PAPER 01 (2023)

Class 10 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

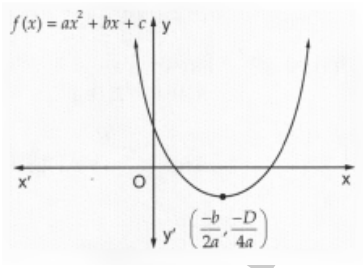
Section A

1. The LCM of smallest 2-digit number and smallest composite number is **[1]**

   a) 4 b) 20

   c) 40 d) 12

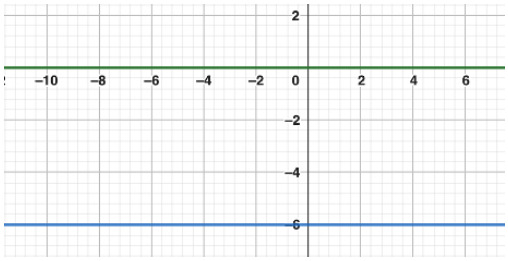
2. Figure show the graph of the polynomial $f(x) = ax^2 + bx + c$ for which **[1]**



   a) a > 0, b < 0 and c > 0 b) a < 0, b < 0 and c < 0

   c) a < 0, b > 0 and c > 0 d) a > 0, b > 0 and c < 0

3. The pair of linear equations y = 0 and y = - 6 has: **[1]**



a) no solution

b) only solution (0, 0)

c) infinitely many solutions

d) a unique solution

4. A cyclist takes 2 hours less to cover a distance of 200 km, if he increases his speed by 5 km/hr. Then his original speed is **[1]**

a) 26 km/hr

b) 20 km/hr

c) 24 km/hr

d) 25 km/hr

5. The common difference of an A.P. in which $a_{18} - a_{14} = 32$ is **[1]**

a) -8

b) 6

c) 8

d) -6

6. Points (6, 8), (3, 7), (-2, -2) and (1, -1) are joined to form a quadrilateral. What will be the structure of the quadrilateral? **[1]**

a) Rectangle

b) Rhombus

c) Square

d) Parallelogram

7. Three consecutive vertices of a parallelogram ABCD are A(1, 2), B(1, 0) and C(4, 0). The co – ordinates of the fourth vertex D are **[1]**

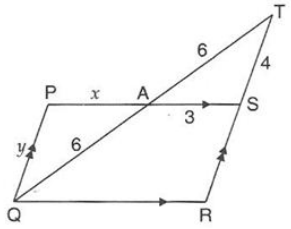
a) (– 4, 2)

b) (4, – 2)

c) (4, 2)

d) (– 4, – 2)

8. In the given figure if PS||QR and PQ||SR and AT = AQ = 6, AS = 3, TS = 4, then **[1]**



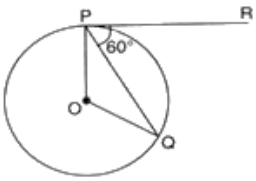
a) x = 2, y = 3.

b) x = 1, y = 2.

c) x = 3, y = 4.

d) x = 4, y = 5.

9. If O is the centre of a circle, PQ is a chord and tangent PR at P makes an angle of 60° with PQ, then $\angle POQ$ is equal to **[1]**



a) 110°

b) 120°

c) 100°

d) 90°

10. Two equal circles touch each other externally at C and AB is a common tangent to the circles. Then, $\angle ACB$ = **[1]**

a) 30^o

b) 45^o

c) 60^o

d) 90^o

11. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \text{cosec}\theta)$ = **[1]**

a) 0 b) 2

c) 1 d) –1

12. If $3\cos\theta = 5\sin\theta$, then the value of $\frac{5\sin\theta - 2\sec^3\theta + 2\cos\theta}{5\sin\theta + 2\sec^3\theta - 2\cos\theta}$ is **[1]**

a) $\frac{542}{2937}$ b) $\frac{271}{979}$

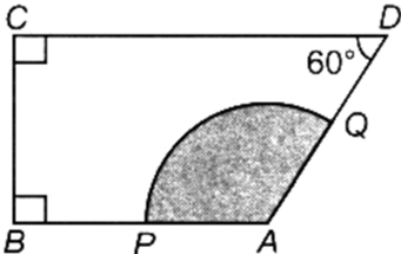
c) None of these d) $\frac{316}{2937}$

13. The height of a tower is 100 m. When the angle of elevation of the sun changes from 30° to 45°, the shadow of the tower becomes x meters less. The value of x is **[1]**

