Sets

Relations & Functions

MCQ (1 Mark)

Q1 **Choose the correct option in the following questions:**

(i) **If $A = \{1, 2, 3, 4, 5\}$ then which of these is true :**
(a)$1 \in A$ **(b)$\{2, 3\} \in A$** **(c)$3 \subset A$** **(d)$5 \notin A$**

(ii) **If $A = \{x, y, z, t\}$ then which of these is not true:**
(a)$x \in A$ **(b)$\{y, z\} \subset A$** **(c)$t \subset A$** **(d)$w \notin A$**

(iii) **Roaster form of $\{x : x \in \mathbb{N}, x \leq 5\}$ is**
(a)$\{1, 2, 3, 4\}$ **(b)$\{5, 6, 7 \ldots \ldots\}$** **(c)$\{1, 2, 3, 4, 5\}$** **(d)$\{5\}$**

(iv) **If $A = \{1, 2, 4\}$ and $B = \{2, 3, 5\}$ then $A \cap B$ is :**
(a)$\{1, 2, 3, 4, 5\}$ **(b)$\{1, 4\}$** **(c)$\{3\}$** **(d)$\{2\}$**

(v) **For any set A, $(A')'$ is**
(a)A' **(b)ϕ** **(c)U** **(d)A**

(vi) **If $n(A) = 3$ then number of subsets of A are :**
(a)3 **(b)8** **(c)6** **(d)4**

(vii) **If $n(A) = 4$ then number of proper subsets of A are :**
(a)16 **(b)15** **(c)14** **(d)1**

(viii) **If $n(A) = 4$ then number of improper subsets of A are :**
(a)16 **(b)15** **(c)14** **(d)1**

(ix) **Interval form of the set $\{x : x \in \mathbb{R}, 3 < x \leq 7\}$ is**
(a)$(3, 7]$ **(b)$[3, 7]$** **(c)$[3, 7)$** **(d) $(3, 7)$**

(x) **$\phi' =$ _____**
(a)ϕ **(b)U** **(c)Any non-empty set** **(d)Singleton set**

(xi) **If $A = \{1, 2\}$ and $B = \{5, 7\}$, then which of the following is a relation from A to B**
(a)$\{(1, 5), (7, 2)\}$ **(b)$\{(1, 5), (1, 7)\}$** **(c)$\{(5, 2), (7, 1)\}$** **(d)$\{(1, 2), (5, 7)\}$**

(xii) **If $n(A) = 2$ and $n(B) = 4$ then number of relations from A to B are :**
(a)64 **(b)256** **(c)128** **(d)512**

(xiii) **If $n(A) = 3$ and $n(B) = 7$ then $n(A \times B)$ is equal to**
(a)3^7 **(b)7^3** **(c)3×7** **(d)$3 + 7$**

(xiv) **If number of elements in the set A are n then number of relations defined on A are :**
(a)n^2 **(b)2^n** **(c)n^{2^n}** **(d)2^{n^2}**

(xv) **If $f(x) = 2x^2 - 3x + 4$, then $f(-1)$is equal to :**
(a)3 **(b)9** **(c)0** **(d)1**

(xvi) **If $f(x) = 2x$ and $g(x) = 3x - 5$ then $(f + g)(x)$ is :**
(a)$5x - 5$ **(b)$x + 5$** **(c)$x - 5$** **(d)$6x^2 - 10x$**

(xvii) **Domain of the function $f(x) = x^2 + 2$ is**
(a)$\mathbb{R}$. **(b)$[2, \infty)$** **(c)$\mathbb{R} - \{2\}$** **(d)$[0, \infty)$**

(xviii) **Range of the function $f(x) = x^2 + 2$ is**
(a)$\mathbb{R}$. **(b)$[2, \infty)$** **(c)$\mathbb{R} - \{2\}$** **(d)$[0, \infty)$**

(xix) **If $f(x) = 2x$ and $g(x) = 3x - 5$ then $(f + g)(x)$ is :**
(a)$5x - 5$ **(b)$x + 5$** **(c)$x - 5$** **(d)$6x^2 - 10x$**

(xx) **Range of a function is :**
(a)Set of all pre-images of the function **(b)Any superset of the range of the function**
(c)Set of all images of the function **(d)Universal set**

2/4/6 Marks Questions

Q2 If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$, $A = \{1, 3, 4, 6, 7, 9\}$ and $B = \{2, 4, 5, 6, 7, 10, 11\}$ then find :
(a)$A \cup B$ (b)$A \cap B$ (c)$A - B$ (d)$(B - A)'$ (e)A'

Q3 If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15\}$, $A = \{1, 3, 4, 6, 7, 9, 10, 11, 15\}$ and $B = \{2, 4, 5, 6, 7, 8, 10, 11\}$then verify the De-Morgan's law for these sets.

Q4 If $A = \{1, 2, 3, 4, 5, 6, 7\}$, $B = \{1, 3, 4, 7, 9\}$ and $C = \{2, 5, 6, 7, 10, 11\}$ then find :
(a)$A \cup (B \cap C)$ (b)$A \cap (B - C)$ (c)$(A - B) \cup C$

Q5 If $A = \{1, 2, 3\}$ and $B = \{6, -7\}$then find $A \times B$and $B \times A$.

Q6 If $A = \{4, 5, 9\}$, $n(B) = 2$ and a relation from A to B is $R = \{(4, 11), (9, 15)\}$ then find the set B .

Q7 A relation is defined as $R = \{(x, x^2) : x \in \{1, 2, 3, 4, 5\}\}$rhen :
(i)Write the relation in roaster form.
(ii)Write the domain of the relation.
(iii)Write the range of the relation.

Q8 A relation is defined as $R = \{(x - 1, x^2 + 1) : x \in \{3, 4, 7, 8, 9\}\}$ then
(i)Write the relation in roaster form.
(ii)Write the domain of the relation.
(iii)Write the range of the relation.

