Roll No. Series JPR_PBI /25-26/10/SUB code 041/SET No.1

NOTE:-

- Please check that this question paper contains 5 printed pages.
- Please check that this question paper contains 38 questions.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minutes time has been allotted to read the question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

MATHEMATICS STANDARD (041)

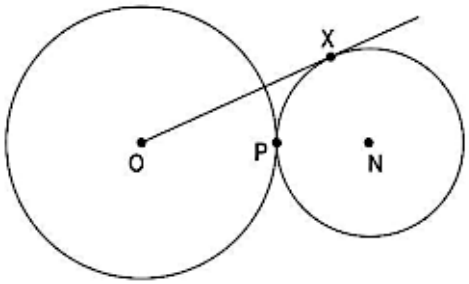
Time allowed: 3 hours **Maximum Marks: 80**

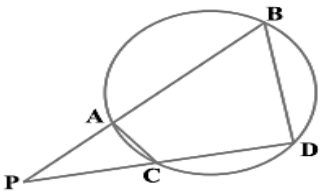
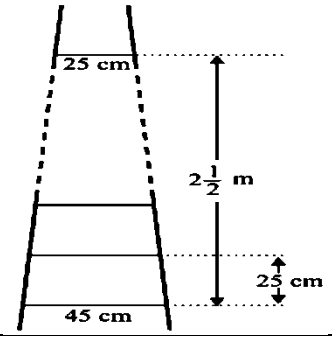
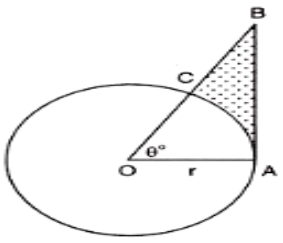
General Instructions:

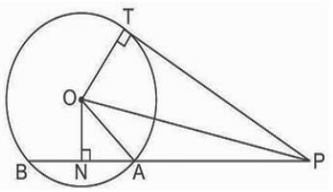
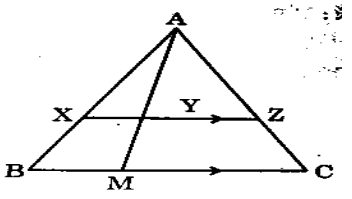
Read the following instructions carefully and follow them:

1. This question paper contains 38 questions. All Questions are compulsory.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Question numbers 1-18 are multiple choice questions (MCQs) and question no.19 and 20 are Assertion- Reason based questions of 1 mark each.
4. In Section B, Question numbers 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Question numbers 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Question numbers 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Question numbers 36-38 are case study-based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. There is no overall choice. However, an internal choice in 2 questions of Section B, 2 questions of Section C and 2 questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required. Take π = 22/7 wherever required if not stated.
10. Use of calculators is not allowed.

Q. No.	**Section A** **Section A consists of 20 questions of 1 mark each.**	Marks
1	A, B, and C are running on a circular track. A completes a lap in 60 seconds, B in 75 seconds, and C in 90 seconds. If they all start at the same starting point and time, What is the least time will they meet again at the starting point? (A) 2 mins (B) 3 mins (C) 6 mins (D) 15 mins	1
2	If a, b, c are the sides of a right triangle where c is the hypotenuse the radius r of the circle which touches the sides of the triangle, then diameter of circle is : (A) a + b - c (B) a + b + c (C) a + c - b (D) c + b - a	1
3	If one of the zeroes of a quadratic polynomial of the form x^2+ ax + b is the negative of the other, then it? (A) has no linear term and the constant term is negative. (B) has no linear term and the constant term is positive. (C) can have a linear term but the constant term is negative. (D) can have a linear term but the constant term is positive.	1
4	The pair of equations of lines x = 0 and y = –7 has (A) One solution (B) Two solutions (C) Infinitely many solutions (D) No solution	1