a) 100 m b) 100 ($\sqrt{3}$ - 1) m

c) $100\sqrt{3}$ m d) $\frac{100}{\sqrt{3}}$ m

14. In the given figure (not drawn to scale), AP = AQ = 3 cm, the area of the shaded region is _____. **[1]**



a) 3π cm^2 b) 7π cm^2

c) 9π cm^2 d) 6π cm^2

15. The length of the minute hand of a wall clock is 7 cm, then area swept by the minute hand in 10 minutes is **[1]**

a) 30 cm^2 b) 25.66 cm^2

c) 30.66 cm^2 d) 28.69 cm^2

16. If three coins are tossed simultaneously, then the probability of getting at least two heads, is **[1]**

a) $\frac{1}{2}$ b) $\frac{3}{8}$

c) $\frac{1}{4}$ d) $\frac{7}{4}$

17. A number x is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3 the probability that $|x| < 2$ is **[1]**

a) $\frac{1}{7}$ b) $\frac{2}{7}$

c) $\frac{3}{7}$ d) $\frac{5}{7}$

18. The mean of first n odd natural numbers is $\frac{n^2}{81}$, then n = **[1]**

a) 9 b) 18

c) 81 d) 27

19. **Assertion (A):** Two identical solid cubes of side a are joined end to end. Then the total surface area of the resulting cuboid is 10 a^2. **[1]**

Reason (R): The total surface area of a cube having side a = 6 a^2.

a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** If S_n is the sum of the first n terms of an A.P., then its n^{th} term a_n is given by $a_n = S_n - S_{n-1}$ **[1]**

Reason (R): The 10^{th} term of the A.P. 5, 8, 11, 14, ... is 35.

a) Both A and R are true and R is the correct explanation of A.

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

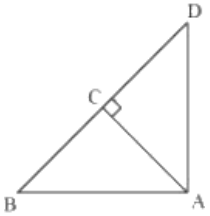
c) A is true but R is false.

d) A is false but R is true.

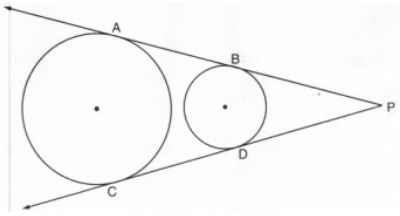
Section B

21. Find the largest positive integer that will divide 122,150 and 115 leaving remainders 5, 7, 11 respectively. **[2]**

22. $\triangle$ABD is a right triangle right-angled at A and AC$\perp$ BD. Show that $AB^2 = BC \times BD$ **[2]**

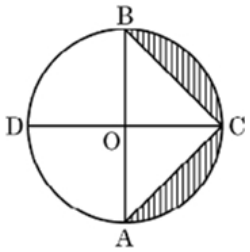


23. In the fig. AB and CD are common tangents to two circles of unequal radii. Prove that AB = CD. **[2]**



24. If θ is an acute angle and $\tan\theta + \cot\theta = 2$, then find the value of $\tan^7\theta + \cot^7\theta$. **[2]**

25. In the given figure, AB and CD are the diameters of a circle with centre O, perpendicular to each other. If OA = 7 cm, find the area of the shaded region. **[2]**



OR

The area of a sector of a circle of radius 5 cm is $5\pi cm^2$. Find the angle contained by the sector.

Section C

26. A wine seller had three types of wine. 403 liters of 1st kind, 434 liters of 2nd kind and 465 liters of 3rd kind. Find the least possible number of casks of equal size in which different types of wine can be filled without mixing. **[3]**

27. Find the zeroes of quadratic polynomial x^2 - 2x - 8 and verify the relationship between the zeroes and their coefficients. **[3]**

28. Solve the following system of equation by elimination method: **[3]**

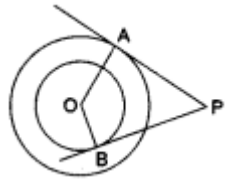
$\frac{x}{2} - \frac{y}{5} = 4$ and $\frac{x}{7} + \frac{y}{15} = 3$

OR

A man has only 20 paisa coins and 25 paisa coins in his purse. If he has 50 coins in all totalling to ₹ 11.25, how many coins of each kind d38196oes he have?

29. Tangents PA and PB are drawn from an external point P to two concentric circles with centre O and radii 8 cm **[3]**

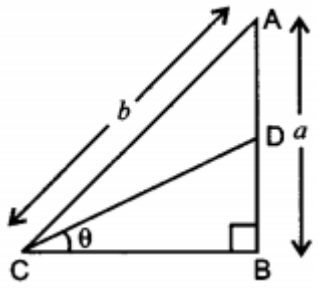
and 5 cm respectively, as shown in the figure. If AP = 15 cm then find the length of BP.



OR

ABC is a right-angled triangle, right angled at A. A circle is inscribed in it. The lengths of two sides containing the right angle are 24 cm and 10 cm. Find the radius of the incircle.

