SAMPLE QUESTION PAPER-2

MATHEMATICS (STANDARD) - Theory

Time allowed : 3 hours | Maximum Marks : 80

GENERAL INSTRUCTIONS:

(i) This question paper contains 38 questions. All questions are compulsory.

(ii) Question paper is divided into FIVE sections – Section A, B, C, D and E.

(iii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.

(iv) Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION - A

Section - A consists of Multiple Choice type questions of 1 mark each.

1. What is the greatest possible speed at which a girl can walk 95 *m* and 171 *m* in an exact number of minutes?

(*a*) 17 m/min. (*b*) 19 m/min (*c*) 23 m/min. (*d*) 13 m/min.

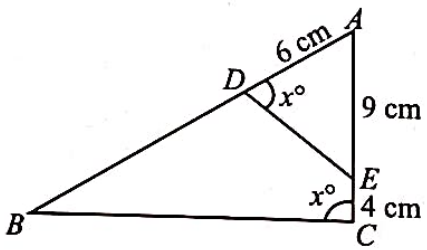
2. A quadratic polynomial, the sum of whose zeroes is 0 and one zero is 4, is

(*a*) $x^2 - 16$ (*b*) $x^2 + 16$ (*c*) $x^2 + 4$ (*d*) $x^2 - 4$

3. secθ when expressed in terms of cotθ, is equal to:

(*a*) $\dfrac{1+\cot^2\theta}{\cot\theta}$ (*b*) $\sqrt{1+\cot^2\theta}$ (*c*) $\dfrac{\sqrt{1+\cot^2\theta}}{\cot\theta}$ (*d*) $\dfrac{\sqrt{1-\cot^2\theta}}{\cot\theta}$

4. In the given figure, $AD = 6$ cm, $AE = 9$ cm and $EC = 4$ cm, then the value of $2BD$ is



(*a*) 9 (*b*) 18 (*c*) 27 (*d*) 36

5. The pair of equations $2x - 5y + 4 = 0$ and $2x + y - 8 = 0$ has

(*a*) A unique solution (*b*) Exactly two solutions (*c*) Infinitely many solutions (*d*) No solution

6. The 11^{th} term of the AP $-3, \frac{-1}{2}, 2, \ldots\ldots$ is:

(a) 22 (b) 28 (c) -38 (d) $48\frac{1}{2}$

7. The radius of a sphere (in cm) whose volume is 12π cm^3, is

(a) 3 (b) $3\sqrt{3}$ (c) $3^{2/3}$ (d) $3^{1/3}$

8. If HCF (306, 1314) = 18, then LCM (306, 1314) is:

(a) 22330 (b) 22335 (c) 22338 (d) 22336

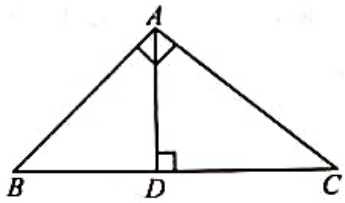
9. A bag contains 12 good mobiles and some defective mobiles. If the probability of drawing a good mobile is three times of a defective mobile, then the number of defective mobiles in the bag are

(a) 3 (b) 18 (c) 4 (d) 6

10. $\frac{2\tan 30°}{1+\tan^2 30°} =$

(a) $\sin 60°$ (b) $\cos 60°$ (c) $\tan 60°$ (d) $\sin 30°$

11. In given figure, if $\angle BAC = 90°$ and $AD \perp BC$ then.



(a) $BD \cdot CD = BC^2$ (b) $AB \cdot AC = BC^2$ (c) $BD \cdot CD = AD^2$ (d) $AB \cdot AC = AD^2$

12. If the difference of the roots of the equation $x^2 - bx + c = 0$ is 1 then

(a) $b^2 - 4c + 1 = 0$ (b) $b^2 + 4c = 0$ (c) $b^2 - 4c - 1 = 0$ (d) $b^2 - 4c = 0$

13. The value of k, for which the pair of linear equations $4x + 6y - 1 = 0$ and $2x - ky = 7$ represents parallel lines is:

