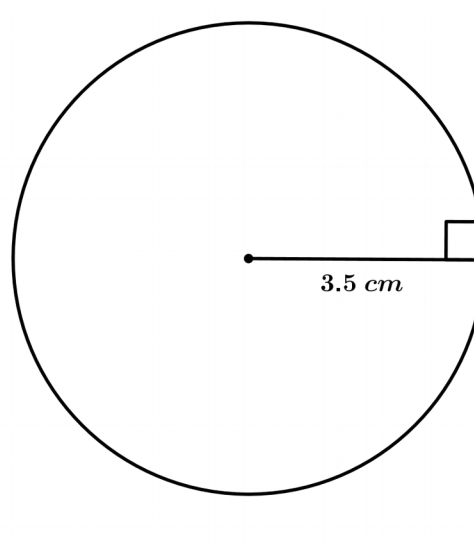
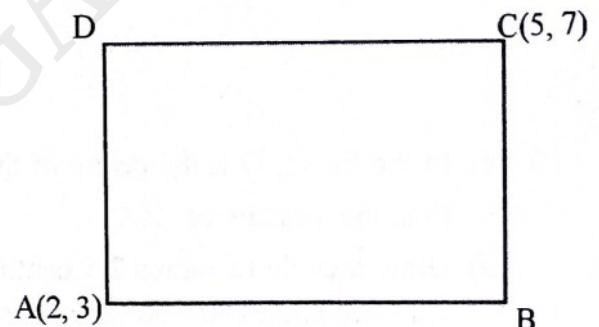|	
	Each questions from 11 to 21 carries 4 scores.
11	The base area of a square pyramid is 144 square centimetres and its height is 8 centimetres. a) What is the length of one base edge of the pyramid? b) What is its slant height? c) Find the lateral surface area of the pyramid.
	Answer **a)** $a = \sqrt{144} = 12\ cm$ **b)** $\left(\dfrac{a}{2}\right)^2 + h^2 = l^2 \implies \left(\dfrac{12}{2}\right)^2 + 8^2 = l^2 \implies 36 + 64 = l^2 \implies l^2 = 100$ $l = \sqrt{100} = 10\ cm$ **c)** Lateral surface area $= 2al = 2 \times 12 \times 10 = 240\ sq.cm$
12	In the figure, sides of the rectangle are parallel to the axes. The coordinates of one pair of opposite vertices are A(2, 3) and C(5, 7). a) Find the coordinates of the other two vertices. b) Find the length of AC. D □ C(5, 7) A(2, 3) B
	Answer **a)** Coordinates of B $= (5, 3)$ Coordinates of D $= (2, 7)$ **b)** $AC = \sqrt{(5-2)^2 + (7-3)^2} = \sqrt{25} = 5$
13	A ladder is leaned against a wall. It makes an angle 50° with the floor. The foot of the ladder is 4 metres away from the wall. The other end of the ladder touches the top of the wall. a) Draw a rough figure representing this. b) Find the height of the wall. (sin 50 = 0.77, cos 50 = 0.64, tan 50 = 1.19)

