

## Unsolved Paper–2

### Class 11, Mathematics

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**Time: 3 hours**

**Max. Marks 100**

**General Instructions**

1. All questions are compulsory.
  2. Use of calculator is not permitted. However you may use log table, if required.
  3. Q.No. 1 to 12 are of very short answer type questions, carrying 1 mark each.
  4. Q.No.13 to 28 carries 4 marks each.
  5. Q.No. 29 to 32 carries 6 marks each.
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1. A, B & C are subsets of Universal Set U. If  $A = \{2, 4, 6, 8, 12, 20\}$ ,  $B = \{3, 6, 9, 12, 15\}$ ,  $C = \{5, 10, 15, 20\}$  and U is the set of all whole numbers, draw a Venn diagram showing the relation of U, A, B and C.
2. If  $R_1 = \{(x, y) \mid y = 2x + 7, \text{ where } x \in \mathbb{R} \text{ and } -5 \leq x \leq 5\}$  is a relation. Then find the domain and Range of  $R_1$ .
3. If  $R_2 = \{(x, y) \mid x \text{ and } y \text{ are integers and } x^2 + y^2 = 64\}$  is a relation. Then find  $R_2$ .
4. The value of  $\cos 2 48^\circ - \sin 2 12^\circ$  is?
5. A circular wire of radius 3 cm is cut and bent so as to lie along the circumference of a hoop whose radius is 48 cm. Find the angle in degrees which is subtended at the centre of hoop.
6. Find the value of P such that the difference of the roots of the equation  $x^2 - Px + 8 = 0$  is 2.
7. The number of ways in which a team of eleven players can be selected from 22 players always including 2 of them and excluding 4 of them is?
8. Three consecutive vertices of a parallelogram ABCD are A (6, -2, 4), B (2, 4, -8), C (-2, 2, 4). Find the coordinates of the fourth vertex.
9. Differentiate the functions w. r. to x:  $(ax^2 + \cot x)(p + q \cos x)$
10. Differentiate the functions w. r. to x:  $\left(x + \frac{1}{x}\right)^3$

11. In a large metropolitan area, the probabilities are .87, .36, .30 that a family (randomly chosen for a sample survey) owns a colour television set, a black and white television set, or both kinds of sets. What is the probability that a family owns either anyone or both kinds of sets?
12. If A and B are mutually exclusive events,  $P(A) = 0.35$  and  $P(B) = 0.45$ , find  
(a)  $P(A')$       (b)  $P(B')$
13. For all sets A and B, Prove that:  $A - (A - B) = A \cap B$
14. Find the domain & range of the following function given by  $f(x) = \frac{3}{2-x^2}$
15. If  $\alpha$  and  $\beta$  are the solutions of the equation  $a \tan \theta + b \sec \theta = c$ , then show that  $\tan(\alpha + \beta) = \frac{2ac}{a^2 - c^2}$
16. Prove by using PMI,  $2 + 4 + 6 + \dots + 2n = n^2 + n$  for all natural numbers n.
17. Write the complex number  $z = \frac{1-i}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$  in polar form.
18. A solution is to be kept between  $40^\circ\text{C}$  and  $45^\circ\text{C}$ . What is the range of temperature in degree Fahrenheit, if the conversion formula is  $F = 9 C/5 + 32$ ?
19. Eight chairs are numbered 1 to 8. Two women and 3 men wish to occupy one chair each. First the women choose the chairs from amongst the chairs 1 to 4 and then men select from the remaining chairs. Find the total number of possible arrangements.
20. If the letters of the word RACHIT are arranged in all possible ways as listed in dictionary. Then what is the rank of the word RACHIT?
21. If n is a positive integer, find the coefficient of  $x^{-1}$  in the expansion of  $(1+x)^n \left(1+\frac{1}{x}\right)^n$  is?
22. A man accepts a position with an initial salary of Rs 5200 per month. It is understood that he will receive an automatic increase of Rs 320 in the very next month and each month thereafter.  
(a) Find his salary for the tenth month  
(b) What is his total earnings during the first year?

23. Find the points on the line  $x + y = 4$  which lie at a unit distance from the line  $4x + 3y = 10$ .
24. Find the equation of the circle which touches x-axis and whose centre is  $(1, 2)$ .
25. Let  $A(2, 2, -3)$ ,  $B(5, 6, 9)$  and  $C(2, 7, 9)$  be the vertices of a triangle. The internal bisector of the angle  $A$  meets  $BC$  at the point  $D$ . Find the coordinates of  $D$ .
26. Evaluate:  $\lim_{h \rightarrow 0} \frac{(a+h)^2 \sin(a+h) - a^2 \sin a}{h}$
27. Identify the quantifiers and write the negation of the following statements
- There exists a number which is equal to its square.
  - For all even integers  $x$ ,  $x^2$  is also even.
  - There exists a number which is a multiple of 6 and 9.
28. Determine the probability  $p$ , for each of the following events.
- An odd number appears in a single toss of a fair die.
  - At least one head appears in two tosses of a fair coin.
  - A king, 9 of hearts, or 3 of spades appears in drawing a single card from a well shuffled ordinary deck of 52 cards.
  - The sum of 6 appears in a single toss of a pair of fair dice.
29. Out of 100 students; 15 passed in English, 12 passed in Mathematics, 8 in Science, 6 in English and Mathematics, 7 in Mathematics and Science; 4 in English and Science; 4 in all the three. Find how many passed
- in English and Mathematics but not in Science
  - in Mathematics and Science but not in English
  - in Mathematics only
  - in more than one subject only
30. If  $\cos(\theta + \phi) = m \cos(\theta - \phi)$ , then prove that  $\tan \theta = \frac{1-m}{1+m} \cot \phi$
31. If  $p^{\text{th}}$ ,  $q^{\text{th}}$ , and  $r^{\text{th}}$  terms of an A.P. and G.P. are both  $a$ ,  $b$  and  $c$  respectively, show that  $a^{b-c} \cdot b^{c-a} \cdot c^{a-b} = 1$
32. Calculate the mean deviation from the median of the following data:

Class Interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	5	3	6	2