Q9 Find the domain and range of the following function :
(i)$f(x) = |3x - 2| + 1$ (ii)$f(x) = \sqrt{x^2 - 36}$ (iii)$f(x) = \sqrt{25 - x^2}$

Q10 For the function $f(x) = \frac{8x}{5} - 2$ find
(i)$f(0)$ (ii)$f(5)$ (iii)$f(-10)$

Trigonometric Functions
Complex Numbers & Quadratic Equations

1 Degree measure of angle $\frac{\pi}{3}$ is :
(a)30° (b)100° (c)60° (d)45°

2 Radian measure of angle 210° is :
(a)$\frac{2\pi}{3}$ (b)$\frac{3\pi}{2}$ (c)$\frac{7\pi}{6}$ (d)$\frac{6\pi}{7}$

3 $\cos^2 x - \sin^2 x$ is equal to :
(a)0 (b)1 (c)$\sin 2x$ (d)$\cos 2x$

4 If $\sin x = \frac{3}{5}$ where x is in first quadrant then $\cos x$ is equal to :
(a)$\frac{5}{4}$ (b)$\frac{4}{5}$ (c)$\frac{3}{5}$ (d)$\frac{5}{3}$

5 $\tan(180 + x)$ is equal to :
(a)$\tan x$ (b)$-\tan x$ (c)$\cot x$ (d)$-\cot x$

6 Which of the following is false ?
(a)$\sin x \in [-1, 1]$ (b)$\cos x \in (1, 2)$ (c)$\tan x \in \mathbb{R}$ (d)$\sec x \notin (-1, 1)$

7 $\tan(45^\circ - x)$ is equal to :
(a)$\frac{1+\tan x}{1-\tan x}$ (b)$\frac{2\tan x}{1-\tan^2 x}$ (c)$\frac{1-\tan x}{1+\tan x}$ (d)$\frac{2\tan x}{1+\tan^2 x}$

8 $\sin\frac{x}{2}$ is equal to :
(a)$\pm\sqrt{\frac{1+\cos x}{2}}$ (b)$\pm\sqrt{\frac{1-\cos x}{2}}$ (c)$\pm\frac{\sqrt{1-\cos x}}{2}$ (d)$\pm\sqrt{\frac{1-\cos x}{1+\cos x}}$

9 If in $\Delta ABC \angle A = 35^\circ$ and $\angle B = 55^\circ$ then $\cos(\angle C)$ is equal to :
(a)1 (b)0 (c)-1 (d)$\frac{1}{2}$

10 1 radian angle is equal to :
(a)60° (b)57° (c)57.3° (d)60.3°

11 Value of $i^9 + i^{10} + i^{11}$ is equal to
(a)$1 - i$ (b)$1 + i$ (c)-1 (d)$-i$

12 Value of $\sqrt{-25} \times \sqrt{-36}$ is
(a)30 (b)$30i$ (c)$-30i$ (d)-30

13 If $z = 3 - 2i$ then $\bar{z}$ is equal to :
(a)$3 + 2i$ (b)$-3 + 2i$ (c)$-3 - 2i$ (d)$3 - 2i$

14 If $x + iy = \frac{1}{\sqrt{3}-2i}$ then y is equal to :
(a)$\frac{\sqrt{3}}{7}$ (b)$\frac{2}{7}$ (c)$-\frac{2}{7}$ (d)$-\frac{\sqrt{3}}{7}$

15 If $z = 3 - 4i$ then $|z|$ is equal to :
(a)7 (b)5 (c)-5 (d)-12

16 Amplitude or argument of $z = 1 + i$ is
(a)60° (b)30° (c)90° (d)45°

17 If $z = \frac{1-i}{1+i}$ then $R_e(z)$ is equal to :
(a)-1 (b)0 (c)1 (d)$\frac{1}{2}$

18 If for $ax^2 + bx + c = 0$ (where $a, b, c \in \mathbb{R}$), $b^2 - 4ac < 0$ then roots of quadratic equation are :
(a)Real and unequal (b)Real and equal (c)Complex conjugate (d)Rational numbers

19 Roots of $x^2 + 289 = 0$ are :
(a)± 17 (b)$\pm 17i$ (c)0 (d)-289

20 If $x^2 + x + 1 = 0$ then value of x is :
(a)$\frac{1\pm\sqrt{3}i}{2}$ (b)$\frac{\sqrt{3}+i}{2}$ (c)$\frac{-1\pm\sqrt{3}i}{2}$ (d)$\frac{\sqrt{3}-i}{2}$

2Marks Questions

1. Express the following complex numbers in $a + ib$ form :

(i)$(2-5i)^3$ (ii)$\frac{2+3i}{1-i}$ (iii) $i^9+i^{19}+i^{29}+i^{39}$ (iv)$\frac{1}{4+5i}$

2. Find the multiplicative inverse of the following complex numbers :

(i)$\sqrt{5}-3i$ (ii)$2+3i$ (iii)$-4+7i$ (iv)$7-\sqrt{3}i$

3. Solve the following quadratic equations :

(i)$4x^2+3x+2=0$ (ii)$x^2+x+1=0$ (iii)$2x^2-5x+4=0$

4. Find the degree measure of the following angles :

(i) $-\frac{12}{49}$ (ii)$\frac{3\pi}{2}$ (iii)$\frac{5\pi}{4}$ (iv)-5

5. Find the radian measure of the following angles :

(i)330° (ii))215° (iii))520° (iv))135°

6. Find the value of the following trigonometric functions :

(i)$\sin 765^\circ$ (ii)$\operatorname{cosec}(-1410^\circ)$ (iii)$\tan 1125^\circ$ (iv)$\cos 1710^\circ$