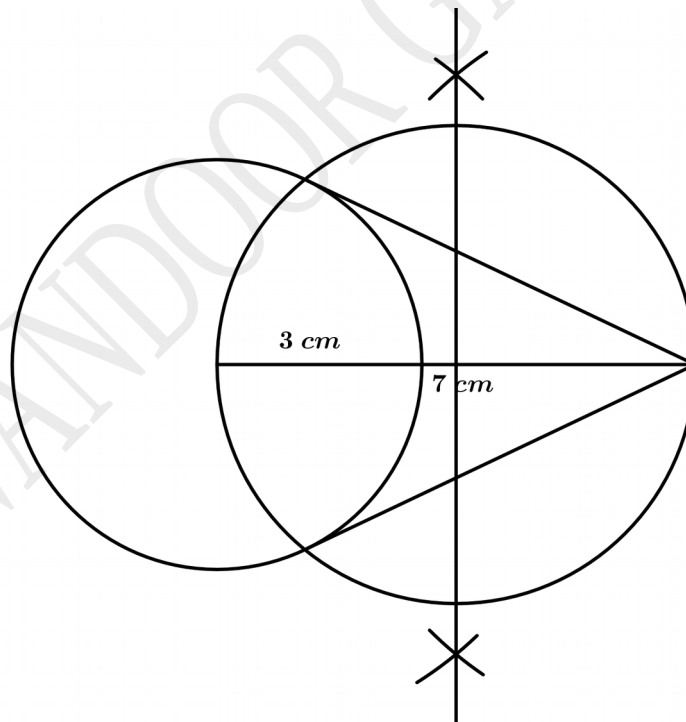**Answer**

a)
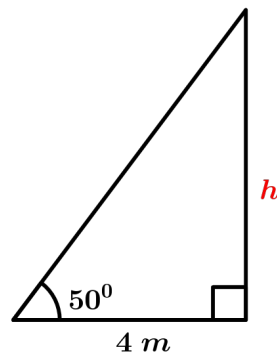
b) b) $\tan 50^0 = \dfrac{\textit{Opposite side of } 50^0}{\textit{Adjacent side of } 50^0}$ ==> $\tan 50^0 = \dfrac{h}{4}$ ==> $1.19 = \dfrac{h}{4}$

$h = 4 \times 1.19 = 4.76 \; m$

| 14 | Draw a circle of radius 3 centimetres. Mark a point P which is at a distance 7 centimetres away from the centre. Draw the tangents to the circle from P. |

Answer

| 15 | The perimeter of a rectangle is 26 centimetres and its area is 40 square centimetres. |

a) What is length + width?

b) Taking the breadth of the rectangle as x, write the length in terms of x

c) Find the length and breadth of the rectangle.

<u>Answer</u>

a) $2\,length + 2\,breadth = 26\,cm \implies length + breadth = \dfrac{26}{2} = 13\,cm$

b) $breadth = x \implies length = 13 - x$

c) $x(13 - x) = 40 \implies 13x - x^2 = 40 \implies x^2 - 13x + 40 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-13) \pm \sqrt{(-13)^2 - 4 \times 1 \times 40}}{2 \times 1}$$

$$= \frac{13 \pm \sqrt{169 - 160}}{2} = \frac{13 \pm \sqrt{9}}{2} = \frac{13 \pm 3}{2}$$

$x = \dfrac{13 + 3}{2}$ \qquad **OR** \qquad $x = \dfrac{13 - 3}{2}$

$x = \dfrac{16}{2} = 8$ \qquad\qquad\qquad $x = \dfrac{10}{2} = 5$

$breadth = 5\,cm$

$length = 13 - 5 = 8\,cm$

<u>Another method</u>

$x^2 - 13x + 40 = 0$

$x^2 - 13x = -40$

$x^2 - 13x + \left(\dfrac{13}{2}\right)^2 = -40 + \left(\dfrac{13}{2}\right)^2$

$\left(x - \dfrac{13}{2}\right)^2 = -40 + \left(\dfrac{169}{4}\right) \implies \left(x - \dfrac{13}{2}\right)^2 = \dfrac{-160 + 169}{4}$

$\left(x - \dfrac{13}{2}\right)^2 = \dfrac{9}{4}$

$x - \dfrac{13}{2} = \sqrt{\dfrac{9}{4}}$

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$$x - \frac{13}{2} = \frac{3}{2} \qquad \text{OR} \qquad x - \frac{13}{2} = \frac{-3}{2}$$

$$x = \frac{3}{2} + \frac{13}{2} \qquad\qquad\qquad x = \frac{-3}{2} + \frac{13}{2}$$

