CLASS -10
MATHEMATICS -041

Time Allowed: 3 Hours **Maximum MARKS :80**

Roll No.: **Date: 27/01/2023**

CODE - I

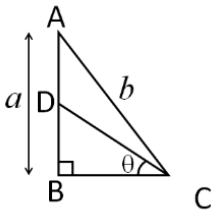
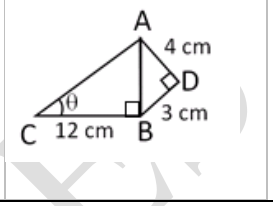
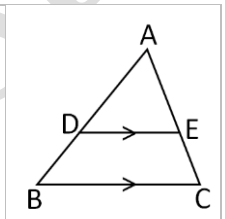
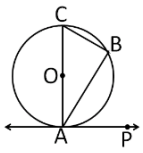
General Instructions:

1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 Case Based integrated units of assessment (4 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 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

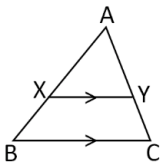
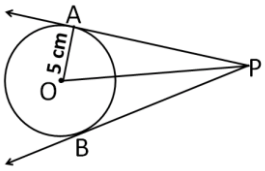
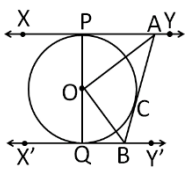
SECTION - A

Section A consists of 20 questions of 1 mark each.

S.NO		Marks
1.	The smallest number divisible by all natural numbers from 1 to 10 is (a) 2020 (b) 2520 (c)1010 (d) 5040	1
2.	If the roots of $x^2 + 4mx + 4m^2 - m - 1 = 0$ are real, then (a) $m = -1$ (b) $m \leq -1$ (c)$m \geq -1$ (d) $m \geq 0$	1
3.	If one zero of the polynomial $x^2 - 8x + k$ exceeds the other by 2 , then the value of k is (a) 35 (b) 25 (c)15 (d)5	1
4.	The pair of equations $2x + ky = 1$ and $5x - 7y = 5$ has no solution when (a) $k = \frac{13}{5}$ (b) $k = \frac{-13}{5}$ (c) $k = \frac{-14}{5}$ (d) $k = \frac{-16}{5}$	1
5.	AOBC is rectangle whose three vertices are A(0,3) B(5,0) and O(0,0). The length of its diagonal is (a) 5 (b) 4 (c)$\sqrt{34}$ (d $\sqrt{44}$	1
6.	In ΔABC and ΔDEF , $\angle B = \angle E$, $\angle F = \angle C$ and AB = 3 DE. Then the two triangles are (a)congruent but not similar (b) similar but not congruent	1

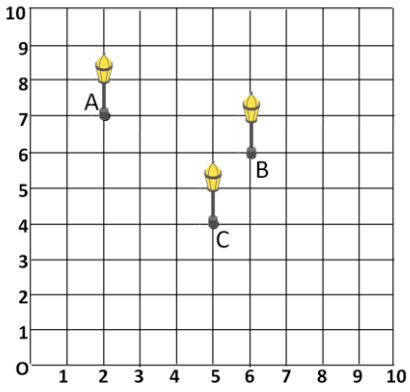
	(c)neither congruent nor similar (d)congruent as well as similar	
7.	In the given figure AB= a , AC= b, AD = BD and $\angle B = 90^{\circ}$, then the value of tan θ is (a) $\frac{a}{2\sqrt{b^2-a^2}}$ (b) $\frac{a}{\sqrt{b^2-a^2}}$ (c) $\frac{b}{\sqrt{a^2+b^2}}$ (d) $\frac{b}{2\sqrt{a^2+b^2}}$ 	**1**
8.	In the figure given, AD= 4 cm , BD = 3 cm , CD = 12 cm then $sec\ \theta$ is (a)$\frac{5}{12}$ (b) $\frac{12}{5}$ (c) $\frac{13}{5}$ (d) $\frac{12}{13}$ 	**1**
9.	D and E are respectively the points on the sides AB and AC of ΔABC such that $AD = 2cm, BD = 3\ cm,\ BC = 7.5\ cm$ and $DE \parallel BC$, then the length of $DE\ (in\ cm)$ is (a)2.5 (b) 3 (c) 5 (d) 6 	**1**
10.	$\Delta\ ABC \sim \Delta\ DEF$, such that AB = 9.1 cm and DE = 6.5 cm. If the perimeter of $\Delta\ DEF$ is 25 cm, then the perimeter of ΔABC is (a)$36cm$ (b) $30cm$ (c) $34cm$ (d) $35cm$	**1**
11.	In the figure, AB is a chord of a circle with centre O and AC is the diameter. $\angle ACB = 50°$, and AP is a tangent to the circle at A. Then $\angle BAP\ is$ (a)65° (b) 60° (c) 50° (d) 40° 	**1**
12.	If the areas of 2 circles are is the ratio 4:9, then the ratio of the perimeters of the semicircles is (a) 2: 3 (b) 3:2 (c) 1: 2 (d) 1: 3	**1**
13.	From a solid, right circular cylinder of height 14 cm and base radius 6 cm, a right circular cone of same height and same radius is removed. The volume of the remaining solid is (a) 1112 cm^3 (b) 1056cm^3 (c) 1000cm^3 (d) 1058cm^3	**1**
14.	If the mean and median of a frequency distribution are 20 and 24 respectively, then the value of mode is (a) 30 (b) 32 (c) 28 (d) 12	**1**
15.	The length of the minor arc of a circle is $\left(\frac{2}{9}\right) th$ of its circumference. Then the angle subtended by the arc at the centre of the circle is	**1**