3/4 Marks Questions

1. **Prove the following :**

(i) $\frac{\cos 7x+\cos 5x}{\sin 7x-\sin 5x}=\cot x$ (ii) $\frac{\sin 5x+\sin 3x}{\cos 5x+\cos 3x}=\tan 4x$

(iii). $\frac{\cos 4x+\cos 3x+\cos 2x}{\sin 4x+\sin 3x+\sin 2x}=\cot 3x$ (iv) $\sin 3x+\sin 5x+\sin 7x=4\cos x\cos 2x\sin 4x$

2. **Find the values of other five trigonometric functions in the following :**

(i) $\cos x=-\frac{1}{2}$, x lies in third quadrant

(ii) $\sin x=\frac{4}{5}$, x lies in second quadrant

(iii) $\tan x=-\frac{5}{12}$, x lies in fourth quadrant

(iv) $\sec x=-\frac{13}{12}$, x lies in third quadrant

3. **If in two circles, arc of same lengths subtends angles 60° and 75° at the centre, find the ratio of their radii.**

4/6 Marks Questions

4. **Find $\sin x/2$, $\cos x/2$, $\tan x/2$ if**

(i) $\sin x=6/11$ and x lies in the second quadrant.

(ii) $\tan x=-4/9$ and x leis in the fourth quadrant.

(iii) $\cot x=3/8$ and x lies in the third quadrant.

Linear Inequalities

Permutations & Combinations

1 If $5x - 3 < 3x + 1$ and x is a natural number then :
(a)$x = 0$ (b)$x = 1$ (c)$x = 1\ and\ x = 2$ (d)$x = 3$

2 If $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ then x belongs to the interval :
(a)$[8, \infty)$ (b)$(8, \infty)$ (c)$(-\infty, 8]$ (d)$(-\infty, 8)$

3 If $-8 \leq 5x - 3 \leq 7$ then x belongs to the interval :
(a)$(-1, 2)$ (b)$[-1, 2]$ (c)$(-1, 2]$ (d)$[-1, 2)$

4 Solution of $5x + 1 \geq -24$, $5x - 1 \leq 24$ is :
(a)$[-5, 5]$ (b)$(-5, 5)$ (c)$(-5, 5]$ (d)$[-5, 5)$

5 Two algebraic expressions related by symbols $>, <, \leq \text{or } \geq$ form :
(a)Equations (b)Inequalities (c)Expressions (d)Functions

If $-x > 5$ then :
6 (a)$x > 5$ (b)$x > -5$ (c)$x < -5$ (d)$x = 5$

The region containing all the solutions of an inequality is called :
7 (a)Problem region (b)Insoluble region (c)Difficult region (d)Solution region

8 For the system of inequalities $x \geq 3$, $y \geq 2$ the solution region lies in
(a)Fourth quadrant (b)First quadrant (c)Second quadrant (d)Third quadrant

9 If $x^2 < 16$ then
(a)$x < 4$ (b)$x > -4$ (c)$-4 < x < 4$ (d)$x = 4$

10 If $\frac{1}{x} \leq \frac{1}{4}$, then
(a)$x \leq 4$ (b)$x \geq 4$ (c)$x \leq -4$ (d)$x \geq -4$

11 Number of arrangements of the word "DELHI" which start with H are :
(a)$5!$ (b)$3!$ (c)$4!$ (d)$6!$

12 If $C(12, r) = C(12, m)$ then :
(a)$r = 12 + m$ (b)$m = 12 + r$ (c)$r + m = 12$ (d)$r - m = 12$

13 Value of $P(12, 0)$ is :
(a)$12!$ (b)0 (c)$11!$ (d)1

14 Value of $C(16, 16)$ is equal to :
(a)1 (b)$16!$ (c)$\frac{16!}{4!}$ (d)0

15 Number of different signals which can be generated using 5 different flags taking all at a time is :
(a)720 (b)120 (c)24 (d)625

16 $4! + 3!$ is equal to :
(a)$7!$ (b)$5!$ (c)30 (d)32

17 Number of diagonals in a regular octagon are :
(a)20 (b)28 (c)16 (d)32

18 Number of teams of 7 players each, which can be selected from 9 players are :
(a)72 (b)35 (c)48 (d)36

19 Total number of ways in which "WAYS" can be written are :
(a)22 (b)24 (c)30 (d)34

20 Which of the following is equal to $C(10, 7)$
(a)$C(7, 10)$ (b)$C(10, 6)$ (c)$C(10, 4)$ (d)$C(10, 3)$

2 Marks Questions

1. Solve the following inequalities and show the graph of each of the solution on number line :
   (i) $5x - 4 < 2x + 7$

(ii) $2(x+3) \geq 4(x-7)$

(iii) $\frac{5-2x}{3} \leq \frac{x}{6} - 5$

(iv) $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$

(v) $\frac{2x-1}{3} \geq \frac{3x-2}{4} - \frac{2-x}{5}$

2. **How many 5 digit telephone numbers can be formed using the digits 0 to 9 if each telephone number starts with 67 and no digit can be repeated ?**
3. **How many four letter code can be can be formed using the first 10 letters of English if no letter can be repeated ?**
4. **Find x if**

(i) $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$

(ii) $\frac{1}{6!} + \frac{1}{7!} = \frac{x}{8!}$

5. **If $C(n,8) = C(n,9)$, then find $C(n,17)$and $C(n,16)$.**
6. **If $(n,6) = C(n,4)$, then find $C(n,2)$ and $C(n,10)$.**

4 Marks Questions

1. **In how many ways the letters of the following words can be written if their vowels do not occur together :**
   - **(i) DAUGHTER**
   - **(ii) MONDAY**
   - **(iii) EQUATION**
   - **(iv) MATHEMATICS**
   - **(v) MISSISSIPPI**
   - **(vi) ALLAHABAD**
2. **Find n if :**

