ME 331

Sl. No.

SSLC MODEL EXAMINATION, FEBRUARY - 2024

MATHEMATICS

(English)

Time : 2½ Hours

Total Score : **80**

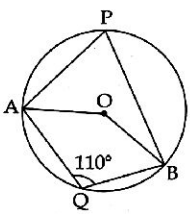
Instructions :

- Read each question carefully before writing the answer.
- Give explanations wherever necessary.
- First 15 minutes is cool-off time. You may use the 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.

Score

Answer any three questions from 1 to 4. Each question carries 2 scores. 3x2=6

1. Consider the arithmetic sequence 1, 11, 21 .....
   (a) What is its common difference ?
   (b) Find the 10^{th} term of this sequence.

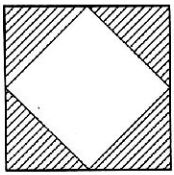
2. 

   In the figure O is the centre of the circle and $\angle AQB = 110°$.
   (a) What is the measure of $\angle APB$?
   (b) What is the measure of $\angle AOB$?

3. The marks of 8 students in a Maths test are given in ascending order as below.
   20, 20, 24, 32, x, 40, 45, 48
   If the median mark is 34, then find the value of x.

Score

4. The midpoints of the sides of a square are joined to form another square. If a dot is put inside the large square find the probability that it is within the shaded portion.



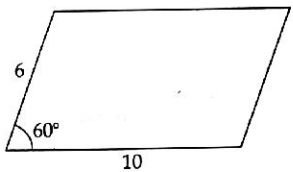
Answer any four questions from 5 to 10. Each question carries 3 score. 4x3=12

5. The algebraic expression of an Arithmetic sequence is $3n-2$.
   (a) Find the first term of the sequence.
   (b) Find the sum of the first 50 terms.

6. Draw a triangle of circumradius 3 centimetres and two of its angles 55° and $62\frac{1}{2}^{\circ}$.

7. One side of a rectangle is 12 centimetres longer than the other side and its area is 864 square centimetres.
   (a) Form a second degree equation by taking the smaller side as 'x'.
   (b) Calculate the lengths of the sides of the rectangle.

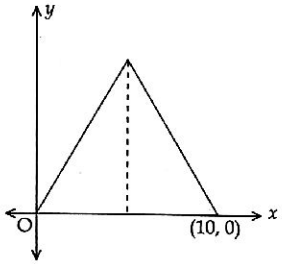
8. A parallelogram is drawn with lengths of adjacent sides 10 centimetres, 6 centimetres and angle between them is 60°.



   (a) Find the distance between the top and bottom side of the parallelogram.
   (b) Calculate the area of the parallelogram.

Score

9. Two vertices of an equilateral triangle are (0, 0) and (10, 0).



(a) Find the length of one side of this triangle

(b) Find the height of the triangle

(c) Find the coordinates of the third vertex

10. A circle with centre at the origin passes through the point (4, 3).

(a) What is the radius of the circle ?

(b) Write the coordinates of the points where this circle cut the y axis.

Answer any eight questions from 11 to 21. Each question carries 4 score. **8x4=32**

11. The 3rd term of an arithmetic sequence is 16 and its 21st term is 124.

(a) Find the common difference of the sequence.

(b) Find the first term of the sequence.

(c) What is the position of 280 in this sequence ?

12. One box contains 10 paper slips numbered 1 to 10 and another box contains 20 paper slips numbered 1 to 20. One slip is taken from each box.

(a) In how many different ways can we choose a pair of slips ?

(b) What is the probability of both numbers being the same ?

(c) What is the probability of getting one even number and one odd number ?

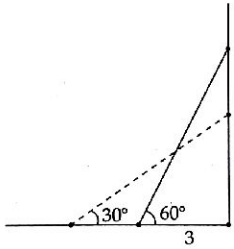
13. 10 added to the product of a natural number and the number 7 more than that is 304.

(a) If the first number is x, what will be the next number ?

(b) Form a second degree equation and find the two numbers.

Score

14. A ladder leans against a wall with its foot 3 metres away from the wall and makes an angle 60° with the floor.



(a) Find the length of the ladder.

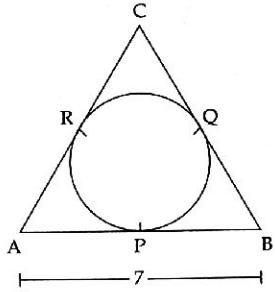
(b) The foot of the ladder is pulled to make an angle 30° with the floor. How high will be its top from the ground ?

