B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PRE BOARD 3: SET 2 (2025-26)
MATHEMATICS

Class: X   **Time: 3 hrs**
Date: 20-01-26   **Max Marks: 80**
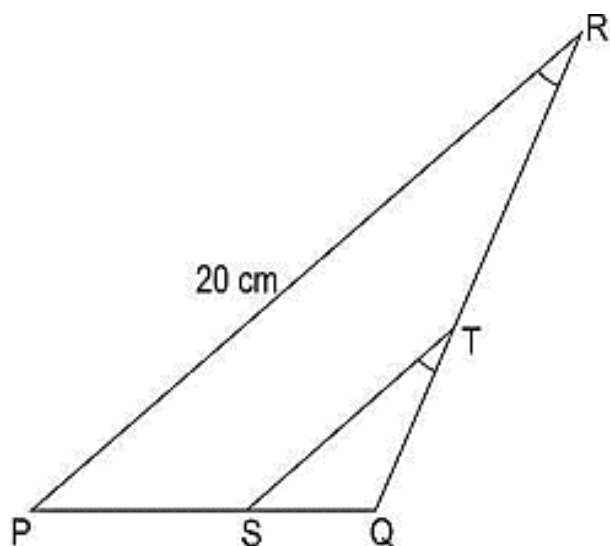**Admission no:**   **Roll no:**

General Instructions
1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into FIVE Sections – A, B, C, D and E.
3. In Section A, Question number 1 to 18 are Multiple Choice Questions (MCQs) and Question number 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Question number 21 to 25 are Very Short Answer (VSA) type questions carrying 2 marks each.
5. In Section C, Question number 26 to 31 are Short Answer (SA) type questions carrying 3 marks each.
6. In Section D, Question number 32 to 35 are Long Answer (LA) type questions carrying 5 marks each.
7. In Section E, Question number 36 to 38 are Case Study Based questions carrying 4 marks each.
8. 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 one sub-part each in 2 questions in Section E.
9. Use of calculator is NOT allowed.

SECTION A

Section A consists of 20 questions of 1 mark each.

1 ΔPQR is shown below. ST is drawn such that ∠PRQ = ∠STQ. If $\frac{QT}{TR} = \frac{1}{3}$, length of TS is: 1

(A)	$\frac{10}{3}$ cm	**(B)**	5 cm	**(C)**	12 cm	**(D)**	$\frac{40}{3}$ cm

2 If R×tan 60° cos 60°= sin 60° cot 60°, then R is: 1

(A)	cos30°	**(B)**	tan30°	**(C)**	sin30°	**(D)**	cot30°

1

3 Consider the following frequency distribution:

Class	0-6	6-12	12-18	18-24	24-30
Frequency	12	10	15	8	11

The median class is:

(A) 6-12 **(B)** 12-18 **(C)** 18-24 **(D)** 24-30

4 Two circles with centres O and N touch each other at point P as shown. O, P and N are collinear. The radius of the circle with centre O is twice that of the circle with centre N. OX is a tangent to the circle with centre N, and OX = 18 cm. The radius of the circle with centre N is: **1**
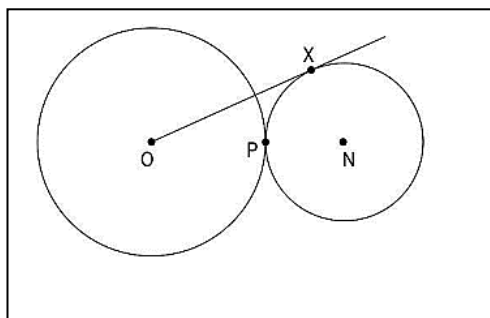
(A) $\frac{18}{\sqrt{2}}$ cm **(B)** 9 cm **(C)** $\frac{9}{\sqrt{2}}$ cm **(D)** $\frac{18}{\sqrt{10}}$ cm

5 If the point P(J, 0) divides the line segment joining the points A(2, –2) and B(–7, 4) in the ratio 1 : 2, then the value of J is: **1**

(A) 1 **(B)** 2 **(C)** -2 **(D)** -1

6 The pair of linear equations $x + 2y + 5 = 0$ and $–3x = 6y – 1$ has: **1**

(A) unique solution **(B)** exactly two solutions **(C)** infinitely many solutions **(D)** no solution

