

Unsolved Paper-1

Class 11, Mathematics

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.

1. If $Y = \{x \mid x \text{ is a positive factor of the number } 2^{p-1}(2^p - 1), \text{ where } 2^p - 1 \text{ is a prime number}\}$. Write Y in the roaster form.
2. If $P = \{x : x < 3, x \in \mathbb{N}\}$, $Q = \{x : x \leq 2, x \in \mathbb{W}\}$. Find $(P \cup Q) \times (P \cap Q)$, where W is the set of whole numbers.
3. Find a and b. (i) $(2a + b, a - b) = (8, 3)$
4. If $\sin \theta + \operatorname{cosec} \theta = 2$, then $\sin^2 \theta + \operatorname{cosec}^2 \theta$ is equal to?
5. If $\tan \theta = 1/2$ and $\tan \phi = 1/3$, then the value of $\theta + \phi$ is?
6. Find the value of $2x^4 + 5x^3 + 7x^2 - x + 41$, when $x = -2 - \sqrt{3}i$
7. The number of different four digit numbers that can be formed with the digits 2, 3, 4, 7 and using each digit only once is?
8. The mid-points of the sides of a triangle are (5, 7, 11), (0, 8, 5) and (2, 3, - 1). Find its vertices.
9. Differentiate the functions w. r. to x: $(\sin x + \cos x)^2$
10. Differentiate the functions w. r. to x: $\frac{3x+4}{5x^2-7x+9}$
11. A team of medical students doing their internship have to assist during surgeries at a city hospital. The probabilities of surgeries rated as very complex, complex, routine, simple or very simple are respectively, 0.15, 0.20, 0.31, 0.26, .08. Find the probabilities that a particular surgery will be rated
(a) complex or very complex;

(b) neither very complex nor very simple;

12. Four candidates A, B, C, D have applied for the assignment to coach a school cricket team. If A is twice as likely to be selected as B, and B and C are given about the same chance of being selected, while C is twice as likely to be selected as D, what are the probabilities that
 - (a) C will be selected?
 - (b) A will not be selected?
13. For all sets A and B, Prove that: $A \cup (B - A) = A \cup B$
14. Find the domain & range of the following function given by $f(x) = \frac{1}{\sqrt{1 - \cos x}}$
15. Show that $2 \sin^2 \beta + 4 \cos(\alpha + \beta) \sin \alpha \sin \beta + \cos 2(\alpha + \beta) = \cos 2\alpha$
16. Prove by using PMI for any natural number n, $x^n - y^n$ is divisible by $x - y$, where x and y are any integers with $x \neq y$.
17. z_1 and z_2 are two complex numbers such that $|z_1| = |z_2|$ and $\arg(z_1) + \arg(z_2) = \pi$ then show that $z_1 = -\bar{z}_2$.
18. A solution of 7% acid is to be diluted by adding 4% acid solution to it. The resulting mixture is to be more than 5% but less than 7% acid. If there is 460 litres of the 9% solution, how many litres of 3% solution will have to be added?
19. If 20 lines are drawn in a plane such that no two of them are parallel and no three are concurrent, in how many points will they intersect each other?
20. In a certain city, all telephone numbers have six digits, the first two digits always being 41 or 42 or 46 or 62 or 64. How many telephone numbers have all six digits distinct?
21. If p is a real number and if the middle term in the expansion of $\left(\frac{p}{2} + 2\right)^8$ is 1120, find p
22. A man saved Rs 66000 in 20 years. In each succeeding year after the first year he saved Rs 200 more than what he saved in the previous year. How much did he save in the first year?
23. Find the equation of one of the sides of an isosceles right angled triangle whose hypotenuse is given by $3x + 4y = 4$ and the opposite vertex of the hypotenuse is (2, 2).

24. Show that the set of all points such that the difference of their distances from (4, 0) and (− 4, 0) is always equal to 2 represent a hyperbola.
25. What are the coordinates of the vertices of a cube whose edge is 2 units, one of whose vertices coincides with the origin and the three edges passing through the origin, coincides with the positive direction of the axes through the origin?
26. Evaluate: $\lim_{x \rightarrow \pi} \frac{1 - \sin \frac{x}{2}}{\cos \frac{x}{2} \left(\cos \frac{x}{4} - \sin \frac{x}{4} \right)}$
27. Using contrapositive method prove that if n^2 is an even integer, then n is also an even integer.
28. A sample space consists of 9 elementary outcomes e_1, e_2, \dots, e_9 whose probabilities are $P(e_1) = P(e_2) = .08$, $P(e_3) = P(e_4) = P(e_5) = .1$, $P(e_6) = P(e_7) = .2$, $P(e_8) = P(e_9) = .07$
Suppose $A = \{e_1, e_5, e_8\}$, $B = \{e_2, e_5, e_8, e_9\}$
(a) Calculate $P(A)$, $P(B)$, and $P(A \cap B)$
(b) Using the addition law of probability, calculate $P(A \cup B)$
(c) List the composition of the event $A \cup B$, and calculate $P(A \cup B)$ by adding the probabilities of the elementary outcomes.
(d) Calculate $P(B^c)$ from $P(B)$, also calculate $P(B^c)$ directly from the elementary outcomes of B^c
29. Let A, B and C be sets. Then show that
 $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
30. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab \cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$
31. If $\theta_1, \theta_2, \theta_3, \dots, \theta_n$ are in A.P., whose common difference is d , show that
$$\sec \theta_1 \sec \theta_2 + \sec \theta_2 \sec \theta_3 + \dots + \sec \theta_{n-1} \sec \theta_n = \frac{\tan \theta_n - \tan \theta_1}{\sin d}$$
32. Calculate the mean deviation about the mean for the following frequency distribution:

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| Class Interval | 0-4 | 4-8 | 8-12 | 12-16 | 16-20 |
| Frequency | 4 | 6 | 8 | 5 | 2 |