5	$\sec^4\theta - \sec^2\theta$ = (A) $\tan^4\theta - \tan^2\theta$ (B)$\tan^2\theta - \tan^4\theta$ (C) $\tan^4\theta + \tan^2\theta$ (D) none of these	1
6	If two towers of heights h_1 and h_2 subtend angles of 60° and 30° respectively at the mid-point of the line joining their feet, then $h_1 : h_2$ = (A) 1 : 2 (B) 1 : 3 (C) 2 : 1 (D) 3 : 1	1
7	If the equation $(1+m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, then value of c^2 is (A) $a^2(1+m^2)$ (B) $a^2(1-m^2)$ (C) $(a^2 - m^2)$ (D) $(a^2 + m^2)$	1
8	There are 10 observations in ascending arrangements. If last 5 observations are increased by 8,then Median (A) Increase by 8 (B) Increase by 4 (C) Remains same (D) Both a and b	1
9	Probability of 53rd Monday in a leap year (A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) $\frac{1}{365}$ (D) $\frac{1}{366}$	1
10	If $\Delta PQR \sim \Delta XYZ$ is such that PQ=4cm and XY= 8cm and the perimeter of ΔPQR is 24cm, find the perimeter of ΔXYZ. (A) 36cm (B) 48cm (C) 42cm (D) 32cm	1
11	A card is selected at random from a well shuffled deck of 52 cards. The probability of its Being a black coloured face card is (A) $\frac{3}{26}$ (B)$\frac{3}{13}$ (C) $\frac{2}{13}$ (D) $\frac{1}{2}$	1
12	Two numbers are (3x, 5x) and their HCF is 4, then the LCM is. (A) 60 (B) 120 (C) 80 (D) 40	1
13	The points A(1,4), B(3,4) ,C(1,2) and D(3,2) are the vertices of a (A) Square (B) Rectangle (C) Parallelogram (D) Trapezium	1
14	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.  What is the radius of the circle with centre N? (A) 18/√2 cm (B) 9 cm (C) 9/√2 cm (D) 18 /√10 cm	1
15	The area of the largest triangle that can be inscribed in a semi-circle of radius r is (A) 2r (B) r (C) √r (D) r^2	1
16	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) $R_1^2 + R_2^2 < R^2$	1
17	If the surface areas of two spheres are in ratio 4 : 9, then the ratio of their volumes is: (A)8 : 27 (B) 16:25 (C) 2 : 3 (D) 9 :4	1
18	If the vertices of a parallelogram PQRS taken in order are P(3,-4), Q(-2,3) and R(-3,2), then the coordinates of its fourth vertex S are (A) (2,-1) (B) (2,5) (C) (2,-5) (D) (2,1)	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. (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.	
19	If prime factorisation of Z as $c^2 \times a^3 \times b$, then Z is a composite number. **Assertion(A):** "The square root of every composite number is rational." **Reason (R):** $a^3 \times b \times c^2$ is also equal to Z by fundamental theorem of arithmetic.	1
20	**Assertion(A):** If $x=2\sin^2\theta$ and $y= -2\cos^2\theta+1$ then the value of x-y=1. **Reason(R):** For any value of θ, $\sin^2\theta = 1-\cos^2\theta$	1
	SECTION B **Section B consists of 5 questions of 2 marks each.**	
21	Two chords AB and CD of a circle intersect each other at the point P (when produced) outside the circle. Prove that: PA · PB = PC · PD 	2
22	(A) If all three sides of a right triangle are in AP, then find them. **OR** (B) A ladder has rungs 25 cm apart. The rungs decrease uniformly in length from 45 cm at the bottom to 25 cm at the top. If the top and the bottom rungs are $2\frac{1}{2}$ m apart, what is the length of the wood required for the rungs? 	2
23	(A) Prove that $$\frac{1}{\text{cosec }\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\text{cosec }\theta + \cot\theta}$$ **OR** (B) If A, B, C are the angles of a triangle and cot (B+C−A) = $\sqrt{3}$, tan (C+A−B) = $\sqrt{3}$, find the values of A, B and C.	2
24	(A) In the given figure, is shown a sector OAC of a circle with centre O, containing ∠θ. AB is perpendicular to the radius OA and meets OC produced at B. Prove that the perimeter of shaded region is $r[\tan\theta + \sec\theta + \frac{\pi\theta}{180} - 1]$  **OR** (B) A horse, a cow and a goat are tied, each by ropes of length 14m, at the corners A, B and C respectively, of a grassy triangular field ABC with sides of lengths 35m, 40m and 50 m. Find the area of grass field that can be grazed by them.	2
25	Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.	2