$$x = \frac{3 + 13}{2} \qquad\qquad\qquad x = \frac{-3 + 13}{2}$$

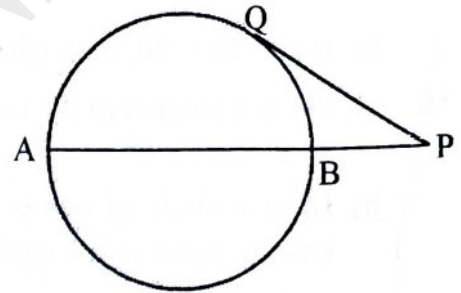$$x = \frac{16}{2} = 8 \qquad\qquad\qquad x = \frac{10}{2} = 5$$

breadth $= 5$ *cm*

length $= 13 - 5 = 8$ *cm*

16

In the figure, AB is the diameter of the circle. PQ is a tangent to the circle drawn from P. PA = 12 centimetres and PQ = 6 centimetres.
a) Find the length of PB.
b) What is the diameter of the circle?

Answer

a) $PA \times PB = PC^2 \implies 12 \times PB = 6^2 \implies 12 \times PB = 36$

$$PB = \frac{36}{12} = 3 \; cm$$

b) $AB = PA - PB = 12 - 3 = 9 \; cm$

17

(6, 4) is a point on a circle drawn with the centre at (3, 0).
a) Find the radius of the circle.
b) Write the coordinates of the points at which the circle cuts the *x* axis.

Answer
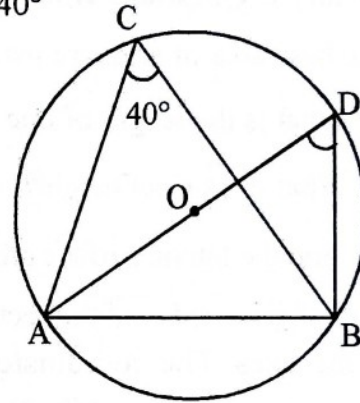
a) $Radius = \sqrt{(6-3)^2 + (4-0)^2} = \sqrt{25} = 5$

b) $(3+5, 0) = (8, 0)$, $(3-5, 0) = (-2, 0)$

18	AD is the diameter of a circle with centre at O, $\angle C = 40°$

a) $\angle D =$ _____

b) $\angle ABD =$ _____

c) If the diameter of the circle is 6 centimetres, find the length of AB.

(sin 40 = 0.64, cos 40 = 0.77, tan 40 = 0.84)

Answer

a) $\angle D = 40^0$ (**All angles made by an arc on its alternate arc are equal**)

b) $\angle ABD = 90^0$ (**Angle in a semicircle is right**)

c) In triangle ABD , $\sin 40^0 = \dfrac{Opposite\ side\ of\ 40^0}{hypotenuse}$ ¿ ==> $\sin 40^0 = \dfrac{AB}{6}$

$$0.64 = \dfrac{AB}{6}$$

$$AB = 0.64 \times 6 = 3.84\ cm$$

19	a) In the figure, O is the centre of the circle. $\angle POQ = 130°$, Find the measure of $\angle A$?

b) Draw a circle of radius 2.5 centimetres. Draw a triangle with two angles 50°, 60° and the sides of the triangle touch the circle.
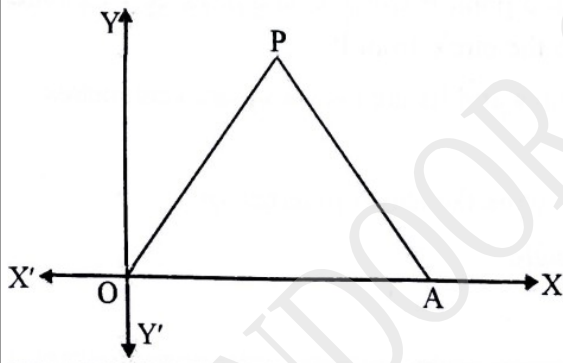