(i) $C(2n,3) : C(n,3) = 12 : 1$

(ii) $C(2n,3) : C(n,3) = 11 : 1$

3. **Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colour.**
4. **In how many ways can one select a cricket team of 11 players from 17 players in which only 5 players can bowl and if each team must include exactly 4 bowlers ?**
5. **In how many ways can we choose 4 cards from a deck of 52 playing cards if**
   - **(i) All of them are of same suit**
   - **(ii) All of them are of different suits**
   - **(iii) All of them are face cards**
   - **(iv) Two are red cards and other two are black cards.**
6. **In how many ways can a team of 3 boys and 4 girls be selected from 7 boys and 5 girls?**
7. **In how many ways can a team of 8 students be formed out of 7 boys and 5 girls if each team must have (i)exactly 3 girls (ii)at least 4 girls (iii)at most 3 girls**

6 Marks Questions

1. **Solve the following system of linear inequalities graphically:**

   (i) $3x + y \leq 9,\ 3x + 2y \leq 12,\ x, y \geq 0.$

   (ii) $7x + 3y \leq 21,\ x + y \geq 3, x - y \leq 0,\ x, y \geq 0.$

   (iii) $8x + 9y \leq 72,\ 4x + y \geq 8,\ 2x - y \geq 0,\ x, y \geq 0.$

   (iv) $x + y \geq 4,\ x + 3y \leq 12,\ x - 2y \geq 0,\ x, y \geq 0.$

   (v) $x + y \leq 6, 2x + y \geq 6, 2x - y \leq 0, x, y \geq 0.$

   (vi) $x + y \leq 6, 2x + y \geq 6, x - y \geq 0, x, y \geq 0.$

   (vii) $x + y \leq 8, 2x + y \geq 8, x - 2y \leq 0, x, y \geq 0.$

   (viii) $x + y \leq 7, x + y \geq 3, x \leq 6, y \leq 6, x, y \geq 0.$

   (ix) $x + y \leq 8, x + y \geq 5, x \leq 7, y \leq 7, x, y \geq 0$

   (x) $x + y \leq 10, x + y \geq 5, x \leq 9, y \leq 9, x, y \geq 0$

Binomial Theorem

1 Number of terms in the expansion of $(2x-3y)^7$ are :
(a)8 (b)7 (c)6 (d)9

2 Number of terms in the expansion of$(x+y)^n$ are :
(a)$n-1$ (b)$n+1$ (c)n (d)n^2

3 In the expansion of $(1+x)^8$ coefficients of which of the two terms are equal :
(a)T_1, T_2 (b)T_3, T_4 (c)T_3, T_7 (d)T_2, T_8

4 Middle term(s) in the expansion of $\left(\frac{2}{3}x-y\right)^8$ is/are :
(a)T_5 (b)T_4, T_5 (c)T_6 (d)T_3, T_4

5 Middle term(s) in the expansion of $\left(3x-\frac{4}{5}y\right)^9$ is/are :
(a)T_5 (b)T_5, T_6 (c)T_6 (d)T_3, T_4

6 In the expansion of $(1+x)^8$ the coefficient of x^4 is :
(a)$C(8,3)$ (b) $C(8,4)$ (c) $C(3,8)$ (d) $C(4,8)$

7 General term in the expansion of $(x+y)^n$ is :
(a)$C(n,r)x^n y^r$ (b) $C(n,r)x^n y^{r+1}$ (c) $C(n,r)x^r y^{n+r}$ (d) $C(n,r)x^{n-r}y^r$

8 General term in the expansion of $(x-y)^n$ is :
(a)$(-1)^r C(n,r)x^{n-r}y^r$ (b) $C(n,r)x^n y^{r+1}$
(c)$(-1)^r C(n,r)x^r y^{n+r}$ (d) $C(n,r)x^r y^{n-r}$

9 The expansion of $(x+y)^n$ is :
(a)$\sum_{r=0}^{r=n} C(n,r)x^n y^r$ (b)$\sum_{r=0}^{r=n} C(n,r)x^n y^{r+1}$ (c)$\sum_{r=0}^{r=n} C(n,r)x^r y^{n+r}$ (d)$\sum_{r=0}^{r=n} C(n,r)x^{n-r}y^r$

10 The expansion of $(x-y)^n$ is :
(a)$\sum_{r=0}^{r=n}(-1)^r C(n,r)x^n y^r$ (b)$\sum_{r=0}^{r=n}(-1)^r C(n,r)x^n y^{r+1}$
(c)$\sum_{r=0}^{r=n}(-1)^r C(n,r)x^r y^{n+r}$ (d)$\sum_{r=0}^{r=n}(-1)^r C(n,r)x^{n-r}y^r$

2/4 Marks Questions

1. Expand the following by binomial theorem :

(i) $\left(\frac{2}{x}-\frac{x}{2}\right)^7$ (ii) $\left(3x^2-\frac{1}{4y}\right)^{10}$ (iii)$\left(3-\frac{x}{3}\right)^6$

2. Find $(x+1)^6+(x-1)^6$.

3. Evaluate $\left(\sqrt{2}+1\right)^6+\left(\sqrt{2}-1\right)^6$.

4. Using binomial theorem show that $9^{n+1}-8n-9$ is divisible by 64 .

5. Using binomial theorem, show that 6^n-5n-1 is divisible by 25.

6. Using binomial theorem, show that $(1.01)^{1000000} > 10000$.

Sequence & Series

1 Arithmetic mean between 8 and 16 is :
(a)8 (b)12 (c)16 (d)24

2 Common difference of sequence $-1, -\frac{3}{2}, -2, \ldots\ldots$ is :
(a)1 (b)-1 (c)$\frac{1}{2}$ (d)$-\frac{1}{2}$

3 5^{th} , 8^{th} and 11^{th} terms of a G.P. are in :
(a)G.P. (b)A.P. (c)A.P. and G.P. both (d)equality