	(a) 80° (b) 60° (c) 45° (d) 30°	
16.	For the following distribution, half the sum of lower limit of median class and the upper limit of the modal class is C.I: 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50-60 | 60-70 freq.: 4 | 7 | 15 | 18 | 4 | 2 (a) 80 (b) 40 (c)50 (d) 60	**1**
17.	The probability of selecting a boy randomly from a class is 0.6 and there are 45 students in the class. Then the number of girls is (a) 9 (b) 12 (c)36 (d)18	**1**
18.	If $\sin\theta = \frac{1}{3}$, then the value of $3cot^2\theta + 3$ is (a) 6 (b) 9 (c) 18 (d)27	**1**
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	**1**
19	**Assertion** : 6^n cannot end with the digit zero, where n is a natural number. **Reason** : Any number ends with the digit zero , if its prime factorization includes $2^m \times 5^n$ where *m* and *n* are whole numbers. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (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.	**1**
20.	**Assertion**: A line formed by joining (-1 , 3) and (9 , 8) is divided by the point (3 , 5) in the ratio 1:3 **Reason** *:* The co- ordinates of the point which divides the line joining (x_1 , y_1) and (x_2 , y_2) in the ratio *m: n* is $\left(\frac{mx_2+nx_1}{m+n} , \frac{my_2+ny_1}{m+n}\right)$ (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (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	**1**
	Section B	
	Section B consists of 5 questions of 2 marks each.	
21.	Solve the following pair of linear equations for *x* and *y*. $mx - ny = m^2 + n^2$ $x + y = 2m$	**2**

22.	In the given figure, $XY \parallel AB$. If $AB = 4BX$ and $YC = 2cm$, then find AY. 	**2**
23.	In the figure the angle between two tangents drawn from an external point P to a circle of radius 5 cm and centre O is 60°, then find the length of OP . 	**2**
24.	The perimeter of a sector of a circle of radius 5.2 cm is 16.4 cm . Find the area of the sector. **[OR]** A pendulum swings through an angle of 30° and describes an arc of length 8.8 cm. Find the length of the pendulum.	**2**
25.	If $2\sin(3x - 15)^{\circ} = \sqrt{3}$, find the value of $sin^2(2x + 10)$. **[OR]** If $\sin(A + B) = 1$ and $\cos(A - B) = \frac{\sqrt{3}}{2}$, $0 < A + B \leq 90^{\circ}$, $A > B$ then find A and B .	**2**
	Section C	
	Section C consists of 6 questions of 3 marks each.	
26.	Prove that $7 - 2\sqrt{3}$ is an irrational number.	**3**
27.	If the sum of the zeroes of the polynomial $(a + 1)x^2 + (2a + 3)x + (3a + 4)$ is -1 , find the product of its zeroes.	**3**
28.	In a painting competition of a school, a student made a flag whose perimeter was $50\ cm$. Its area will be decreased by $6cm^2$, if length is decreased by $3cm$ and breadth is increased by $2cm$, then find the dimensions of the flag. **[OR]** A two digit number is obtained by either multiplying the sum of the digits by 8 and subtratcting 5 or multiplying the difference of the digits by 16 and then adding 3. Find the number .	**3**
29.	Prove that $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} = \sin\theta + \cos\theta$	**3**
30.	In the figure XY and $X'Y'$ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and $X'Y'$ at B. Find the measure of $\angle AOB$. 	**3**

