



3. Find the angle between the straight lines  $x - 2y + 1 = 0$  and  $x + 3y = 2$

See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Short Answer Type Question No. 12.

4. If the coefficient of  $x^3$  in the expansion of  $\left(x^2 + \frac{k}{x}\right)^6$  be 160, find the value of  $k$ .

See Topic: MATHEMATICAL INDUCTION & BINOMIAL THEOREM, Short Answer Type Question No. 5.

5. In a cricket team of 14 players there are 6 bowlers. How many different teams of 11 players can be formed taking at least 4 bowlers in the team?

See Topic: PERMUTATIONS AND COMBINATIONS, Short Answer Type Question No. 7.

6. Without using Venn diagram, prove that  $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ .

See Topic: SETS, Short Answer Type Question No. 4.

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(Long Answer Type Questions)

7. a) If  $\alpha$  and  $\beta$  are the roots of the equation  $2x^2 - 4x + 1 = 0$ , then form such an equation whose roots are  $\alpha^2 + \beta$  and  $\beta^2 + \alpha$ .

b) If  $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$ , then prove that  $xyz = 1$ .

c) Find the sum of  $6 + 66 + 666 + \dots$  upto  $n$  terms.

a) See Topic: THEORY OF QUADRATIC EQUATION, Short Answer Type Question No. 3.

b) See Topic: BASIC ALGEBRA, Short Answer Type Question No. 4.

c) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 5.

8. a) Find the locus of the point, the ratio of whose distances from the line  $x = 2$  and from the point  $(5, -1)$  is 3:2.

b) If  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in A.P. and  $(a+b+c \neq 0)$ , then show that  $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$  are also in A.P.

c) Find the equation of the circle through the points  $(4, 3)$  and  $(-2, 5)$  and having its centre on the line  $2x - 3y = 4$ .

a) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 11.

b) See Topic: SEQUENCES & SERIES, Long Answer Type Question No. 7.

c) See Topic: TWO DIMENSIONAL COORDINATE GEOMETRY, Long Answer Type Question No. 12.

9. a) If  $x$  is real, find the maximum value of  $\frac{x+2}{2x^2+3x+6}$ .

b) Apply the principle of mathematical induction to prove,

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$$\frac{1}{4.7} + \frac{1}{7.10} + \frac{1}{10.13} + \dots + \frac{1}{(3n+1).(3n+4)} = \frac{n}{4(3n+4)}$$

c) Solve the equation  $2^{x+2} + 2^{x-1} = 9$

a) See Topic: **THEORY OF QUADRATIC EQUATION**, Long Answer Type Question No. 14.

b) See Topic: **MATHEMATICAL INDUCTION & BINOMIAL THEOREM**, Long Answer Type Question No. 4.

c) See Topic: **BASIC ALGEBRA**, Long Answer Type Question No. 17.

10. a) Examine whether the function  $f : z \rightarrow z$  defined by  $f(x) = x + 2$  is one-one onto. If inverse exists, find its inverse.

b) Prove that  $C_0^2 + C_1^2 + C_2^2 + \dots + C_n^2 = \frac{(2n)!}{(n!)^2}$

c) Show that the straight line  $y = x + c\sqrt{2}$  touches the circle  $x^2 + y^2 = c^2$ , where  $c$  is a constant. Also find the point of contact.

a) See Topic: **FUNCTIONS**, Long Answer Type Question No. 1.

b) See Topic: **MATHEMATICAL INDUCTION & BINOMIAL THEOREM**, Long Answer Type Question No. 2.

c) See Topic: **TWO DIMENSIONAL COORDINATE GEOMETRY**, Long Answer Type Question No. 17.

11. a) What is the present value of Rs. 1,000 due in 2 years at 5% compound interest according to the interest is paid i) yearly, ii) half-yearly?

b) Find the total number of arrangements of the letters of the word 'STATISTICS' when

i) there is no restriction

ii) the vowels remain together

iii) order of the vowels remain unchanged.

c) State De Morgan's laws

If  $U = \{-1, -2, 0, 3, 5, 10, 12, 13, 16\}$ ,  $P = \{-2, 3, 5, 12\}$ ,  $Q = \{-1, -2, 0, 5, 12, 13\}$  then verify De Morgan's laws.

a) See Topic: **COMPOUND INTEREST AND ANNUITY**, Long Answer Type Question No. 2.

b) See Topic: **PERMUTATIONS AND COMBINATIONS**, Long Answer Type Question No. 5.

c) See Topic: **SETS**, Long Answer Type Question No. 11.