4 7^{th} term of sequence $2, 7, 12, \ldots\ldots\ldots$ is :
(a)34 (b)37 (c)32 (d)27

5 If A and G are arithmetic mean and geometric mean between two positive integers then :
(a)$A = G$ (b)$A \leq G$ (c)$A \geq G$ (d)$A + G = 0$

6 Common ratio of sequence $\frac{5}{2}, \frac{5}{4}, \frac{5}{8}, \ldots\ldots\ldots$ is :
(a)5 (b)$\frac{1}{4}$ (c)2 (d)$\frac{1}{2}$

7 Geometric mean of 2 and 32 is :
(a)2 (b)8 (c)64 (d)128

8 If $-\frac{2}{7}, x, -\frac{7}{2}$ are in G.P. then value of x is :
(a)± 1 (b)0 (c)± 14 (d)± 2

9 A number 3 more than 5^{th} term of sequence $3, 5, 7, \ldots\ldots\ldots$ is :
(a)11 (b)12 (c)13 (d)14

10 A number 2 less than 4^{th} term of sequence $4, 12, 36, \ldots\ldots\ldots$ is :
(a)108 (b)107 (c)106 (d)105

11 If x, y, z are in G.P. then :
(a)$x = y \neq z$ (b)$2y = x + z$ (c)$z^2 = xy$ (d)$y^2 = xz$

2/4 Marks Questions

1. If 4^{th} , 10^{th} and 16^{th} terms of G.P. are x, y and z respectively, then prove that x, y and z are in G.P.

2. Find the sum to n terms of the sequence 8, 88, 888, 8888, ……

3. If A and G are the arithmetic and geometric mean between two positive numbers respectively, then prove that (i) Numbers are $A \pm \sqrt{(A+G)(A-G)}$ (ii) $A \geq G$

4. The sum of first three terms of a G.P. is 16 and the sum of next three terms is 128. Determine the first term and common ratio of the G.P.

Straight Lines & Conic Section

1 Slope of line $3x - 2y = 6$ is :
(a)$-\frac{3}{2}$ (b)$\frac{3}{2}$ (c)$-\frac{2}{3}$ (d)$\frac{2}{3}$

2 Equation of line making intercepts 4 and 7 on the coordinate axes is :
(a)$\frac{x}{4}+\frac{y}{7}=1$ (b)$\frac{x}{7}+\frac{y}{4}=1$ (c)$4x+7y=1$ (d)$7x+4y=1$

3 If slope of line is 1 then angle between line and x −axis is :
(a)0° (b)30° (c)45° (d)60°

4 If m_1 and m_2 are slopes of two lines then angle between them is given by :
(a)$\frac{m_1-m_2}{1+m_1m_2}$ (b)$\frac{m_1+m_2}{1+m_1m_2}$ (c)$\frac{m_1+m_2}{1-m_1m_2}$ (d)$\frac{m_1-m_2}{1-m_1m_2}$

5 Which of the following points lie on the line $5x - 2y = 10$?
(a)$(2,0)$ (b)$(0,5)$ (c)$(-2,0)$ (d)$(2,5)$

6 On which of the following lines , the point $(2,5)$ lies ?
(a)$5x+2y=30$ (b)$5x-2y=27$ (c)$2x+5y=29$ (d)$2x-5y=28$

7 Point of intersection of lines $2x + 3y = 6$ and $3x + 2y = 6$ is :
(a)$\left(\frac{5}{6},\frac{5}{6}\right)$ (b)$\left(-\frac{5}{6},-\frac{5}{6}\right)$ (c)$\left(-\frac{6}{5},-\frac{6}{5}\right)$ (d)$\left(\frac{6}{5},\frac{6}{5}\right)$

8 If m_1 , m_2 are slopes of two perpendicular lines then :
(a)$m_1=m_2$ (b)$m_1m_2=1$ (c)$m_1m_2=-1$ (d)$m_1+m_2=1$

9 If m_1 , m_2 are slopes of two parallel lines then :
(a)$m_1=m_2$ (b)$m_1m_2=1$ (c)$m_1m_2=-1$ (d)$m_1+m_2=1$

10 Which of the following lines pass through $(0,0)$?
(a)$2x-5y=1$ (b)$5x+3y=0$ (c)$y=4x+7$ (d)$7x+8y=56$

11 Centre of the circle $x^2+y^2-12x+6y+20=0$ is :
(a)$(-6,3)$ (b)$(-12,6)$ (c)$(12,-6)$ (d)$(6,-3)$

12 Radius of the circle $x^2+y^2-36=0$ is :
(a)6 units (b)36 units (c)5 units (d)7 units

13 Length of latusrectum of parabola $y^2=16x$ is :
(a)4 units (b)-4 units (c)16 units (d)-16 units

14 Parabola $x^2=-20y$ is :
(a)Upwards (b)Downwards (c)Right Handed (d)Left Handed

15 Ecentricity of ellipse is 0 if it is a :
(a)Circle (b)Line segment (c)Parabola (d)Hyperbola

16 Length of major axis of ellipse $\frac{x^2}{36}+\frac{y^2}{49}=1$ is :
(a)6 units (b)7 units (c)36 units (d)14 units

17 Centre of the hyperbola $\frac{x^2}{25}-\frac{y^2}{16}=1$ is :
(a)$(5,4)$ (b)$(5,0)$ (c)$(0,0)$ (d)$(0,4)$

18 Ecentricity of a hyperbola is always :
(a)Greater than 1 (b)Less than 1 (c)Equal to 1 (d)0

19 Vertex of parabola $x^2=20y$ is :
(a)$(0,0)$ (b)$(20,0)$ (c)$(0,20)$ (d)$(0,5)$

20 Foci of ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ are :
(a)$(0,\pm3)$ (b)$(\pm3,0)$ (c)$\left(\pm\sqrt{5},0\right)$ (d)$\left(0,\pm\sqrt{5}\right)$

2/4 Marks Questions

1. Without using Pythagoras theorem , show that the points $(4,4),(3,5),(-1,-1)$ are vertices of a right angled triangle.