7 If the difference of Mode and Median of a data is 24, then the difference of median and mean is: **1**

(A) 8 **(B)** 12 **(C)** 24 **(D)** 36

8 If $\sec \theta – \tan \theta = m$, then the value of $\sec \theta + \tan \theta$ is: **1**

**(A)** $1 - \frac{1}{m}$ **(B)** $m^2 - 1$ **(C)** $\frac{1}{m}$ **(D)** -m

9 If the probability of a player winning a game is 0.790, then the probability of his losing the same game is: **1**

(A) 1.79 **(B)** 0.31 **(C)** 0.21% **(D)** 0.21

10 If one zero of the polynomial $6x^2 + 37 x – (t – 2)$ is reciprocal of the other, the value of t is: **1**

(A) -6 **(B)** -4 **(C)** 6 **(D)** 4

    1

11 If the discriminant of the quadratic equation $3x^2 - 2x + c = 0$ is 16, then the value of c is:

(A) 1 **(B)** 0 **(C)** -1 **(D)** $\sqrt{2}$

12 Two identical solid cubes of side k units are joined end to end. The volume of the resulting cuboid in cubic units is: **1**

(A) $6k^3$ **(B)** $4k^3$ **(C)** $3k^3$ **(D)** $2k^3$

13 Two dice are rolled together. The probability of getting addition of numbers on the two dice as 5 is: **1**

(A) $\dfrac{1}{9}$ **(B)** $\dfrac{11}{36}$ **(C)** $\dfrac{5}{36}$ **(D)** $\dfrac{4}{9}$

14 The value of x for which 2x, (x + 10) and (3x + 2) are the three consecutive terms of an AP, is: **1**

(A) 6 **(B)** -6 **(C)** 18 **(D)** -18

15 In the given figure, tangents PA and PB to the circle centred at O, from point P are perpendicular to each other. If PA = 5 cm, the length of AB is equal to: **1**
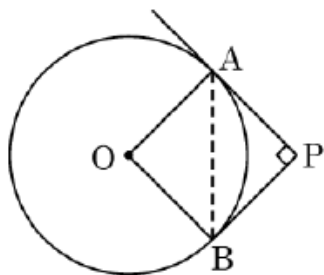
(A) 5 cm **(B)** $5\sqrt{2}$ cm **(C)** $2\sqrt{5}$ cm **(D)** 10 cm

16 If α, β are the zeroes of a polynomial $p(x) = x^2 + x - 1$, then $\dfrac{1}{\alpha} + \dfrac{1}{\beta}$ is: **1**

(A) -1 **(B)** 2 **(C)** 1 **(D)** $\dfrac{-1}{2}$

17 AD is a median of ΔABC with vertices A(5, -6), B(6, 4) and C(0, 0). Length AD is equal to: **1**

(A) $\sqrt{68}$ **(B)** $2\sqrt{15}$ units **(C)** $\sqrt{101}$ units **(D)** 10 units

18 The radius of the base of a right circular cone and the radius of a sphere are each 5 cm in length. If the volume of the cone is equal to the volume of the sphere then the height of the cone is: **1**

(A) 5 cm **(B)** 20 cm **(C)** 10 cm **(D)** 4 cm

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.

(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 and 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):** If product of two numbers is 5780 and their HCF is 17, then their LCM is 340. **1**

Reason (R): HCF is always a factor of LCM

20 **Assertion(A):** If the circumference of a circle is 176 cm, then its radius is 28 cm. **1**

Reason (R): Circumference $= 2\pi \times$ radius of a circle.

SECTION B

Section B consists of 5 questions of 2 marks each.

21 Find the point on x-axis which is equidistant from the points (2, -2) and (-4, 2). **2**

22 (a)The probability of selecting a blue marble at random from a jar that contains only blue, black and green marbles is $\frac{1}{5}$. The probability of selecting a black marble at random from the same jar is $\frac{1}{4}$. If the jar contains 11 green marbles, find the total number of marbles in the jar. **2**

OR

(b)Cards numbered 7 to 40 were put in a box. Poonam selects a card at random. What is the probability that Poonam selects a card which is a multiple of 7?