31.	Cards numbered from 2 to 61 are put inside a box. One card is drawn at random. Find the probability of getting a card with (a) a number which is multiple of 6 (b) a prime number less than 20 (c) a perfect square number.	**3**
	Section D	
	Section D consists of 4 questions of 5 marks each.	
32.	A plane left 30 minutes late than its scheduled time and in order to reach the destination 1500 km away on-time, it had to increase its speed by 100 km/hr from the usual speed. Find its usual speed. **[OR]** A shopkeeper buys a number of books for Rs.80. If he had bought 4 more books for the same amount, each book would have cost Rs.1 less. How many books did he buy?	**5**
33.	Prove that if a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio. Using the above theorem, prove that a line drawn through the midpoint of one side of a triangle parallel to another side, bisects the third side.	**5**
34.	A toy is in the form of a cone of radius 3.5cm mounted on a hemisphere of same radius .The total height of the toy is15.5cm . Find the volume and total surface area of the toy. **[OR]** A wooden article is made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 12cm and base is of radius 4.2cm, find the total surface area of the article. Also find the volume of wood left in the article.	**5**
35.	If the median of the following distribution is 32, find the values of *x* and *y* where the total number of frequencies is 100.	**5**

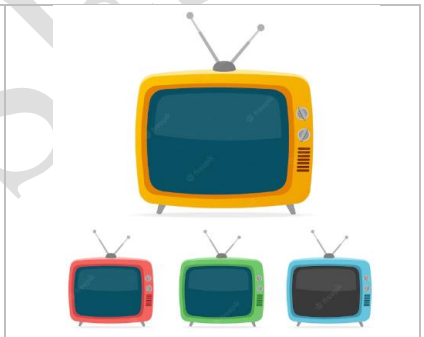
Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	10	*x*	25	30	*y*	10

	Section E	
	Case study based questions are compulsory.	
36.	**Case Study – 1** Resident Welfare Association (RWA) of Gulmohar society in Delhi has installed three electric poles A, B and C in the society's common park. Despite these three poles, some parts of the park are still in dark. So they decide to have more poles in the park. The park can be modelled as a co-ordinate system as shown in the figure.  Based on the above information answer the following questions.	

(i)	What is the distance of the pole B from the corner O of the park?	1
(ii)	Find the coordinates of the fourth pole D so that the points A, B, C and D taken in order form a parallelogram.	1
(iii)	Find the relation between x and y such that E (x, y) is equidistant form A and C. **[OR]** Find the ratio in which P (4, m) divides the line segment joining A and C. Hence find m	2

37. **Case Study – 2**

India is one of the competitive manufacturing location, low cost and manpower contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16,000 sets in its 6^{th} year and 22,600 in the 9^{th} year.



Based on the above information answer the following questions.

(i)	Find the production of TV sets during the first year.	1
(ii)	How many TV sets were produced during the 8^{th} year?	1
(iii)	Find the total number of TV sets produced in the first 7 years. **[OR]** In which year the production of TV sets was 29,200?	2

38. **Case Study – 3**

Friends Forever: Ramu and Somu are best friends. One day Ramu had to go overseas for higher studies by ship. Two ships C and D are on either side of a light house AB in such a way that the ships and the light house are in the same straight line. Ramu standing on the deck of ship C which is 10 m above the water level, waves to Somu standing on the top of the light house at an angle of elevation of 30°. Distance between Ramu and Somu is 100 m. Somu observes ship D at an angle of depression of 60°.(Use $\sqrt{3} = 1.73$).

Based on the above information answer the following questions

		(i)	Draw a neat labelled figure to show the above situation diagrammatically.	1	
		(ii)	Find the height of the light house.	1	
		(iii)	Find the distance between the ships. **[OR]** Find the distance between Somu and the ship D.	2	

End of Paper