(a) 2 (b) -3 (c) 4 (d) -2

14. In an AP, if $a = 3$, $n = 8$, $S_n = 192$ then $d = ?$

(a) 4 (b) 5 (c) 6 (d) 7

15. If the zeroes of the polynomial $x^2 - 4x + 1$ are $a - b$ and $a + b$, then a is

(a) 1 (b) 0 (c) 2 (d) None of these

16. Mean of n numbers $x_1, x_2, \ldots x_n$ is m. If x_n is replaced by x, then new mean is

(a) $m - x_n + x$ (b) $\frac{nm - x_n + x}{n}$ (c) $\frac{(n-1)m + x}{n}$ (d) $\frac{m - x_n + x}{n}$

17. LCM of 6, 72 and 120 is

(a) 360 (b) 260 (c) 180 (d) None of these

18. The length of the line AB formed by two points $A(4, 10)$ and $B(7, -6)$ is

(a) $\sqrt{256}$ (b) $\sqrt{265}$ (c) $\sqrt{526}$ (d) $\sqrt{625}$

DIRECTIONS: In the question number **19** and **20**, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option out of the following:

(*a*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of (A).

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Assertion (A) is false but Reason (R) is true.

19. Assertion (A): The length of the side of a square (whose diagonal is 16 cm) is $8\sqrt{2}$ cm.
Reason (R): In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

20. Assertion (A): Degree of zero polynomial is not defined.
Reason (R): Degree of a non-zero constant polynomial is 0.

SECTION - B

Section - B consists of Very Short Answer (VSA) type questions of 2 marks each.

21. (*a*) If α and β are the roots of quadratic equation $2x^2 - 5x + 3 = 0$, then, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

OR

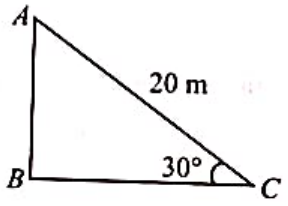
(*b*) Solve the quadratic equation: $x^2 - 2ax + (a^2 - b^2) = 0$ for x.

22. Find a relation between x and y such that the point (x, y) is equidistant from the point (3, 6) and (–3, 4).

23. (*a*) From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower.

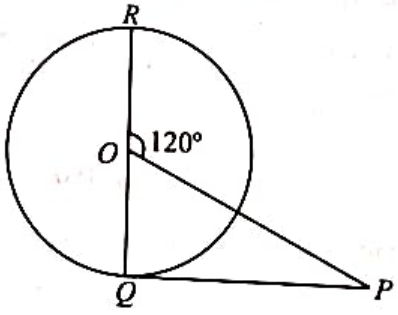
OR

(*b*) A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30°.



24. Using converse of basic proportionality theorem, prove that the line joining the mid-points of any two sides of a triangle is parallel to the third side.

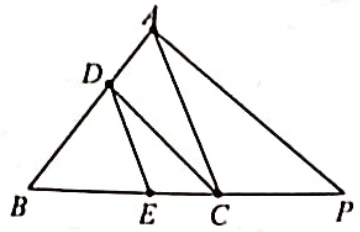
25. PQ is a tangent drawn from an external point P to a circle with centre O and QOR is the diameter of the circle. If $\angle POR = 120°$, What is the measure of $\angle OPQ$?



SECTION - C

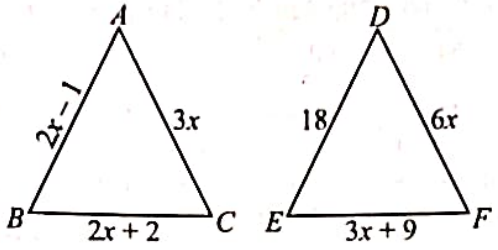
Section - C consists of Short Answer (SA) type questions of 3 marks each.

26. (*a*) In Fig., $DE \parallel AC$ and $DC \parallel AP$. Prove that $\frac{BE}{EC} = \frac{BC}{CP}$.



OR

(*b*) In given figure, if $\angle ABC \sim \angle DEF$ and their sides are of lengths (in cm) as marked along them, then find the lengths of the sides of each triangle.