2. **Without using distance formula, find the value of x for which points $(x,-1),(2,1),(4,5)$ are collinear.**
3. **Find angle between the line and the $x-$ axis, where line passes from the points $(3,-1)$, $(4,-2)$.**
4. **Find the equations of any two medians of a triangle with vertices $(3,2),(7,9),(9,-2)$.**
5. **Find the equation of a line passing from the point $(4,-5)$ and perpendicular to a line passing from the points $(2,5)$, $(-4,7)$.**
6. **The perpendicular from origin to a line meets it at the point $(4,-8)$, find the equation of line.**
7. **Reduce the following equations of lines in slope intercept , intercept and normal form :**

   $3x+2y-12=0$, $4x-3y=8$, $5x+3y=16$, $4x-7y+30=0$.
8. **Two lines passing from the point $(2,3)$ intersects each other at an angle of 60°. If slope of one line is 2, then find equation of the other line.**
9. **Find the coordinates of foot of perpendicular drawn from $(4,-5)$to the line $4x-6y=13$.**
10. **Mid points of sides of a triangles are $(3,4),(7,8),(5,1)$ then find the equations of the sides.**
11. **Find the centre and radius of the following circles :**

    $$x^2+y^2-6x-8y-11=0\,,\qquad x^2+y^2-9y+14=0,\quad 2x^2+2y^2-x=0$$
12. **Find the equation of the circle passing through the points $(2,3),(-1,1)$ and whose centre is on the line $x-3y-11=0$.**
13. **Find the equation of a circle passing from the points $(2,1)$, $(5,6)$, $(8,0)$.**
14. **Find the vertex, focus, equation of directrix, equation of latusrectum, equation of axis and length of latusrectum of the following parabolas:**

    $$y^2=15x,\qquad y^2=-16x,\qquad x^2=10y,\qquad x^2=-24y$$
15. **Find the centre, foci, vertices, equation and length of major axis, equation and length of minor axis and equation and length of latusrecta in the foolowing :**

    $$36x^2+4y^2=144,\qquad 16x^2+y^2=16,\qquad 4x^2+9y^2=36,\qquad 16x^2+9y^2=576$$

Intro to 3-D Geometry &Limits & Derivatives

1 Number of octants in the three dimensional space are
(a)4 (b)6 (c)8 (d)10

2 Point $(2,-3,-4)$ is in the octant
(a)4th (b)6th (c)7th (d)8th

3 Point $(-5,4,-2)$ is in the octant
(a)4th (b)6th (c)7th (d)8th

4 Mid-point of the line joining the points $(2,-3,9)$ and $(4,7,-7)$ is
(a)$(1,2,3)$ (b)$(2,1,3)$ (c)$(3,1,2)$ (d)$(3,2,1)$

5 Distance between the points $(5,2,1)$ and $(4,2,-3)$ is
(a)4 units (b)5 units (c)$\sqrt{17}$units (d)$\sqrt{15}$units

6 x – axis , y – axis and z – axis are mutually
(a)perpendicular (b)parallel (c)non-intersecting (d)finite in length

7 Co-ordinates of origin of the three dimensional space are
(a)$(1,1,1)$ (b)$(0,0,0)$ (c)$(-1,-1,-1)$ (d)$(1,2,3)$

8 Co-ordinates of the point dividing the line joining the points (x_1,y_1,z_1) and (x_2,y_2,z_2) in the ratio $m_1:m_2$ internally are
(a)$\left(\frac{m_2x_1+m_1x_2}{m_1+m_2},\frac{m_2y_1+m_1y_2}{m_1+m_2},\frac{m_2z_1+m_1z_2}{m_1+m_2}\right)$ (b)$\left(\frac{m_2x_1-m_1x_2}{m_1-m_2},\frac{m_2y_1-m_1y_2}{m_1-m_2},\frac{m_2z_1-m_1z_2}{m_1-m_2}\right)$
(c)$\left(\frac{m_1x_1+m_2x_2}{m_1+m_2},\frac{m_1y_1+m_2y_2}{m_1+m_2},\frac{m_1z_1+m_2z_2}{m_1+m_2}\right)$ (d)$\left(\frac{m_1x_1-m_2x_2}{m_1-m_2},\frac{m_1y_1-m_2y_2}{m_1-m_2},\frac{m_1z_1-m_2z_2}{m_1-m_2}\right)$

9 Co-ordinates of centroid of the triangle with the vertices $(x_1,y_1,z_1),(x_2,y_2,z_2)$ and (x_3,y_3,z_3) are
(a)$\left(\frac{x_1-x_2+x_3}{3},\frac{y_1-y_2+y_3}{3},\frac{z_1-z_2+z_3}{3}\right)$ (b)$\left(\frac{x_1+x_2+x_3}{3},\frac{y_1+y_2+y_3}{3},\frac{z_1+z_2+z_3}{3}\right)$
(c)$\left(\frac{x_1+x_2+x_3}{2},\frac{y_1+y_2+y_3}{2},\frac{z_1+z_2+z_3}{2}\right)$ (d)$\left(\frac{x_1+x_2+x_3}{4},\frac{y_1+y_2+y_3}{4},\frac{z_1+z_2+z_3}{4}\right)$

10 In which octant all axes are negative
(a)1st (b)3rd (c)5th (d)7th

11 In which octant all axes are positive
(a)1st (b)3rd (c)5th (d)7th

12 $\lim_{x\to0}\frac{\tan x}{x}$ is equal to :
(a)0 (b)-1 (c)1 (d)2

13 $\lim_{x\to0}\frac{\sin x}{x}$ is equal to :
(a)0 (b)-1 (c)1 (d)2

14 $\lim_{x\to0}\frac{x^n-a^n}{x-a}$ is equal to :
(a)a^n (b)na^n (c)n^a (d)na^{n-1}

