A

SAMAGRA SHIKSHA, KERALA
HALF YEARLY EVALUATION 2023-2024
MATHEMATICS

E-1003

Class : 10

Time : $2\frac{1}{2}$ hours

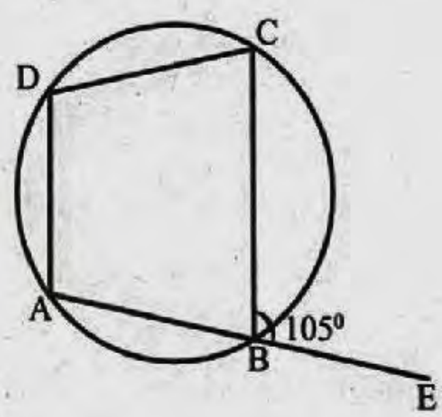
Instructions

- There is a 'cool off' time of 15 minutes in addition to the writing time. Use this time to get familiar with the questions and plan your answers.
- Read the instructions carefully before answering the questions.
- Keep in mind, the score and time while answering the questions. Give explanations wherever necessary.
- No need to simplify irrationals like $\sqrt{2}, \sqrt{3}, \pi$ etc., using approximations unless you are asked to do so.

Answer any 3 Questions from 1 to 4. Each question carries 2 scores. **(3 x 2 = 6)**

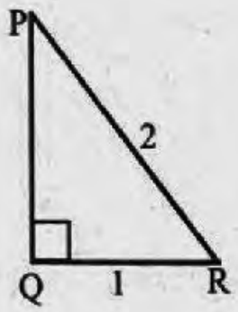
1. a) Which among the following coordinates is a point on the x axis?
   $(0,-1), (2,5), (3,0), (-5,4)$
   b) Find the distance from this point to the origin.

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



   a) Find $\angle ADC$.
   b) $\angle ADC + \angle ABC =$ _____

3. In the figure ΔPQR is a right triangle.



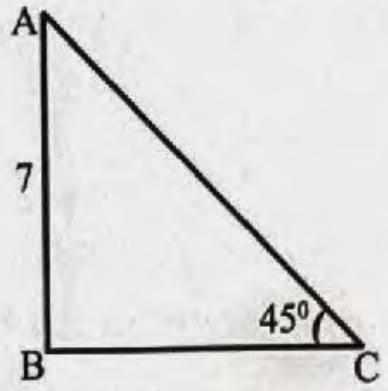
   a) What is the length of PQ ?
   b) $\angle QRP =$ ____
   $(30^0, 45^0, 60^0, 90^0)$

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.

Answer any 4 Questions from 5 to 10. Each question carries 3 scores. (4 x 3 = 12)

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

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



   a) Find AC.

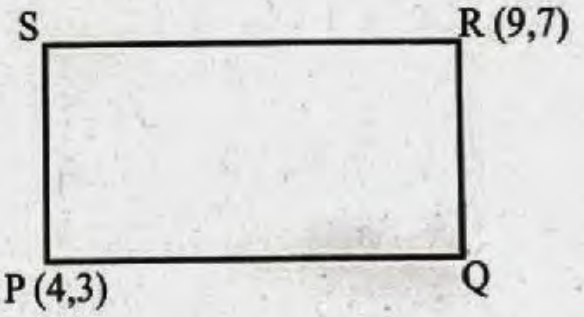
   b) If a square is drawn with the side AC, find its area.

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.

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.

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

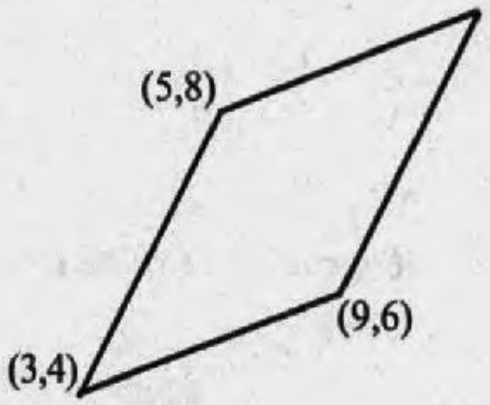
   a) What is the difference between 15^{th} term and 9^{th} term ?

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

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.



Answer any 8 Questions from 11 to 21. Each question carries 4 scores.(8 x 4 = 32)

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 ?

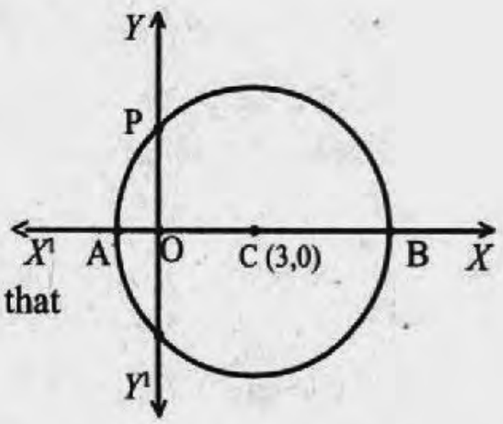
    c) What is the probability of getting a red ball, if 3 red balls are taken out from the box ?

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 ?

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.