In the figure, OAB is an equilateral triangle, OA = 6 units

Answer

a) $\angle A = 50^0$

b)
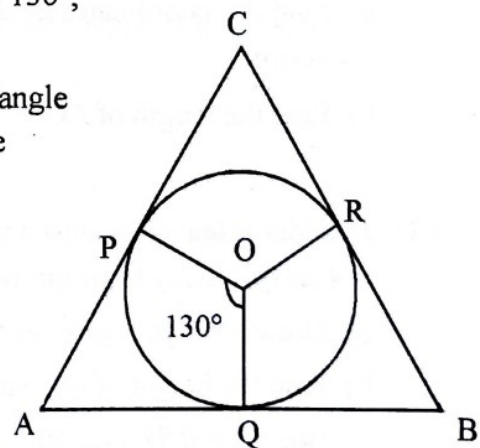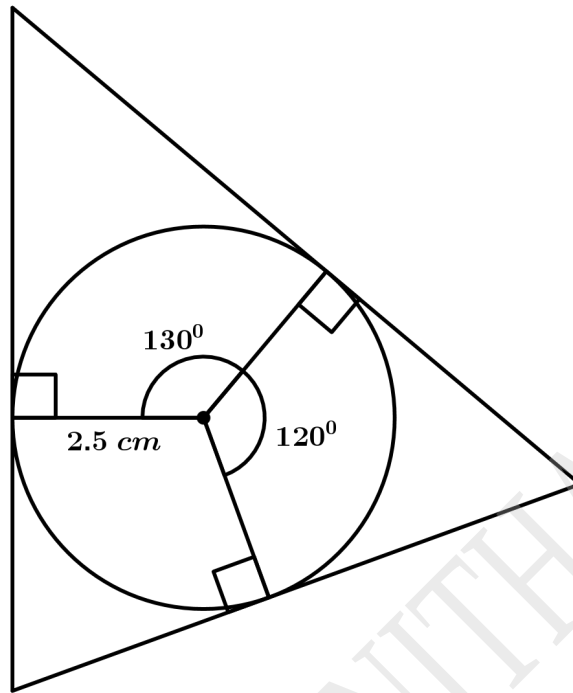
20 0. In the figure, OAP is an equilateral triangle. OA = 6 units.
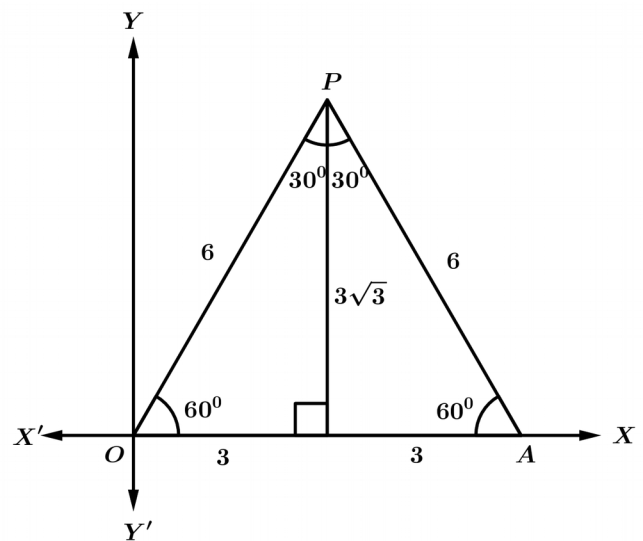

a) Write the coordinates of A.

b) Find the perpendicular distance from P to the x axis.

c) Write the coordinates of P.

Answer

a) $(6 , 0)$
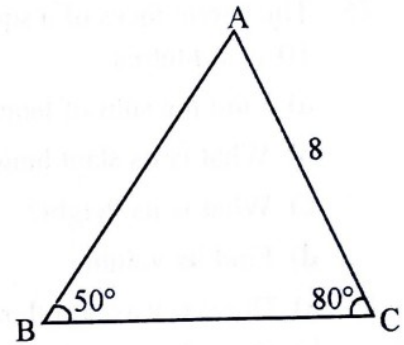
b) $3\sqrt{3}$

c) $(3 , 3\sqrt{3})$

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21	In triangle ABC, AC = 8 centimetres ∠B = 50°, ∠C = 80° a) What is the measure of ∠A? b) Find the length of BC. c) Find the area of the triangle. (sin 80 = 0.98, cos 80 = 0.17, tan 80 = 5.67)

Answer

a) $\angle A = 180^0 - (50^0 + 80^0) = 180^0 - 130^0 = 50^0$

b) $BC = 8\ cm \qquad\qquad (\angle A = \angle B)$

c) Draw AP perpendicular to BC .

