

Sl. No.

SSLC MODEL EXAMINATION, FEBRUARY - 2019
MATHEMATICS
 (English)

Time : 2½ Hours

Total Score : 80

Instructions :

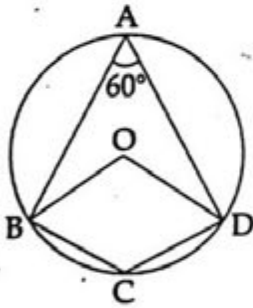
- Read each question carefully before answering.
- Give explanations wherever necessary.
- First 15 minutes is cool-off time. You may use this time to read the questions and plan your answers.
- No need to simplify the irrationals like $\sqrt{2}$, $\sqrt{3}$, π etc., using approximation unless you are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

Score

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

3x2=6

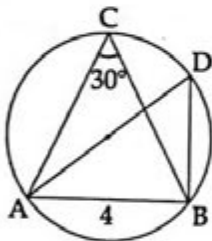
1. Consider the arithmetic sequence 13, 23, 33,
 (a) What is its common difference ?
 (b) What is the first three digit term of this sequence ?
2. In the figure, O is the centre of the circle $\angle A = 60^\circ$.



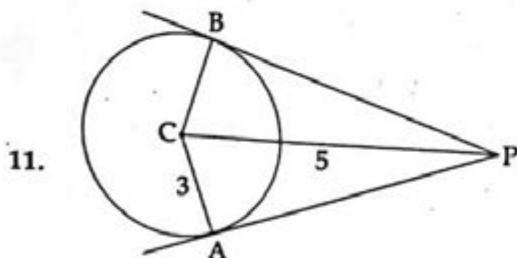
- (a) $\angle BOD =$ _____
- (b) $\angle C =$ _____
3. If $x - 1$ is a factor of the polynomial $5x^3 - 4x^2 + x - k$, what number is k ?
4. A circle is drawn with the origin as centre. It passes through the point (3, 3).
 (a) What is the radius of the circle ?
 (b) Write the co-ordinates of a point where the circle meets the x -axis.

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

5. (a) If a square is inscribed in a circle of diameter 4 cm, what will be the length of a side of the square?
 (b) What is the base edge of a square pyramid of maximum size that can be carved out from a hemisphere of radius 5 cm?
6. Draw the co-ordinate axes and mark the point (4, 0). Draw an isosceles right angled triangle with this point as one of its vertices.
7. Draw a circle of radius 3.5 centimetres. Draw a triangle of angles 50° , 60° , 70° with its vertices as points on the circle.
8. The algebraic form of an arithmetic sequence is $5n + 4$.
 (a) What is its first term?
 (b) What is the difference of its 10th and 20th terms?
 (c) Can the difference of any two terms of this sequence be 368? Justify.
9. The length of a rectangle is 6 centimetres more than its breadth. Its area is 1216 square centimetres. Find its length.
10. In the figure. C, D are points on the circle AD is a diameter of the circle. $\angle C = 30^\circ$, $AB = 4$ centimetres.



- (a) $\angle D =$ _____
 (b) $\angle ABD =$ _____
 (c) What is the length of the diameter?

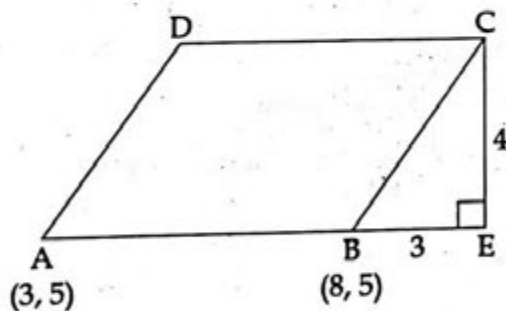


In the figure C is the centre of the circle, PA and PB are tangents. $PC = 5$ centimetres and radius of the circle is 3 centimetres.

- (a) Find the length of PA.
 (b) What is the area of the quadrilateral PACB?

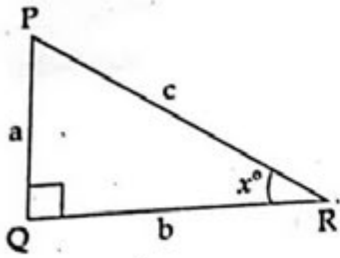
Answer any 7 questions from 12 to 21. Each question carries 4 scores.

