S2

PRE BOARD EXAM-2023-24

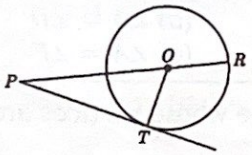
MATHEMATICS

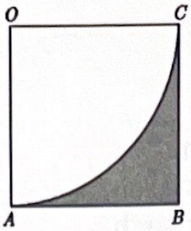
(SET1)

Time Allowed: 3 Hrs. **Maximum Marks : 80**

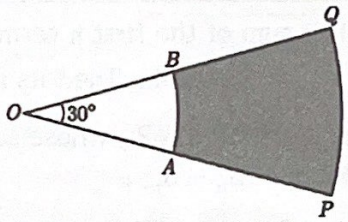
General Instructions:

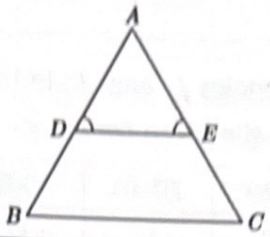
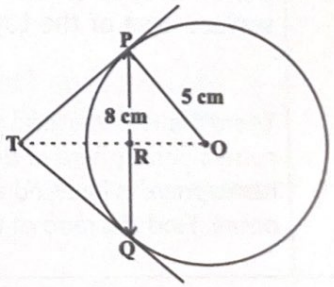
1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (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 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

	SECTION A **Section A consists of 20 questions of 1 mark each.**
1	In figure, on a circle of radius 7cm, tangent PT is drawn from a point P such that PT=24 cm. If O is the centre of the circle then the length of PR is  (a) 30 cm (b) 28 cm (c) 32 cm (d) 25 cm
2	If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then (a) $R_1 + R_2 = R$ (b) $R_1^2 + R_2^2 = R^2$ (c) $R_1 + R_2 < R$ (d) $R_1^2 + R_2^2 < R^2$
3	If the difference of roots of the quadratic equation $x^2 + kx + 12 = 0$ is 1, then the positive value of k is (a) -7 (b) 7 (c) 4 (d) 8

4	The zeroes of the quadratic polynomial $x^2 + 5x + 6$ are (a) $-2, -3$ (b) 3 , 4 (c) 3 , 2 (d) 2 , -1
5	In the adjoining figure OABC is a square of side 7 cm. OAC is a quadrant of a circle with O as centre. The area of the shaded region is  (a) 10.5 cm^2 (b) 38.5 cm^2 (c) 49 cm^2 (d) 11.5 cm^2
6	The pair of linear equations $3x + 5y = 3$ and $6x + ky = 8$ do not have a solution if k (a) $= 5$ (b) $= 10$ (c) $\neq 10$ (d) $\neq 5$
7	If HCF of 65 and 117 is expressible in the form of $65m - 117$ then the value of m is (a) 1 (b) 2 (c) 3 (d) 4
8	If ΔABC and ΔDEF are similar such that $2AB = DE$ and $BC = 8\,cm$ then $EF =$ (a) $16cm$ (b) $112cm$ (c) $8cm$ (d) $4cm$
9	If in ΔABC and ΔEDF, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar when (a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$
10	The centroid of the triangle whose vertices are $(3, -7)$, $(-8, 6)$ and $(5, 10)$ is (a) (0,9) (b) (0, 3) (c) (1, 3) (d) (3,5)
11	There are 30 cards of the same size in a bag in which the numbers 1 to 30 are written. One card is taken out of the bag at random. What is the probability that the number on the selected card is not divisible by 3? (a) $\frac{1}{15}$ (b) $\frac{2}{3}$ (c) $\frac{1}{10}$ (d) $\frac{1}{3}$
12	If the distance between the points $A(4, p)$ and $B(1, 0)$ is 5 units, then the value(s) of p is (are) (a) 4 only (b) -4 only (c) ± 4 (d) 0

13	If $sin\theta + cos\theta = \sqrt{2}cos\theta$, $(\theta \neq 90°)$ then the value of $tan\theta$ is (a) $\sqrt{2}-1$ (b) $\sqrt{2}+1$ (c) $\sqrt{2}$ (d) $-\sqrt{2}$
14	If $cosA = \frac{4}{5}$, then the value of $tanA$ is (a) $\frac{3}{5}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $\frac{5}{3}$
15	If X, M, Z are denoting mean, median and mode of a data and $X: M = 9: 8$, then the ratio $M: Z$ is (a) 3:4 (b) 4:9 (c) 4:3 (d) 2:5
16	If the angle of depression of an object from a 75 m high tower is 30°, then the distance of the object from the tower is (a) $25\sqrt{3}$m (b) $50\sqrt{3}$m (c) $75\sqrt{3}$m (d) 150 m
17	The P(A) denotes the probability of an event A then (a) $P(A) < 0$ (b) $P(A) > 1$ (c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$
18	The 4^{th} term from the end of the AP: $-11, -8, -5, ..., 49$ is (a) 37 (b) 40 (c) 43 (d) 58
	DIRECTION: In question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).** Choose the correct option
19	**Statement A(Assertion):** If sum of the first n terms of an AP is given by $S_n = 3n^2 - 4n$. Then its n^{th} term is $a_n = 6n - 7$. **Statement R(Reason):** n^{th} term of an AP , whose sum to n terms is S_n is given by $a_n = S_n - S_{n-1}$. (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.