   In triangle APC ,

$$\sin 80^0 = \frac{Opposite\ side\ of\ 80^0}{hypotenuse}$$

$$\sin 80^0 = \frac{AP}{AC} \quad ==> \quad 0.98 = \frac{h}{8}$$

$$h = 0.98 \times 8 = 7.84\ cm$$

$$Area\ of\ the\ triangle\ ABC = \frac{1}{2} \times BC \times h$$

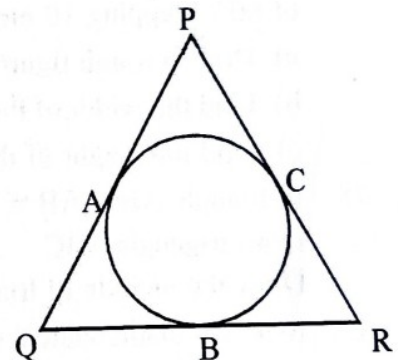$$= \frac{1}{2} \times 8 \times 7.84 = 31.36\ sq.cm$$
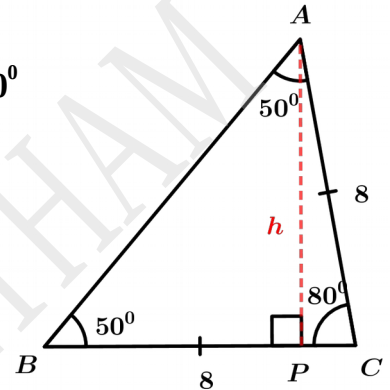
Each questions from 22 to 29 carries 5 scores.

22	The sides of triangle PQR touches the circle at the points A, B and C. PQ = 10 centimetres, BR = 4 centimetres. a) What is the length of CR? b) What is QB + PC ? c) Find the perimeter of triangle PQR. d) Find the area of a triangle with perimeter 28 centimetres and radius of the incircle is 2 centimetres.

Answer

a) $CR = 4 \ cm$

b) $QB + PC = QA + PA = PQ = 10 \ cm$
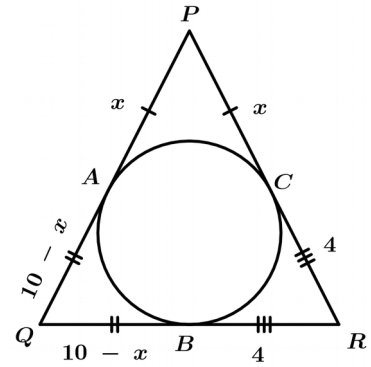
c) Perimeter of the triangle PQR

$$= PQ + QR + PR$$

$$= 10 + (QB + BR) + (CR + CP)$$

$$= 10 + QB + 4 + 4 + CP$$

$$= 10 + 8 + QB + CP$$

$$= 10 + 8 + 10 = 28 \ cm$$

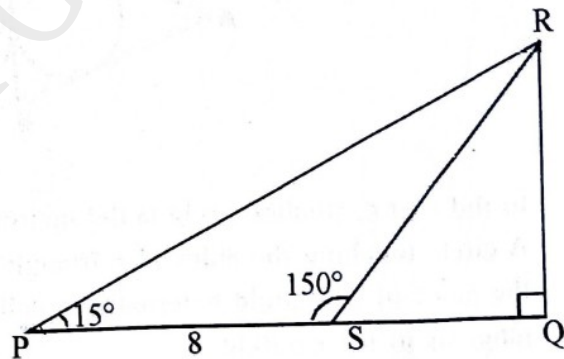d) $A = \dfrac{P}{2} \times r \implies$ Area $= \dfrac{28}{2} \times 2 = 28 \ sq.cm$

23

In triangle PQR, $\angle Q = 90°$, $\angle P = 15°$, $\angle PSR = 150°$, PS = 8 centimetres.
a) What is $\angle PRS$?
b) What is the length of SR?
c) Find $\angle QSR$.
d) Find the lengths of QS and QR.