15 $\lim_{x\to0}\frac{x^2-4}{x-2}$ is equal to :
(a)6 (b)2 (c)4 (d)8

16 $\lim_{x\to0}\frac{\sin 7x}{5x}$ is equal to :
(a)$\frac{2}{5}$ (b)$\frac{7}{5}$ (c)$\frac{5}{2}$ (d)$\frac{5}{7}$

17 $\lim_{x\to0}\cos 10x$ is equal to :
(a)1 (b)0 (c)10 (d)100

18 If $y=\cos x$ then $\frac{dy}{dx}$ is equal to :
(a)$\sin x$ (b)$-\sin x$ (c)$\sec x$ (d)$\sec x\tan x$

19 If $f(x)=3x^2-x-2$ then $f'(x)$ at $x=0$ is :
(a)1 (b)-2 (c)-1 (d)6

20 Which of the following is correct ?

(a) $\frac{d}{dx}\big(f(x)g(x)\big) = f'(x)g(x) + g'(x)f(x)$ **(b)** $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - g'(x)f(x)}{g(x)}$

(c) $\frac{d}{dx}\big(f\big(g(x)\big) = f'\big(g'(x)\big)g(x)$ **(d)** $f'(x) = \lim_{h\to 1}\frac{f(x+h)-f(x)}{h}$

2/4 Marks Questions

16. Show that the points $(0, 7, -10), (1, 6, -6), (4, 9, -6)$ are vertices of an isosceles triangle.

17. Show that the points $(0, 7, 10), (-1, 6, 6), (-4, 9, 6)$ are vertices of a right angled triangle.

18. Find the points which trisect the line segment joining the points $(4, 2, -6), (10, -16, 6)$.

19. Find the ratio in which the line segment joining the points $(4, 8, 10)$, $(6, 10, -8)$ is divided by the YZ – plane.

20. Find the coordinates of the centroid of the triangle with vertices $(3, 2, 9)$, $(4, -2, 7), (5, 6, -8)$.

21. Evaluate the following limits :

$$\lim_{x\to 3} x^2 + 2x - 8\,, \qquad \lim_{x\to 6}\frac{5x+3}{2x-5}\,, \qquad \lim_{x\to 0}\frac{x^2-2x+10}{x+5}\,, \qquad \lim_{x\to 1} 7x^3 - 3x^2 + 4x - 12$$

$$\lim_{x\to 3}\frac{x^4-81}{x-3}\,, \qquad \lim_{x\to 6}\frac{x^2-36}{x-6}\,, \qquad \lim_{x\to 2}\frac{x^3-8}{x^2-4}\,, \qquad \lim_{x\to 5}\frac{x^2-9x+20}{x^2-6x+5}\,, \qquad \lim_{x\to 3}\frac{x^2-4x+3}{x^2-2x-3}$$

22. If $\lim_{x\to a}\frac{x^9-a^9}{x-a} = 9$ then find the value of a.

23. If $\lim_{x\to 2}\frac{x^n-2^n}{x-2} = 80$ then find the value of n.

24. Evaluate the following limits :

$$\lim_{x\to 0}\frac{\sin 3x}{5x}\,, \qquad \lim_{x\to 0}\frac{\sin 9x}{\sin 7x}\,, \qquad \lim_{x\to 0}\frac{\tan mx}{\tan nx}\,, \qquad \lim_{x\to 0}\frac{3\sin 2x + 2x}{3x + 2\tan 3x}\,, \qquad \lim_{x\to 0}\frac{3\sin x + 2x\cos 5x}{15x - 2\tan x}$$

25. Differentiate the following w.r.t. x :

(i) $3x^3 + 4x^2 - 5x - 10$ **(ii)** $\sin x + \tan x - \log x + e^x$

(iii) $3x^2 \sec x$ **(iv)** $e^x \log x + \log(\tan x)$

(v) $\frac{3x-2}{5x+2}$ **(vi)** $\frac{\sin x}{\log x} + 3\sin^3 x$

(vii) $\sin(\log x)$ **(viii)** $[\tan(\log 5x)]^2$

Statistics & Probability

1 If E is any event then $P(E)$ lies in the interval :
(a)$(-\infty, +\infty)$ (b)$[0, 1]$ (c)$(0, 1)$ (d)$[-1, 1]$

2 If $P(E) = \frac{1}{5}$ then $P(not\ E)$ is equal to :
(a)$\frac{3}{5}$ (b)$-\frac{1}{5}$ (c)$\frac{4}{5}$ (d)$\frac{5}{4}$

3 Number of elements in the sample space of throwing two dice are :
(a)36 (b)12 (c)6 (d)216

4 Number of elements in the sample space of tossing 3 coins are :
(a)6 (b)9 (c)3 (d)8

5 One card is drawn from a pack of well shuffled 52 cards. The probability that it is a king or spade is :
(a)$\frac{1}{26}$ (b)$\frac{3}{26}$ (c)$\frac{4}{13}$ (d)$\frac{3}{13}$

6 Two dice are thrown , probability of getting an even prime number on both dice are :
(a)$\frac{2}{36}$ (b)$\frac{3}{36}$ (c)$\frac{5}{36}$ (d)$\frac{1}{36}$

7 If $\frac{2}{5}$ is the probability of occurrence of any event then probability of its non-occurrence is :
(a)$\frac{1}{5}$ (b)$\frac{5}{2}$ (c)$\frac{5}{3}$ (d)$\frac{3}{5}$