12. The co-ordinates of two opposite vertices of a rectangle are (7, 8) and (1, 3).
- Without drawing coordinate axes, mark these points as the vertices of a rectangle with left-right, top-bottom positions correct.
 - Find the co-ordinates of other two vertices.
 - What is the length of its diagonals?
13. Consider the polynomial $P(x) = ax^3 - x^2 - bx - 1$
- Find $P(1)$.
 - What is the relation between a and b if $x - 1$ is a factor of $P(x)$?
 - What is the relation between a and b if $x + 1$ is a factor of $P(x)$?
 - Will, $P(x)$ have both $(x + 1)$ and $(x - 1)$ as factors for any numbers a and b ? Justify.
14. The radius and height of a cone are 12 centimetres and 6 centimetres respectively.
- What is its volume?
 - If this cone is cut parallel to its base, along the midpoint of its height, what is the radius of the small cone obtained?
 - What is the volume of the small cone?
 - Find the ratio of the volumes of the small cone and the first cone.
15. In the figure ABCD is a parallelogram. $\angle E = 90^\circ$. $A(3, 5)$ $B(8, 5)$ are two vertices $BE = 3$ units, $CE = 4$ units.



- Write the coordinates of C.
 - What are the coordinates of D?
 - Find the coordinates of meeting point of the diagonals of the parallelogram.
16. Draw a circle of radius 3 centimetres. Mark a point 7 centimetres away from its centre. Draw the tangents to the circle from that point.

17. In triangle PQR, $\angle Q = 90^\circ$, $\angle R = x^\circ$. Lengths of the sides PQ, QR and PR are a, b, c respectively.



- (a) Which among the following is $\tan x^\circ$?

$$\left(\frac{a}{c}, \frac{b}{a}, \frac{a}{b}, \frac{b}{c} \right)$$

- (b) Similarly write $\sin x^\circ$ and $\cos x^\circ$ from this triangle.

- (c) Prove that $\frac{\sin x^\circ}{\cos x^\circ} = \tan x^\circ$

18. Consider two fractions having numerator 1. The denominator of one fraction is 2 more than the denominator of the other. Sum of these fractions is $\frac{5}{12}$.

- (a) Write the above fact as an algebraic equation.

- (b) Find the fractions.

19. A bag contains some red and green balls. If we take a ball from it, without looking, the probability of getting a red ball is $\frac{1}{4}$.

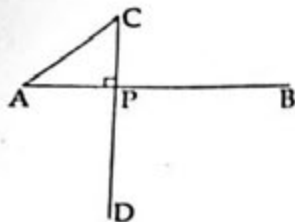
- (a) What is the total number of balls, if there are 8 red balls ?

- (b) What is the probability that a ball taken is green ?

- (c) Find the sum of both the probabilities.

- (d) From a box containing some red balls and some blue balls the probability of getting a red ball is $\frac{a}{b}$. What is the probability of getting a blue ball ?

20. In the figure, $\angle P = 90^\circ$. Sides of triangle APC are extended to B and D.



- (a) If a circle is drawn with AC as its diameter, where will be the position of P with respect to that circle?
- (b) What about the position of P, if the circle is drawn with AD as diameter?
- (c) Prove that, the circles drawn with the sides of a quadrilateral with perpendicular diagonals, will meet at a common point.
21. (a) Write the sequence of odd numbers greater than 1.
- (b) What is the algebraic form of this sequence?
- (c) What is the algebraic form of the arithmetic sequence $\frac{3}{6}, \frac{5}{6}, \frac{7}{6}, \dots$
- (d) Prove that this sequence does not contain any natural number.

Answer any five questions from 22 to 28. Each question carries 5 scores.

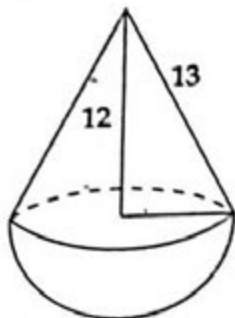
5x5=25

22. The table below shows the students of a class sorted according to their scores in a test.

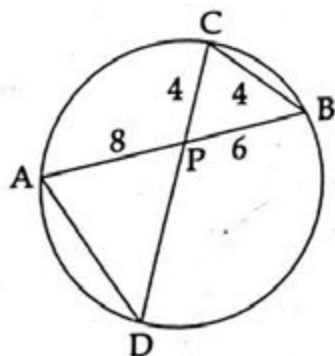
Score	Number of students
0 - 10	5
10 - 20	9
20 - 30	10
30 - 40	9
40 - 50	8

- (a) If the students are arranged in the increasing order of their scores, the score of the student at what position is taken as the median?
- (b) What may be assumed as the score of the 15th student in the arrangement?
- (c) Find the median score.