Answer
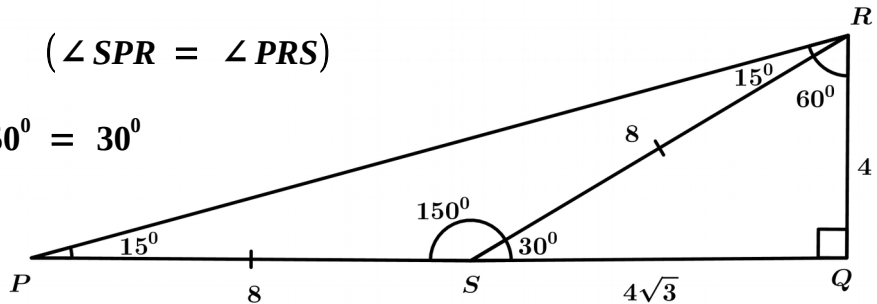
a) $\angle PRS = 180^0 - (15^0 + 150^0) = 180^0 - 165^0 = 15^0$

b) $SR = 8 \ cm$ $\qquad (\angle SPR = \angle PRS)$

c) $\angle QSR = 180^0 - 150^0 = 30^0$

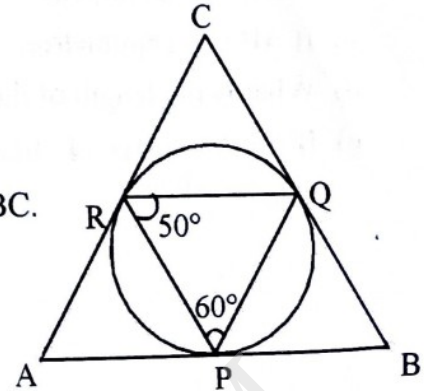d) $QS = 4\sqrt{3} \ cm$

$\quad QR = 4 \ cm$

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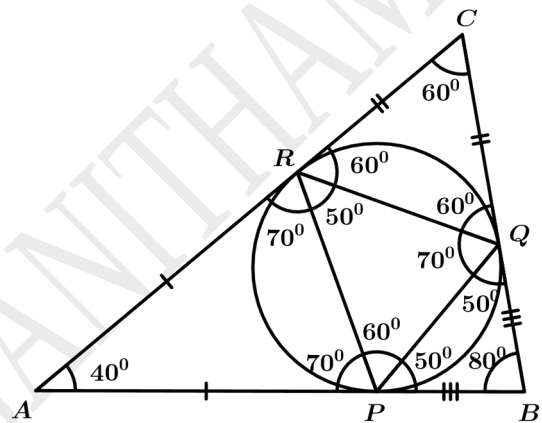| 24	In figure, the sides of triangle ABC touches the circle at the points P, Q and R $\angle QPR = 60°$, $\angle PRQ = 50°$. a) What is the measure of $\angle BPQ$? b) What is the measure of $\angle B$? c) Find the measures of other two angles of triangle ABC.
	Answer a) $\angle BPQ = 50^0$ b) $\angle BPQ = \angle BQP = 50^0$ $\angle B = 180^0 - (50^0 + 50^0)$ $= 180^0 - 100^0 = 80^0$ c) $\angle CQR = 60^0$ $\angle CQR = \angle CRQ = 60^0 \implies \angle C = 180^0 - (60^0 + 60^0) = 180^0 - 120^0$ $= 60^0$ $\angle A = 180^0 - (80^0 + 60^0) = 180^0 - 140^0 = 40^0$
25	The lateral faces of a square pyramid are equilateral triangles. The length of its base edge is 10 centimetres. a) Find the sum of lengths of all its edges. b) What is its slant height? c) What is its height? d) Find its volume
	Answer a) Sum of the lengths of all edges $= 8 \times 10 = 80 \ cm$ $(a = e = 10 \ cm)$