15. (a) Find the distance between the points $(-1, 2)$ and $(5, 10)$.

(b) Prove that the line joining these points passes through the point $(11, 18)$.

16. Draw a circle of radius 3 centimetres. Mark a point 7.5 centimetres away from the centre and draw the pair of tangents to the circle from this point.

17. The incircle of a triangle touches the sides at P, Q and R. The perimeter of the triangle is 24 centimetres and the length of AB is 7 centimetres.



(a) Prove that $AP + BQ + CR = 12$ centimetres.

(b) Find the length of QC.

Score

18. A cone of radius 12 centimetres is to be made by folding a sector cut from a circle of radius 20 centimetres.
    (a) What should be the central angle of the sector ?
    (b) Calculate the curved surface area of the cone.

19. A line is drawn by joining the points (2, 3) and (5, 9)
    (a) Find the slope of the line.
    (b) Find the equation of the line.
    (c) Check whether (1, 5) is a point on this line.

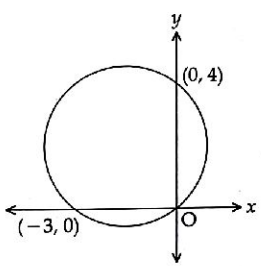
20. Consider the polynomial $P(x) = 2x^2 - 7x + 9$
    (a) Find the value P(2)
    (b) Find the solutions of the equation $P(x) - P(2) = 0$

21. A solid metal hemisphere of radius 10 centimetres is melted and recast into small solid spheres of radius 1 centimetre each. How many such spheres can be made ?

Answer any six questions from 22 to 29. Each question carries 5 score. 6x5=30

22. The first term of an arithmetic sequence is 5 and the common difference is 4.
    (a) What is the algebraic expression for this sequence ?
    (b) What is the algebraic expression for the sum of first n terms of this sequence ?
    (c) Find the sum of first 20 terms of this sequence.

23. A circle passes through the origin, (−3, 0) and (0, 4).

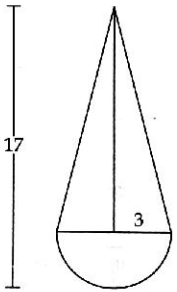


    (a) Find the length of the diameter of circle.
    (b) What are the coordinates of the centre ?
    (c) Write the equation of the circle.

Score

24. Draw a triangle of sides 4 centimetres, 5 centimetres and angle between them 70°. Draw the incircle of the triangle and measure its inradius.

25. A toy is in the shape of a cone attached to a hemisphere. Its common radius is 3 centimetres and the total height is 17 centimetres.



(a) What is the height of the cone ?

(b) Find the volume of the toy.

26. The table shows the number of workers in a company sorted according to their daily wages.

Daily wages (Rs.)	Number of Workers
800 - 900	5
900 - 1000	7
1000 - 1100	6
1100 - 1200	10
1200 - 1300	15
1300 - 1400	2

(a) If the daily wages are arranged in ascending order, what will be the assumed wage of the 19^{th} worker ?

(b) Find the median wage.

Score

27. A boy 1.5 metre tall, standing at the top of a building 8.5 metre high, sees the top of a tower at an elevation of 40° and the bottom of the tower at a depression of 50°.

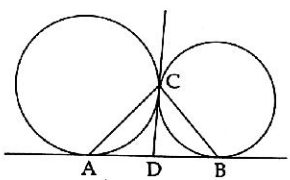
(a) Draw a rough figure using the given details.

(b) How far is the building from the tower ?

(c) Find the height of the tower.

($\tan 40° = 0.84$, $\tan 50° = 1.2$)

28. Two circles meet at point C. AB and CD are common tangents to the circles.



(a) Prove that D is the midpoint of AB.

(b) Find the measure of $\angle ACB$

29. See the pattern given below.

$$1+2+1=4$$
$$1+2+3+2+1=9$$
$$1+2+3+4+3+2+1=16$$
$$1+2+3+4+5+4+3+2+1=25$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

(a) Write the 5^{th} line of the pattern.

(b) Find the sum of the line

$1+2+3+\ldots\ldots\ldots+13+14+15+14+13+\ldots\ldots\ldots+2+1$

(c) Find the middle number of the line that gives the sum 400.

(d) Find the value of n if

$1+2+3+\ldots\ldots\ldots+(3n-2)+(3n-1)+(3n-2)+\ldots.+2+1=2500$

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