	Section C **Section C consists of 6 questions of 3 marks each.**	
26.	Prove that $\sqrt{2}+\sqrt{3}$ is an irrational number. What is the product of a rational number and an irrational number? Give an example to justify your answer.	2+1
27	The given figure from external point P, a tangent PT and a line segment PAB are drawn to a circle with centre O. ON is perpendicular to the chord AB. Prove that (i) PA · PB = PN² - AN² (ii) PN² - AN² = OP² - OT² 	1+2
28	If α and β are the zeros of the quadratic polynomial p(y) = $y^2 - \frac{4y}{3} - \frac{2}{3}$, find α and β? Also verify the relationship between zeros and its coefficient ?	3
29	(A) If $\cos\theta + \cos^2\theta = 1$, then find the value of $\sin^{12}\theta + 3\sin^{10}\theta + 3\sin^8\theta + \sin^6\theta - 2\sin^4\theta - 2\sin^2\theta + 2$? **OR** (B) If $\tan A = n \tan B$ and $\sin A = m \sin B$, prove that $\cos^2 A = \frac{m^2-1}{n^2-1}$	3
30	Two customers, Shyam and Ekta, are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any day as on another day. What is the probability that both will visit the shop on (i) Consecutive days? (ii) Different days?	1.5 + 1.5
31	(A) A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h; it would have taken 3 hours more than the scheduled time. Find the distance covered by the train. **OR** (B) Solve the following system of equations graphically: $x + 2y = 6$, $2x - y - 2 = 0$. Find the area of the triangle so formed by two lines and x axis.	3
	SECTION D **Section D consists of 4 questions of 5 marks each.**	
32	(i) One fourth of a herd of camels was seen in the forest. Twice the square root of the herd had gone to mountains and the remaining 15 camels were seen on the bank of a river. Find the total number of camels. (ii) If roots of quadratic equation $(b-c)x^2 + (c-a)x + (a-b) = 0$ are real and equal then shows that are in an arithmetic progression.	3+2
33	Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that ΔABC ~ ΔPQR. Also Find the length of XY, if in the given figure, XZ is parallel to BC. AZ = 3 cm, ZC = 2 cm, BM = 3 cm and MC = 5 cm. 	3+2
34	(A) A right triangle whose sides are 3 cm and 4 cm (other than the hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. **OR** (B) An empty cone of radius 3cm and height 12cm is filled with ice-cream such that the	5

lower part of the cone which is $\frac{1}{6}$ th of the volume of the cone is unfilled (empty) but a hemisphere is formed on the top. Find the volume of the ice-cream.

35. The distribution below gives the makes of 40 students of a class, if the mean marks are 16.5, find the frequencies x and y? Also Find Median of given Data? 3+2

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35
No. of students	1	7	11	x	y	4	2

OR

Find the value of x and y from the following data if its mode is 65. Also Find Median of given Data?

Class	0-20	20-40	40-60	60-80	80-100	100-120	Total
Frequency	6	8	x	12	y	5	47

SECTION E

Section E consists of 3 case study-based questions of 4 marks each

36 A thief, after committing a theft, runs on his bike at a speed of 58 m/min and increases his speed by 2 m/min every succeeding minute. After 3 minutes, a policeman runs on his jeep to catch him. He goes 94 m in the first min and increases his speed by 5 m/min every succeeding minute.

(i) Find the distance travel by thief in n^{th} minute? 1

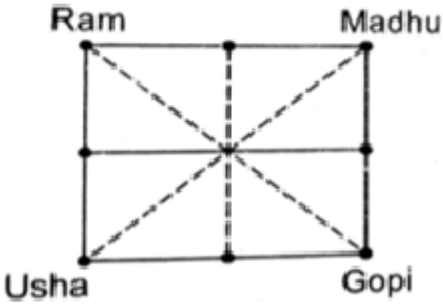
(ii) Find the total distance travel by policeman after p^{th} minute? 1

(iii) (A) After how many minutes policeman will catch the thief? 2

OR

(iii) (B) If policeman runs on his jeep with uniform speed of 104 m/min. Then after how many minutes he will catch the thief?

37 If Ram and Gopi sit on two opposite vertices of a square given as (-1, 2) and (3, 2) respectively.



(i) Find the length of side of square. 1

(ii) Find the co-ordinate of mid-point between Usha and Madhu? 1

(iii) (A) Find the co-ordinate Usha? 2

OR

(iii) (B) Find the co-ordinate Madhu?

38 A transparent spherical balloon of radius r subtends an angle α at the eye of an observer. If the angle of elevation of its centre is β.

(i) Draw an appropriate figure for above situation? 1

(ii) Distance of centre of spherical balloon from the eye of observer? 1

(iii) (A) What is height of centre of spherical balloon from the ground? 2

OR

(iii) (B) A transparent spherical balloon of radius 1.5m subtends an angle 60° at the eye of an observer of height 3m. If the angle of elevation of its centre is 45°. What is height of centre of spherical balloon from the ground?