23 (a)Show that $5 \times 11 \times 17 + 3 \times 11$ is a composite number. **2**

OR

(b)Find the H.C.F and L.C.M of 480 and 720 using the Prime factorisation method.

24 PQ is a line segment such that the y- coordinate of P is -1 and Q lies on Y – axis. The mid-point of PQ is O(-3, -6). Find the coordinates of P and Q. **2**

25 If sin(A+B) =1 and cos(A-B) = $\frac{\sqrt{3}}{2}$, 0°< A+B ≤ 90° and A> B, then find the measures of angles A and B. **2**

SECTION C

Section C consists of 6 questions of 3 marks each.

26 If α and β are the zeroes of the polynomial $x^2 - x - 2$, find a polynomial whose zeroes are $(2\alpha + 1)$ and $(2\beta + 1)$. **3**

27 (a)In a teachers' workshop, the number of teachers teaching French, Hindi and English are 48, 80 and 144 respectively. Find the minimum number of rooms required if in each room the same number of teachers are seated and all of them are of the same subject. **3**

OR

(b)On a morning walk, three persons step out together and their steps measure 30 cm, 36 cm and 40 cm respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps?

28 (a)A chord of a circle of radius 14 cm subtends an angle of 60^0 at the centre. Find the area of the corresponding minor segment of the circle. **3**

OR

(b)A horse is tied with a 14 m long rope at one corner of an equilateral triangular field having side 20m. Find the area of the field where the horse cannot graze.

29 Prove that: $\dfrac{tan\,\theta}{1-cot\,\theta} + \dfrac{cot\,\theta}{1-tan\,\theta} = 1 + \sec\theta\,\text{cosec}\,\theta$ **3**

30 Prove that $2 + 5\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number. **3**

31 Sum of the areas of two squares is 468 m². If the difference of their perimeters is 24 m, find the sides of the two squares. **3**

SECTION D

Section D consists of 4 questions of 5 marks each.

32 A pole 6m 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 60^0 and the angle of depression of the point P from the top of the tower is 45^0. Find the height of the tower and the distance of the point P from the foot of the tower. **5**

(Use $\sqrt{3}$ = 1.73)

33 (a)Solve the following pair of equations graphically: $3x + y – 5 = 0;\ \ 2x – y – 5 = 0$ **5**

Also find the co-ordinates of the points where the lines represented by the above equations meet the *y*-axis.

OR

(b)Tara scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Tara would have scored 50 marks. Assuming that Tara attempted all questions, find the total number of questions in the test.

34 (i)Prove that the lengths of the tangents drawn from an external point to a circle are equal. **5**

(ii) In Figure, a quadrilateral ABCD is drawn to circumscribe a circle.

Prove that AB + CD = BC + AD.
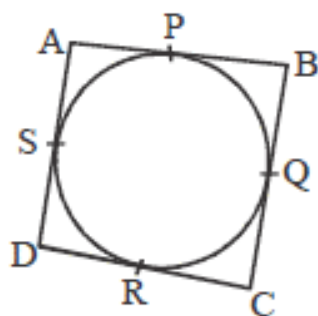
35 (a)Daily wages of 110 workers, obtained in a survey, are tabulated below: **5**

Daily Wages(₹)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
No. of workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers.

OR

(b)If the median of the following frequency distribution is 32.5, find the values of f_1 and f_2.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

SECTION E

### Section E consists of 3 questions of 4 marks each.

36

Case Study Based -1

A **ripple effect** occurs when an initial disturbance to a system propagates outward to disturb an increasingly larger portion of the system, like ripples expanding across the water when an object is dropped into it.

A stone is thrown into still water and the figure represents concentric circular phenomenon known as ripple effect.