b) $l = 5\sqrt{3}\ cm$

c) $\left(\dfrac{a}{2}\right)^2 + h^2 = l^2 \implies \left(\dfrac{10}{2}\right)^2 + h^2 = \left(5\sqrt{3}\right)^2$

$$25 + h^2 = 25 \times 3$$

$$h^2 = 75 - 25 = 50$$

$$h = \sqrt{50} = \sqrt{25 \times 2} = \ = \sqrt{50} = 5\sqrt{2}\ cm$$

d) Volume $= \dfrac{1}{3} \times a^2 h = \dfrac{1}{3} \times 10^2 \times 5\sqrt{2} = \dfrac{500\sqrt{2}}{3}\ cubic.cm$

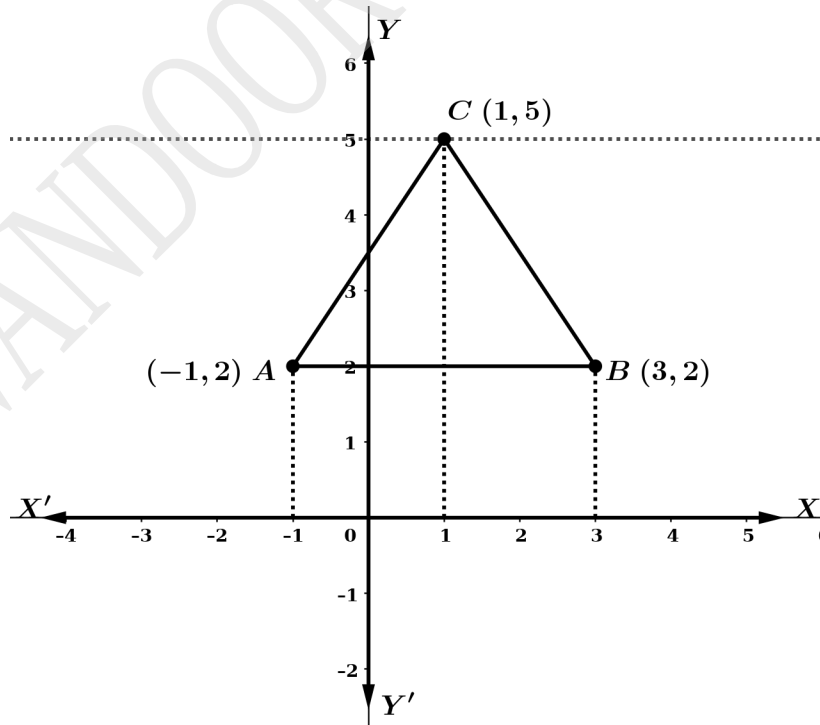**26**
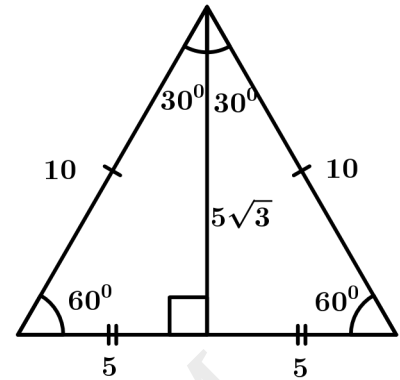
a) Draw x, y axes and mark the points A(-1, 2), B(3, 2) and C(1, 5)

b) Draw the triangle joining these points.

c) Write the coordinates of any point on the line passing through C and parallel to AB.

