SSLC EXAMINATION, MARCH - 2020
MATHEMATICS
(English)

Time : 2½ Hours   Total Score : 80

INSTRUCTIONS :

- Read each question carefully before writing the answer.
- Give explanations wherever necessary.
- First **15 minutes** is Cool-off time. You may use this time to read the questions and plan your answers.
- No need to simplify irrationals like $\sqrt{2}$, $\sqrt{3}$, π etc., using approximations unless you are asked to do so.

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Score
3x2=6

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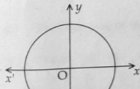Answer **any three** questions from **1** to **4**. Each question carries **2** scores.

1. (a) Write the 6th term of the arithmetic sequence 1, 25, 49, 73, 97, ...
   (b) How many perfect square terms are there in the arithmetic sequence 97, 73, 49, ... ?

2. Chords AB and CD are intersecting at P. AB = 10 centimetres, PB = 4 centimetres and PD = 3 centimetres.
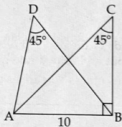

   (a) What is the length of PA ?
   (b) Find the length of PC.

3. Write the polynomial $p(x) = x^2 - 4$ as the product of two first degree polynomials.

4. In the figure, O is the centre of the circle and $x^2 + y^2 = 25$ is the equation of the circle.

Answer **any five** questions from **5** to **11**. Each question carries **3** scores.

5. (a) Write the first term and the common difference of the arithmetic sequence whose algebraic expression is $3n+5$.

(b) First term of an arithmetic sequence is 8 and the common difference is 5. Write its algebraic form.

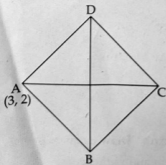6. In the figure, $\angle ABC = 90°$, $\angle C = \angle D = 45°$, $AB = 10$ centimetres.

(a) What is the length of AC ? $10\sqrt{2}$

(b) What is the radius of the circumcircle of triangle ABC ?

(c) What is the radius of the circumcircle of triangle ABD ?

7. Draw a circle of radius 3 centimetres. Mark a point P at a distance 6 centimetres from the centre of the circle. Draw tangents from P to the circle.

8. (a) What is the common difference of the arithmetic sequence $x-1, x, x+1, \ldots\ldots$?

(b) If $x-1$ is an even number, which is the next even number ?

(c) Prove that the product of two consecutive even numbers added to 1 gives a perfect square.

9. In the figure, ABCD is a square. Its diagonals are parallel to the coordinate axes. $AC=6$ and the coordinates of A is $(3, 2)$ write the coordinates of the vertices C, B and D.
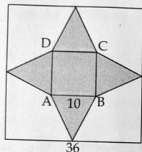
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10. In the figure, ABCD is a cyclic quadrilateral. Also $\angle A + \angle D = 210°$, $\angle D + \angle C = 250°$.
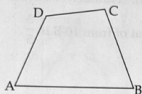
(a) What is $\angle A + \angle C$?

(b) Find the measures of $\angle A$ and $\angle C$.

11. The figure of a square sheet of paper is shown below. Length of one side of the paper sheet is 36 centimetres and AB = 10 centimetres. The shaded portion is cut out and folded into a square pyramid.

(a) What is the length of the base edge of the pyramid ?

(b) What is the slant height of the pyramid ?

(c) Find the lateral surface area of the pyramid.

Answer **any seven** questions from **12** to **21**. Each question carries **4** scores.

$7 \times 4 = 28$

12. (a) What is the sum of the first 5 terms of the arithmetic sequence 1, 3, 5, 7, ... ?

(b) What is the sum of the first n terms of the arithmetic sequence 1, 3, 5, 7, ... ?

(c) Find the sum of the first n terms of the arithmetic sequence $\frac{1}{n}, \frac{3}{n}, \frac{5}{n}, \frac{7}{n}, ...$

(d) What is the sum of first 2020 terms of the arithmetic sequence $\frac{1}{2020}, \frac{3}{2020}, \frac{5}{2020}, ...$?

13. Draw a rectangle of length 4 centimetres and breadth 2 centimetres. Draw a square having the same area of the rectangle.

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14. In a school, the total number of students in 10 A division is equal to the total number of students in 10 B. One student is to be selected from each division. Number of boys in 10 A is 20. The probability of selecting a boy from 10 A is $\frac{2}{5}$ and that of from 10 B is $\frac{3}{5}$.

(a) How many students are there in 10 A ?

(b) What is the probability of selecting a girl from 10 A ?

(c) How many boys are there in 10 B ?

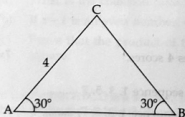(d) What is the probability of both the selected students being boys ?

15. Perimeter of the rectangle in the figure is 36 centimetres. $AC = \sqrt{164}$ centimetres.
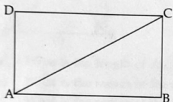
(a) What is $AB + BC$?

(b) Find the length of AB.

