

1. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ $A = \{2, 4, 6, 8, 10\}$ $B = \{4, 6, 8, \}$
- Find A' and B' (1)
 - Also find $(A \cup B)'$ (1)
 - Verify $(A \cup B)' = A' \cap B'$ (2)
2. Let $A = \{1, 2, 3, \dots, 14\}$ R is a relation on A defined by
 $R = \{(x, y) : 3x - y = 0, x, y \in A\}$ a) Write R in tabular form
 b) Find the domain and range of R (2)
3. Consider the statement $P(n) : -7^n - 3^n$ is divisible by 4
- Show that it is true for $n = 1$ (1)
 - Using principle of induction prove that it is true for any natural number n . (3)
4. a) Convert $31/3 \pi$ radian in to degree measure b) Find the value of $\sin 31/3 \pi$
 c) Find the general solution of the equation $\sin x = -3/2$ (1 + 1 + 2)
5. Prove that $\sin 5x - 2\sin 3x + \sin x = \tan x$ (4)
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- $\cos 5x - \cos x$
6. a) Solve the $3x - 4 \geq x + 1 - 1$ (2)
 $2 \quad 4$ (3)
 b) Solve the following system of linear equalities $x + 2y \leq 8$, $2x + y \leq 8$ $y \geq 0$
7. Consider the points $A(2, 2)$ and $B(5, 3)$
- Find the slope of the line through the points A and B (1)
 - Find the equation of the line passing through the points A and B (1)
 - Find the image of the point $(1, 2)$ in the line through a and B (3)
8. a) Find r if ${}^5P_r = 6 {}^6P_{r-1}$ **OR** How many 4 digit numbers are there with distinct digits (2)
 b) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls **OR** If ${}^{2n}C_3 : {}^nC_3 = 11 : 1$ then find the value of n (2)
9. Write the general term in the expansion of $\left\{ \frac{3x^2}{2} - \frac{1}{3x} \right\}^6$ (1)
- b) Find the term independent of x in the expansion of the above expression (2)
10. Consider the circle $x^2 + y^2 + 8x + 10y - 8 = 0$. Find its centre C and radius (1)
- Find the equation of the circle with centre at C and passing through the point $(1, 2)$

11. In an AP if m^{th} term is n and n^{th} term is m , $m \neq n$ find the $(m + n)^{\text{th}}$ term (3)
 ii) If the 3rd, 8th and 13th terms of a GP are x, y, z respectively, prove that x, y, z are in GP (2)
 iii) Prove that x, y, z in the above satisfies the equation $\frac{y^{10}}{(xz)^5} = 1$ (1)

12. Consider the conic $4x^2 + 9y^2 = 36$ Find (2 + 1 + 1)
 i) the focus ii) eccentricity iii) Length of latus rectum

13. Find the derivative of $1/x$ from first principle. (2)
 Find the derivative of $(ax^2 + b)(cx^3 + d)$ (2)

14. Write the converse of the statement P : If a divides b then b is a multiple of a
 b) Consider the compound statement P : $2 + 2$ is equal to 4 or 6 Write the component statements
 c) Is the compound statement true? Why ((1 + 2 + 1)

15. The scores of two batsman A and B in 5 innings during a certain match are as follows

| | | | | | |
|----------|-----------|-----------|-----------|-----------|-----------|
| A | 10 | 15 | 80 | 70 | 25 |
| B | 8 | 9 | 7 | 10 | 6 |

- i) Find Mean score of each batsman (2)
 ii) Standard deviation of the scores of each batsman (2)
 iii) Which batsman is more consistent (1)
16. 4 cards are drawn from a well shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade (2)
 ii) If A and B are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ $P(A \cap B) = \frac{1}{6}$
 a) $P(A \cup B)$ b) $P(\text{not } A \text{ and not } B)$ (1 + 2)

17. Consider the points A(2,1,3) and B(1,2,1)
 a) Find the ratio in which the join of AB is divided by YZ plane (2)
 b) Also find the point of division (2)

18. a) Express the complex number $\frac{2 - i}{(1 - i)(1 + 2i)}$ in the form $a + ib$ (2)
 b) Find the polar form of the complex number $\sqrt{3} + i$ (2)
 c) Solve the quadratic equation $3x^2 - 10x + 9 = 0$ (2)

19. Evaluate the following limits. i) $\lim_{x \rightarrow 4} \frac{4x + 3}{x - 2}$ ii) $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$

- iii) $\lim_{x \rightarrow 0} \frac{2x + x \cos x}{3 \sin x}$ (2 + 2 + 2)