30. In figure AD = BD and $\angle B$ is a right angle. Determine $\sin^2\theta + \cos^2\theta$. **[3]**



31. Find the mean of the following data using step-deviation method: **[3]**

Class	500 - 520	520 - 540	540 - 560	560 - 580	580 - 600	600 - 620
Frequency	14	9	5	4	3	5

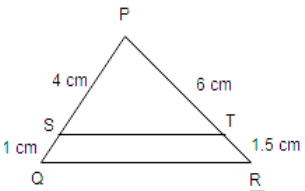
Section D

32. A 2-digit number is such that the product of its digits is 24. If 18 is subtracted from the number, the digits interchange their places. Find the number. **[5]**

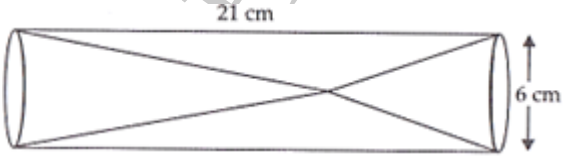
OR

Sum of the areas of two squares is 544 m^2. If the difference of their perimeters is 32 m, find the sides of the two squares.

33. In the given figure, PS, SQ,PT and TR are 4 cm,1 cm,6 cm and 1.5 cm,respectively. Prove that ST ‖ QR. **[5]**



34. Two solid cones A and B placed in a cylindrical tube as shown in the figure. The ratio of their capacities are 2 : 1. Find the heights and capacities of cones. Also, find the volume of the remaining portion of the cylinder. **[5]**



OR

A solid wooden toy is in the shape of a right circular cone mounted on a hemisphere. If the radius of the hemisphere is 4.2 cm and the total height of the toy is 10.2 cm, find the volume of the wooden toy.

35. Find the mean and the median of the following data: **[5]**

Marks	Number of Students
0 - 10	3

10 - 20	5
20 - 30	16
30 - 40	12
40 - 50	13
50 - 60	20
60 - 70	6
70 - 80	5

Section E

36. **Read the text carefully and answer the questions:** **[4]**

Akshat's father is planning some construction work in his terrace area. He ordered 360 bricks and instructed the supplier to keep the bricks in such as way that the bottom row has 30 bricks and next is one less than that and so on.

The supplier stacked these 360 bricks in the following manner, 30 bricks in the bottom row, 29 bricks in the next row, 28 bricks in the row next to it, and so on.

(a) In how many rows, 360 bricks are placed?

(b) How many bricks are there in the top row?

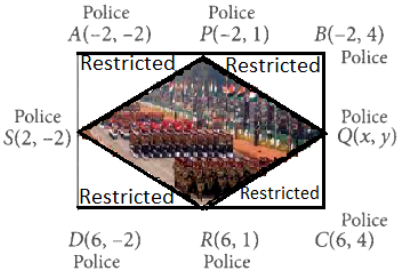
OR

How many bricks are there in 10^{th} row?

(c) If which row 26 bricks are there?

37. **Read the text carefully and answer the questions:** **[4]**

In order to facilitate smooth passage of the parade, movement of traffic on certain roads leading to the route of the Parade and Tableaux ah rays restricted. To avoid traffic on the road Delhi Police decided to construct a rectangular route plan, as shown in the figure.



(a) If Q is the mid point of BC, then what are the coordinates of Q?

(b) What is the length of the sides of quadrilateral PQRS?

OR

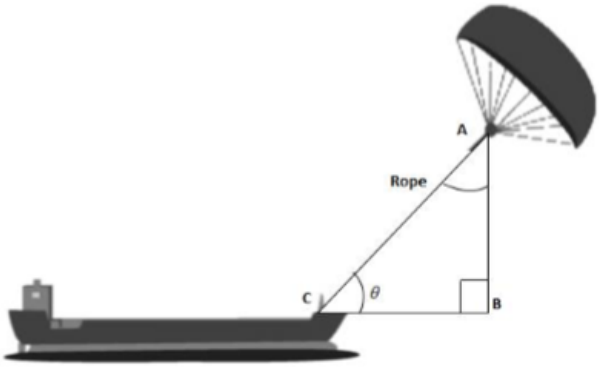
What is the length of route PQRS?

(c) What is the length of route ABCD?

38. **Read the text carefully and answer the questions:** **[4]**

Skysails is the genre of engineering science that uses extensive utilization of wind energy to move a vessel in the seawater. The 'Skysails' technology allows the towing kite to gain a height of anything between 100 metres - 300 metres. The sailing kite is made in such a way that it can be raised to its proper elevation and then brought back with the help of a 'telescopic mast' that enables the kite to be raised properly and effectively.

Based on the following figure related to sky sailing, answer the following questions:



(a) In the given figure, if $\sin\theta = \cos(\theta - 30^o)$, where θ and $\theta - 30^o$ are acute angles, then find the value of θ.

(b) What should be the length of the rope of the kite sail in order to pull the ship at the angle θ (calculated above) and be at a vertical height of 200m?

OR

In the given figure, if $\sin\theta = \cos(3\theta - 30^o)$, where θ and $3\theta - 30^o$ are acute angles, then find the value of θ.

(c) What should be the length of the rope of the kite sail in order to pull the ship at the angle θ (calculated above) and be at a vertical height of 150m?