The radius of the first circle is 3 cm. The radius of each circle is 4 cm more than the previous circle.
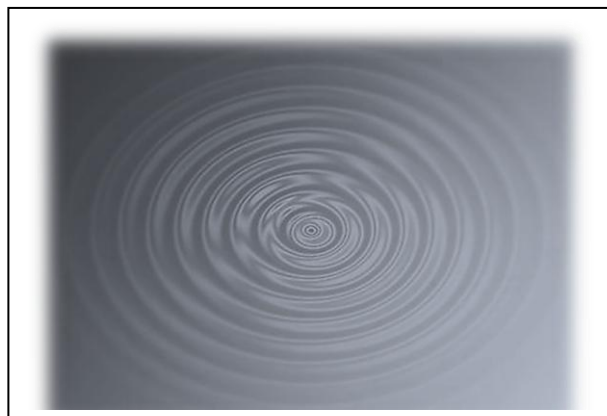
Based on the above information answer the following questions:

(i)	Find the radius of the 20th circle.	**1**
(ii)	(a) Which circle has a radius of 43 cm?	**2**
	OR	
	(b) Find the number of circles formed if the sum of the radii of first n circles is 136.	**2**
(iii)	Write the AP representing the circumferences of the concentric circles formed.	**1**

37 **Case Study Based - 2**

A company deals in casting and moulding of metal on orders received from its clients.
In one such order, company is supposed to make 50 toys in the form of a hemisphere mounted by a right circular cone of the same base radius as that of hemisphere. The radius of the base of the cone is 21 cm and height is 28 cm.
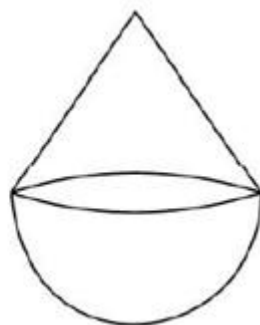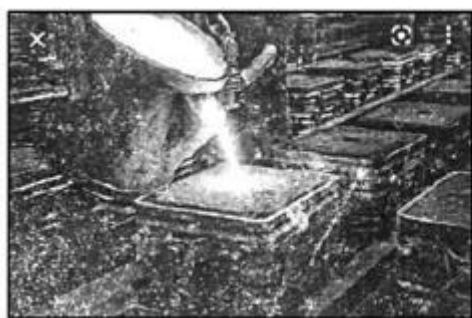
Based on the above information answer the following questions:

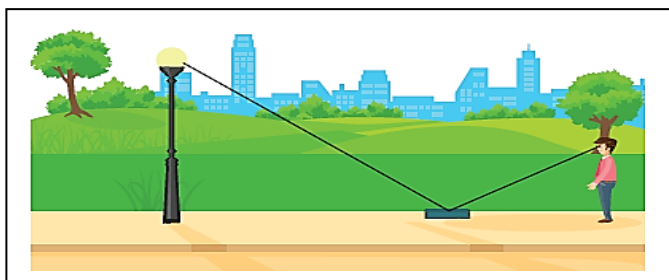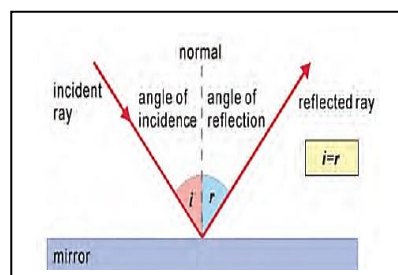|		
(i)	Find the ratio of Volume of hemispherical part to the Volume of conical part of the toy.	**1**
(ii)	Find the slant height of the conical part of the toy.	**1**
(iii)	(a) Find the volume of the toy.	**2**
	OR	
	(b) Find the TSA of the toy.	**2**

38 **Case Study Based-3**

The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.

Ramesh places a mirror on level ground to determine the height of a pole (with traffic light fixed on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Ramesh's eye level is 1.5 m above the ground. Ramesh is positioned 1.8 m from the mirror, while the pole is located 3.6 m away from the mirror.

(Figure 1)   (Figure 2)

Based on the above information answer the following questions:

(i)	Which criterion of similarity is applicable here to prove the similarity of triangles formed in Figure 1?	**1**
(ii)	What is the height of the pole given in Figure 1?	**1**
(iii)	(a)Ramesh moves such that distance between pole and Ramesh is 3 meters. He places a mirror between him and pole to see the reflection of light in right position. What is the distance between the mirror and Ramesh? **OR** (b) Ramesh moves such that distance between pole and Ramesh is 3 meters. He places a mirror between him and pole to see the reflection of light in right position. What is the distance between the mirror and the pole?	**2** **2**

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