27. Prove that: $\frac{2\cos^3\theta - \cos\theta}{\sin\theta - 2\sin^3\theta} = \cot\theta$

28. In what ratio does the point $\left(\frac{24}{11}, y\right)$ divide the line segment joining the points $P(2, -2)$ and $Q(3, 7)$? Also find the value of y.

29. (*a*) Find the sum of natural numbers less than 100, which are divisible by 7.

OR

(*b*) Find the sum of first 25 terms of an A.P., in which the third term is 7 and the seventh term is two more than thrice of its third term.

30. National Art convention got registrations from students from all parts of the country, of which 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same artform and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room?

31. Solve the following quadratic equation:
$6a^2x^2 - 7abx - 3b^2 = 0$

SECTION - D

Section - D consists of Long Answer (LA) type questions of 5 Marks each.

32. (*a*) The two palm trees are of equal heights are standing opposite to each other on either side of the river, which is 80 m wide. From a point O between them on the river the angles of elevation of the top of the trees are 60° and 30°, respectively. Find the height of the trees and the distances of the point O from the trees.

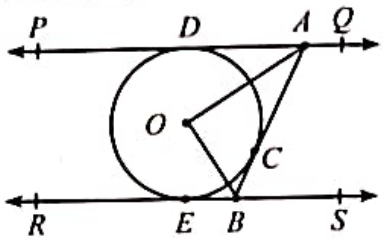
OR

(*b*) A pole 6 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point P on the ground is 60° and the angle of depression of the point P from the top of the tower is 45°. Find the height of the tower and the distance of point P from the foot of the tower. (Use $\sqrt{3} = 1.73$)

33. (*a*) If from an external point B of a circle with centre O two tangents, BC and BD are drawn such that $\angle DBC = 120°$. Prove that $BC + BD = BO$, i.e., $BO = 2BC$

OR

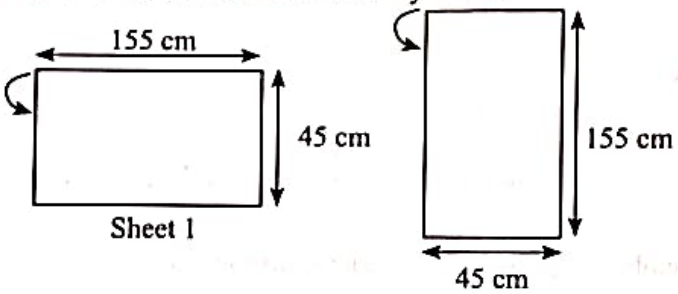
(*b*) In Figure, PQ and RS are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting PQ at A and RS at B. Prove that $\angle AOB = 90°$.



34. The data below gives the earnings of 350 workers in a cotton mill. Find the average monthly earning of the group.

Monthly Earning	160-180	180-200	200-220	220-240	240-260	260-280	280-300	300-320	320-340
No. of Workers	40	54	60	72	45	32	28	15	4

35. Two rectangular sheets of dimensions 45 cm × 155 cm are folded to make hollow right circular cylindrical pipes, such that there is exactly 1 cm of overlap when sticking the ends of the sheet. Sheet 1 is folded along its length, while Sheet 2 is folded along its width. That is, the top edge of the sheet is joined with its bottom edge in both the sheets, as depicted by the arrow in the figure below. Both pipes are closed on both ends to form cylinders.



(Note: The figures are not to scale.)

(*i*) Find the difference in the curved surface areas of the two cylinders.

(*ii*) Find the ratio of the volumes of the two cylinders formed.

(Note: Use $\pi = \frac{22}{7}$. Assume that the sheets have negligible thickness.)

SECTION - E

Section - E consists of three Case Study Based questions of 4 marks each.

36. Rahul and Ravi, two friends with a shared interest in board games and business strategy, decided to spend an evening playing "Business," a popular board game that simulates entrepreneurship and financial decision-making.