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)

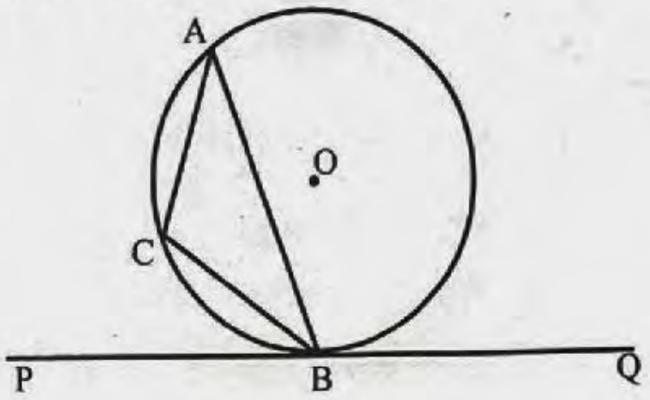
Angle	sin	cos	tan
40^0	0.64	0.77	0.84
50^0	0.77	0.64	1.19

    a) Draw a rough figure.

    b) Find the height of the tower.

    c) Find the distance between the two persons.

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.

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 ?

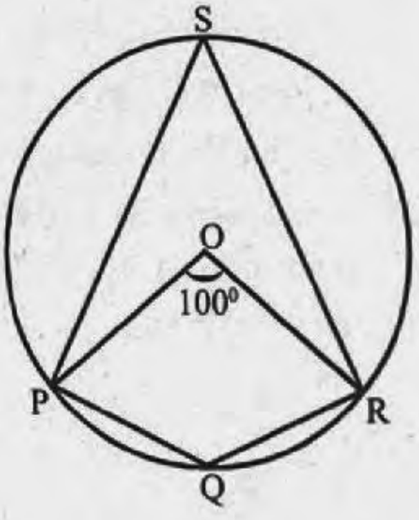
c) Calculate the total cost of the canvas needed to make the tent at the rate of rupees 60 per squaremetre.

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)

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



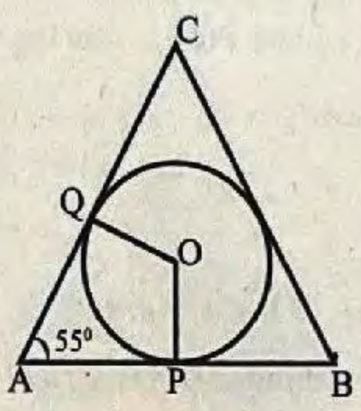
a) What is the central angle of arc PSR ?
(210^0, 180^0, 260^0, 200^0)

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

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

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.

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



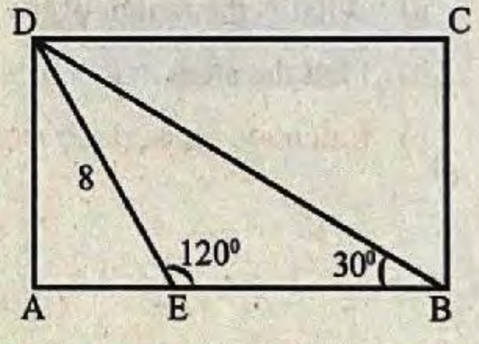
b) Draw a circle of radius 2.5 centimetres.
Draw a triangle of angles 55^0 and 70^0 with all its sides touching the circle.

21. In a circle the coordinates of the end points of a diameter are (2,8), (10,14).
a) Find the coordinates of the centre of the circle.
b) Find the radius of the circle.
c) Is (9,15) is a point on the circle ? Why ?

Answer any 6 Questions from 22 to 29. Each question carries 5 scores. (6 x 5 = 30)

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

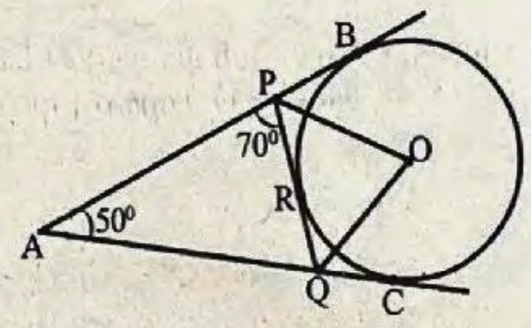
23. In the figure ABCD is a rectangle.
$\angle BED = 120^0$, $\angle DBE = 30^0$,
DE = 8 centimetres.



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.

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'.

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?

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.

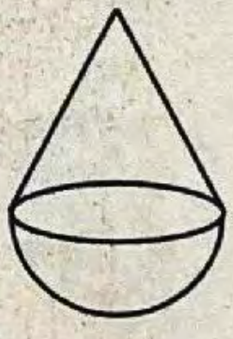
a) Find the sum of first 15 terms.

27. 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.

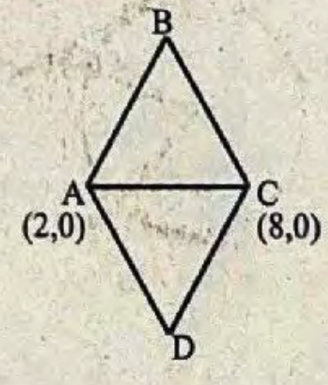
a) What is the height of the cone ?

b) Find the slant height of the cone.

c) Calculate the surface area of the toy.



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.

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) $1^3+2^3+3^3+.....+n^3 =$ _____