16. In triangle ABC, $\angle A = \angle B = 30°$, $AC = 4$ centimetres.

(a) What is the length of BC ?

(b) Find the length of AB.

(c) In triangle PQR, $PQ = 4\sqrt{3}$ centimetres, $\angle P = \angle Q = 30°$. Draw the triangle.

17. (a) If $p(x) = x^2 - 7x + 13$, What is $p(3)$?

(b) Write the polynomial $p(x) - p(3)$ as the product of two first degree polynomials.

(c) Find the solutions of the equation $p(x) - p(3) = 0$.

18. In the figure, O is the centre of both the circles. AB and AC touch the small circle at P and Q.
A, B and C are points on the large circle.
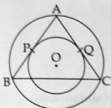
(a) If AP = 5 centimetres, then what is the length of AQ ?

(b) Prove that AB = AC.

(c) If AP = 5 centimetres and $\angle A = 90°$, then what is the radius of the small circle ?

19. Draw the coordinate axes and mark the points $A(-3, 0)$, $B(3, 0)$ and $C(0, 3\sqrt{3})$.

20. A sector of radius 12 centimetres and central angle 120° is rolled up into a cone.

(a) What is the slant height of the cone ?

(b) Find the radius and the height of the cone.

(c) What is the central angle of the sector to be used to make a cone of base radius $\sqrt{2}$ centimetres and height 4 centimetres ?

21. (a) What is the slope of the line passing through the points (5, 0) and (3, 2) ? Write the equation of the line.

(b) The x coordinate of a point on the line $x - y = 5$ is 5. What is the y coordinate of that point ?

(c) Write the coordinates of the point of intersection of the lines $x + y = 5$ and $x - y = 5$.

Answer **any five** questions from 22 to 28. Each question carries 5 scores.   5×5=25

22. Sum of the first 4 terms of an arithmetic sequence is 72. Sum of the first 9 terms is also 72.

(a) What is the 5th term of the sequence ?

(b) Find the sum of the first five terms.

(c) Write the sequence.

23. A boy standing at the edge of a canal sees the top of a tree on the other edge at an elevation of 60°. Stepping 12 metres back, he sees it at an elevation of 30°. Find the height of the tree.

24. In $\triangle ABC$, AB = 5 centimetres, $\angle A = 65°$, $\angle B = 55°$. Draw the triangle ABC and draw the incircle. Measure the radius of the incircle.

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25. A circle is drawn with (5, 3) as centre. (5, 6) is a point on the circle.

   (a) What is the radius of the circle ?

   (b) Write the equation of the circle.

   (c) What is the distance from the centre of the circle to the x-axis ?

   (d) What is the length of the tangents from the origin to the circle ?

26. (a) The radius of a solid sphere is 6 centimetres. Find its volume and surface area.

   (b) It is cut into two equal halves. What is the total surface area of each hemisphere ?
        What is the volume of a hemisphere ?

27. The table below shows, children of a class sorted according to their marks in an examination.

Marks	Number of Children
0-10	4
10-20	7
20-30	10
30-40	12
40-50	8
	41

   (a) If we arrange the children from the one with the least mark to the one with the greatest,
        then what will be the assumed mark of the 12th student ?

   (b) Compute the median mark.

28. In the figure, O is the centre of the large circle. Centre of the small circle is C. OP is a tangent
         to the small circle. $\angle BOQ = 50°$.

   (a) $\angle OAQ = \ldots\ldots\ldots$

   (b) $\angle OCP = \ldots\ldots\ldots$

   (c) $\angle APO = \ldots\ldots\ldots$
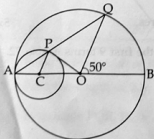
   (d) $\angle POQ = \ldots\ldots\ldots$

29. Read the following Passage. Understand the Mathematical concept in it and answer the questions that follow. Each question carries 1 score.   6×1=6

The common difference of the arithmetic sequence 15, 14, 13, 12, ... is $14 - 15 = -1$.
First term of the sequence is 15 and the 15th term is $15 + 14 \times -1 = 15 - 14 = 1$.

Similarly the 4th term is 12 and the 12th term is 4.

Its 16th term is, $x_{16} = 15 + 15 \times -1 = 15 - 15 = 0$. So the sum of the first 31 terms is also zero. That is if the nth term of an arithmetic sequence with common difference -1 is m, then the mth term is n and the $(m+n)^{th}$ term is zero.

(a) Seventh term of an arithmetic sequence is 10 and the 10th term is 7. What is the common difference ?

(b) What is the 21st term of the arithmetic sequence 21, 20, 19, ... ?

(c) 5th term of an arithmetic sequence is 17 and the 17th term is 5. Which term of the sequence is zero ?

(d) 5th term of an arithmetic sequence is 17 and the 17th term is 5. What is the 44th term ?

(e) First term of an arithmetic sequence is n and the nth term is 1. What is the $(n+1)^{th}$ term ?

(f) The first term of an arithmetic sequence is n and the nth term is 1. Sum of how many terms, starting from the first term, of this sequence is zero ?

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