Based on the given information, answer the following questions:

(*i*) Ravi got first chance to roll the dice twice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 8? **1**

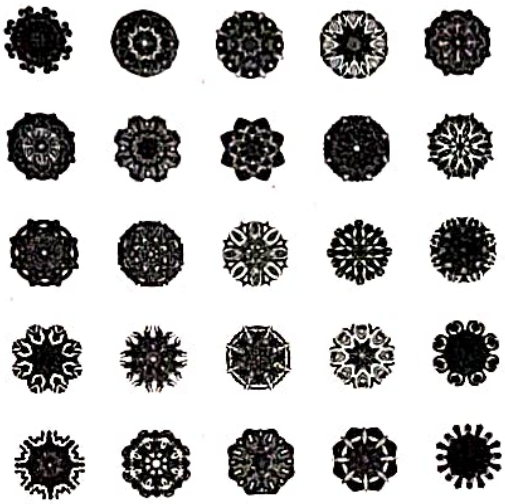
(*ii*) Rahul got next chance to roll the dice twice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 12? **1**

(*iii*) Now it was Ravi's turn. He rolled the dice twice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is greater than or equal to 6? **2**

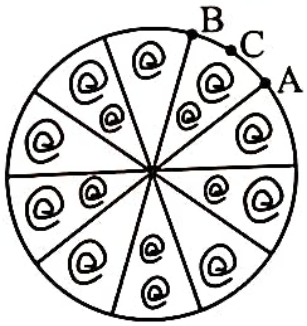
OR

Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is greater than 8?

37. A brooch is a decorative piece often worn on clothing like jackets, blouses or dresses to add elegance. Made from precious metals and decorated with gemstones, brooches come in many shapes and designs.



One such brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the figure.



Based on the above given information, answer the following questions:

(*i*) Find the central angle of each sector. **1**

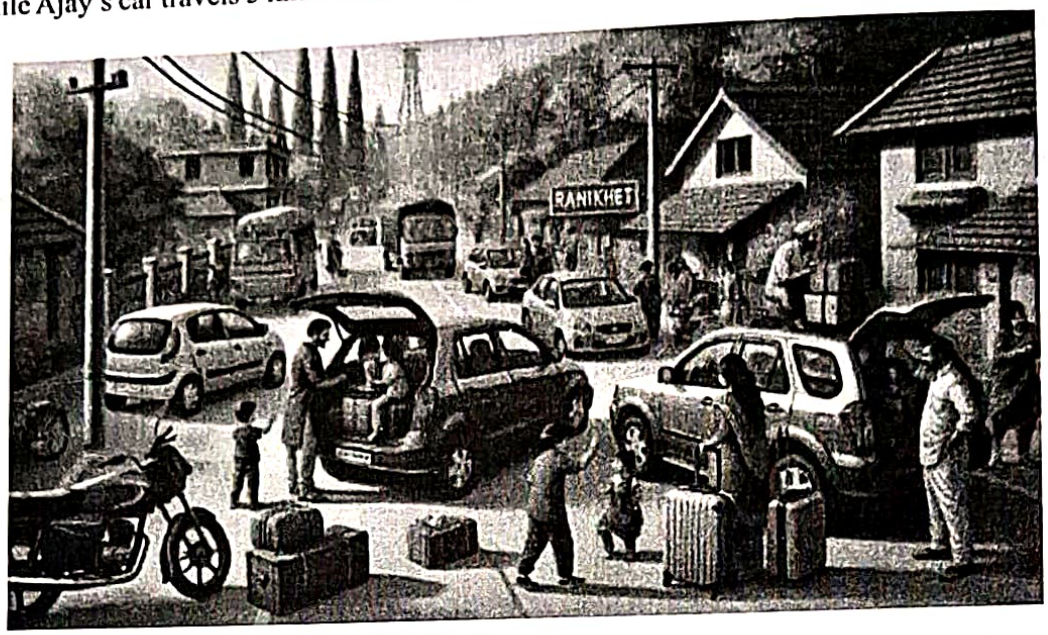
(*ii*) Find the length of the arc ACB. **1**

(*iii*) Find the area of each sector of the brooch. **2**

OR

Find the total length of the silver wire used.

38. Raj and Ajay are very close friends. Both of their families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km.



Based on the given information, answer the following questions:

(*i*) What will be the distance covered by Raj's car in three hours? 1

(*ii*) What will be the distance covered by Ajay's car in the two hours? 1

(*iii*) Find the quadratic equation. 2

OR

What is the speed of Raj's car?