Answer

a)

b)

c) $(2, 5)$ (OR any point with y coordinate 5)

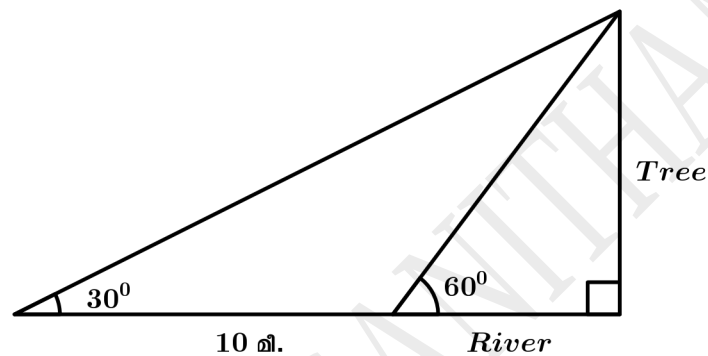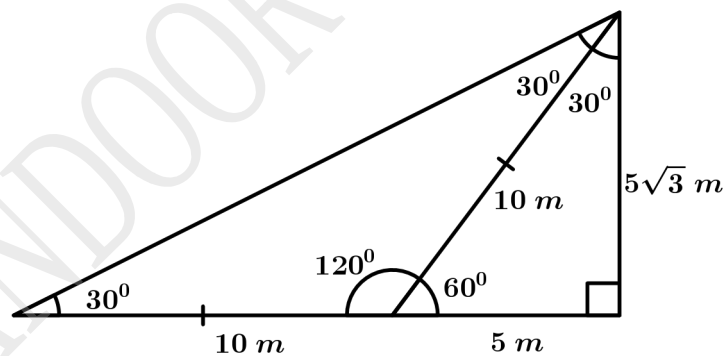| 27	A boy standing at the edge of a river sees the top of a tree on the other edge at an elevation of 60°. Stepping 10 metres back, he sees it at an elevation of 30°.
	a) Draw a rough figure based on the given details.
	b) Find the width of the river.
	c) Find the height of the tree.

Answer

a)

b)

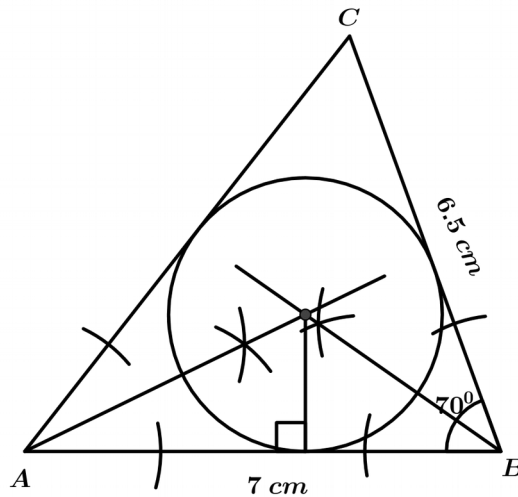**Width of the river = 5 m**

c) Height of the tree = 5$\sqrt{3}$ m

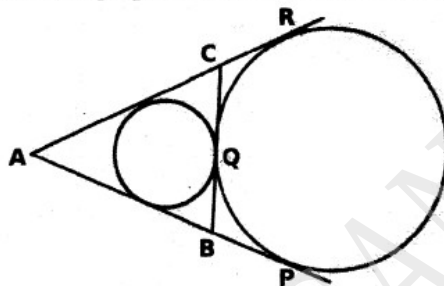| 28	In triangle ABC, AB = 7 centimetres, BC = 6.5 centimetres, ∠B = 70°.
	Draw triangle ABC.
	Draw the incircle of triangle ABC.

29 Read the mathematical concept given below and answer the following questions.

In the figure, smaller circle is the incircle of triangle ABC and larger circle is its excircle. A circle touching the sides of a triangle internally is called the incircle. A circle touching the sides of a triangle externally is called excircle. Here AP, AR, CQ, CR, BQ, BP are tangents to the excircle.

a) If BQ = 3 centimetres, what is the length of BP?

b) If CQ = 2 centimetres, what is the length of CR?

c) If AB = 6 centimetres, AC = 7 centimetres, what is the perimeter of triangle ABC?

d) What is the length of the tangent AP?

e) If the perimeter of triangle ABC is 30 centimetres, what would be the length of the tangent AP?

Answer

a)   **3 cm**

b)   **2 cm**

c)   **13 + BC**

d) **Half the perimeter of the triangle ABC .**

e) $\dfrac{30}{2}$ **= 15 cm**