23. A solid is made by fixing a hemisphere of same radius on the flat face of a cone. The height of the cone is 12 centimetres and its slant height is 13 centimetres.

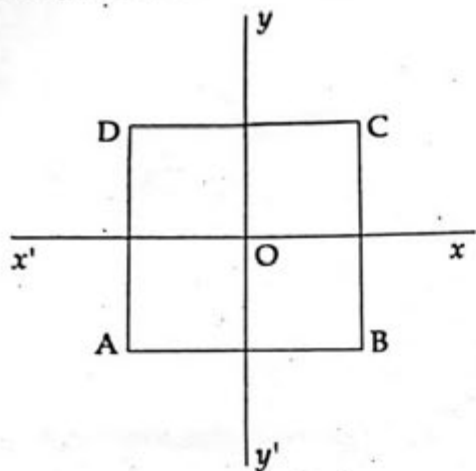


- (a) What is the radius of the cone ?
 (b) What is the curved surface area of the hemisphere ?
 (c) What is the total surface area of the solid ?
24. Draw a triangle of sides 5 centimetres, 6 centimetres and 7 centimetres. Draw its incircle.
25. A boy is standing between two buildings of equal height. The boy and the buildings are in a straight line. He sees the tops of those buildings at elevations of 45° and 30° . The nearest building is 20 metres away from him.
 (a) Draw a rough figure.
 (b) Find the height of the buildings and distance between the buildings.
26. In the figure chords AB and CD intersect at P. $PA = 8$ centimetres, $PB = 6$ centimetres, $PC = 4$ centimetres, $BC = 4$ centimetres.



- (a) Which angle is equal to $\angle A$?
 (b) Write one more pair of equal angles.
 (c) Find the length of PD.
 (d) What is the length of AD ?
27. The sum of first 9 terms of an arithmetic sequence is 45 and the sum of first 18 terms is 171.
 (a) What is the sum of its 10th to 18th terms ?
 (b) What is its 5th term ?
 (c) Find its 14th term.
 (d) Find the sum of 5th to 14th terms.

28. In the figure ABCD is a square. The axes are drawn through the mid points of its sides. The length of its side is 6 units.



- (a) Write the coordinates of its vertices.
 (b) Write the equation of its diagonal BD.

Read the following, understand the mathematical idea expressed in it and answer the questions that follow. 6x1=6

29. Consider the number 2751. The sum of its digits is $2+7+5+1=15$. Adding the digits of 15 we get $1+5=6$. This number 6 is called the 'digital root' of the number 2751. That is, to find the digital root of a number, find the sum of its digits (Don't forget to find the sum of the digits again, if the first sum has more than one digit)

Let us see one more example.

The sum of the digits of the number 679412 is $6+7+9+4+1+2=29$

Sum of digits of 29 = $2+9=11$

Sum of digits of 11 = $1+1=2$

Therefore the digital root of 679412 is 2.

Digital roots have an interesting property. To see this, consider the product $43 \times 27 = 1161$. The digital roots of the numbers 43 and 27 are $4+3=7$ and $2+7=9$. Product of the digital roots = $7 \times 9 = 63$. Digital root of 63 = $6+3=9$. The digital root of 1161 is also 9 ($1+1+6+1=9$). That is the digital root of 1161 = The digital root of 63, where 63 is the product of the digital roots of 43 and 27. This property is true for all other natural numbers.

- (a) What is the digital root of 345 ?
 (b) What is the digital root of 927 ?
 (c) What is the digital root of 345×927 ?
 (d) The digital root of the number $63\Box 5$ is 8 (\Box represents a missing digit). Find the missing digit.
 (e) $121 \times 92 = 11\Box 32$. Find the missing digit.
 (f) If the digital root of a is 5 and the digital root of b is 2. Then what is the digital root of ab ?