20	**Statement A(Assertion):** Two cubes each of volume $8cm^3$ are joined end to end, then the surface area of the resulting cuboid is $40cm^2$. **Statement R(Reason):** Surface area of a cuboid is given by $SA = 2(LB + BH + LH)$ (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.
	SECTION B **Section B consists of 5 questions of 2 marks each.**
21	Two tangents PA and PB are drawn from an external point P to a circle inclined to each other at an angle of 70^0, then what is the value of $\angle PAB$?
22	A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road. OR In figure PQ and AB are two arcs of concentric circles of radii 7 cm and 3.5 cm respectively with centre O. If $\angle POQ = 30^0$, then find the area of the shaded region. 
23	Prove that $3 + \sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

24	In figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that ΔBAC is an isosceles triangle. 
25	Prove that $\sqrt{\frac{1-cosA}{1+cosA}} = cosecA - cotA$ **OR** Prove that $(sin\theta + cosec\theta)^2 + (cos\theta + sec\theta)^2 = 7 + tan^2\theta + cot^2\theta$
	SECTION C **Section C consists of 6 questions of 3 marks each.**
26	Solve the following system of linear equations graphically: $2x - 5y + 4 = 0$, $2x + y - 8 = 0$. Find the points where these lines meet the y −axis. **OR** The sum of a two digit number and the number formed by interchanging its digits is 110. If 10 is subtracted from the original number, the new number obtained is 4 more than 5 times the sum of the digits of the original number. Find the original number.
27	Prove that $\frac{sin\theta - cos\theta + 1}{sin\theta + cos\theta - 1} = \frac{1}{sec\theta - tan\theta}$
28	Prove that the lengths of tangents drawn from an external point to a circle are equal. **OR** PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length TP. 

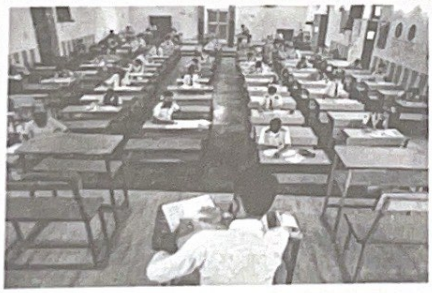
29	Find the greatest number which divides 285 and 1249 leaving remainders 9 and 7 respectively.
30	Find the missing frequencies f_1 and f_2 in the table given below; it is being given that the mean of the given frequency distribution is 50.

Class	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	f_1	32	f_2	19	120

31	If α and β are zeroes of the polynomial $p(x) = 6x^2 - 5x + k$ such that $\alpha - \beta = \frac{1}{6}$. Find the value of k.
	SECTION D **Section D consists of 4 questions of 5 marks each**
32	State and prove Basic proportionality theorem. Also state its converse.
33	If the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$. **OR** The speed of a boat in still water is 8 km/hr. It can go 15 km upstream and 22 km downstream in 5 hours. Find the speed of the stream.
34	Find the mean and mode for the following frequency distribution. Also find the median using the empirical formula.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	10	18	30	20	12	5

35	A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 4 cm and the diameter of the base is 8 cm. Determine the volume of the toy. If a cube circumscribes the toy, then find the difference of the volumes of the cube and the toy. Also, find the total surface area of the toy. **OR** There are two identical solid cubical boxes of side 7cm. From the top face of the first cube a hemisphere of diameter equal to the side of the cube is scooped out. This hemisphere is inverted and placed on the top of the second cube's surface to form a dome. Find the ratio of the volume of the two new solids formed.

	SECTION E **Case study based questions are compulsory.**
36	In a board game, the number of seashells in various cells forms an AP. If the number of seashells in the 3^{rd} and 11^{th} cell together is 68 and number of shells in 11^{th} cell is 24 more than that of 3^{rd} cell, then answer the following questions based on this data. (i) What is the difference between the number of seashells in the 19^{th} and 20^{th} cells? (ii) How many seashells are there in the first cell? (iii) How many total shells are there in the first 13 cells? **OR** What is the sum of number of seashells in the 7^{th} and 9^{th} cell?
37	In an examination hall, students are seated at suitable distance from each other, to maintain the social distance due to CORONA virus pandemic. Let three students sit at points A, B and C whose coordinates are $(4,-3)$, $(7,3)$ and $(8,5)$ respectively.Based on the above information , answer the following questions.  (i) Find the distance between A and C. (ii) Find the midpoint of the line segment joining A and C. (iii) Find the ratio in which B divides the line segment joining A and C **OR** If an invigilator at the point S lying on the straight line joining B and C such that it divides the distance between them in the ratio of 1 : 2, then find the coordinates of S .

38	Rohit is standing at the top of the building observes a car at an angle of 30^0, which is approaching the foot of the building with a uniform speed. 6 seconds later, angle of depression of car formed to be 60^0, whose distance at that instant from the building is 25m. Based on the above information, answer the following questions. (i) Find the height of the building. (ii) Find the distance between two positions of the car. (iii) Find the total time taken by the car to reach the foot of the building from the starting point. OR Find the distance of the observer from the car when it makes an angle of 60^0.