8 Probability of a sure event is :
(a)1 (b)0 (c)-1 (d)2

9 Probability of an impossible event is :
(a)1 (b)0 (c)-1 (d)2

10 The probability that a leap year will have 53 Fridays is
(a)$\frac{1}{7}$ (b)$\frac{2}{7}$ (c)$\frac{3}{7}$ (d)$\frac{4}{7}$

2/4 Marks Questions

1. Write the sample space of the following events :
   (i) A coin is tossed three times.
   (ii) 4 coins are tossed once.
   (iii) 2 dice are thrown.
   (iv) A coin is tossed and a die is thrown.
2. A pair of dice is thrown, describe the following events :
   (i) A : getting the sum of numbers appeared greater then 8.
   (ii) B : 2 occur on either die.
   (iii) C : getting the sum of numbers appeared is at least 7.
   Which pair of events is mutually exclusive ? Also find $A \cup B$, A', $B \cap C$, $A \cap B$, $A \cap C$.
3. One card is drawn from a well shuffled deck of 52 cards. If each outcome is equally likely, calculate the probability that the drawn card is (i) a diamond (ii) not an ace (iii) a black card.
4. A fair coin with 1 marked on one face and 6 on the other face and a fair die are both tossed, find the probability that the sum of numbers appeared is (i) 3 (ii) 12 .
5. Three coins are tossed once, find the probability of getting :
   (i) At most 2 heads.
   (ii) At least 2 tails.
6. If 7 cards are drawn from a well shuffled deck of 52 cards, find the probability of getting :
   (i) All kings.
   (ii) At least 3 kings.

7. **4 cards are drawn from a well shuffled deck of 52 cards, find the probability of getting :**
   - **(i) 3diamondsand one spade.**
   - **(ii) At least 2 hearts.**
   - **(iii) At most 2 queens.**
8. **Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that :**
   - **(i) You both enter in the same section.**
   - **(ii) You both enter in the different sections.**
9. **If $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$ and $P(A \cap B) = \frac{1}{15}$ then find $P(A \cup B)$.**
10. **If $P(A) = \frac{1}{5}$, $P(B) = \frac{1}{7}$ and $P(A \cup B) = \frac{61}{280}$ then find $P(A \cap B)$.**

6.Marks Questions

1. **Calculate :**
   - **(i) Mean deviation about mean.**
   - **(ii) Mean deviation about median.**
   - **(iii) Mean, variance and standard deviation.**

   For the following data :

   (a)

Class Interval :	0-10	10-20	20-30	30-40	40-50	50-60
Frequency :	6	7	15	16	4	2

   (b)

Class Interval :	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency :	2	3	8	14	8	3	2

   (c)

Class Interval :	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800
Frequency :	4	8	9	10	7	5	4	3

CLASS - XI

MATHEMATICS

(2023-24)

Time: 3:00 hrs

Theory : 80 Marks
INA : 20 Marks
Total : 100 Marks

1. All the questions are compulsory.
2. The question paper consists of 16 questions divided into 4 sections A,B,C,and D.
3. Section A comprises of 3 questions.
   i. Q.No.1 consists of 16 Multiple Choice Questions carrying 1 mark each.
   ii. Q.No.2 consists of 8 Fill in the Blank type questions carrying 1 mark each.
   iii. Q.No. 3 consists of 8 True/False type questions carrying 1 mark each.
4. Section B comprises of 5 questions of 2 marks each.
5. Section C comprises of 5 questions of 4 marks each.
6. Section D comprises of 3 questions of 6 marks each.
7. An internal choice has been provided in three questions of 2 marks, three questions of 4 marks and three questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.
8. Use of calculators is not permitted.

Sr. No	Unit	Topic	Q. Carrying 1-Mark	Q. Carrying 2-Marks	Q. Carrying 4-Marks	Q. Carrying 6-Marks	Total Marks
1	Sets & Functions	Sets	9	-	1	1	19
		Relations & Functions					
		Trigonometric Functions					
2	Algebra	Complex numbers & Quadratic Equations	9	3	2	1	29
		Linear Inequalities					
		Permutations & Combinations					
		Binomial Theorem					
		Sequence & Series					
3	Co-ordinate Geometry	Straight lines	6	1	1	-	12
		Conic Sections					
		Introduction to Three-dimensional Geometry					
4	Calculus	Limits & Derivatives	5	-	-	1	11
5	Statistics & Probability	Statistics	3	1	1	-	9
		Probability					
	Total Questions		**3(32)**	**5**	**5**	**3**	**16**
	Total Marks		**32**	**10**	**20**	**18**	**80**

SAMPLE PAPER (FULL SYLLABUS) 2024-25

Class: XI

Time: 3 hours **Subject: MATHEMATICS** **M.M. 80**

Section-A (1 mark each)

1. Choose the correct options in the following questions:

(i) If $A = \{x: x \in N, x^2 = 4\}$ then which of these is correct:

(A)$4 \in A$ (B)$-2 \in A$ (C) $2 \notin A$ (D)$2 \in A$

(ii) $\sec\left(\frac{3\pi}{2} - x\right)$ is equal to:

(A)$\operatorname{cosec} x$ (B)$-\operatorname{cosec} x$ (C)$-\sec x$ (D)$\sec x$

(iii) Value of i^{2025} is equal to:

(A)1 (B)-1 (C)i (D)$-i$

(iv)$y + ix = 12 - 7i$ then $x + y =$

(A) 5 (B) -7 (C) -5 (D) 9

(v) Total number of ways in which "YEAR" can be arranged are:

(A)6 (B) 12 (C)48 (D)24

(vi)Number of chords that can be drawn through 20 points on a circle are:

(A)40 (B)200 (C)190 (D)210

(vii) In a G.P. having third term 24 and common ratio 2, Second term is equal to:

(A)6 (B)12 (C)24 (D)48

(viii) Slope of line parallel to the line $2x - 6y = -1$ is:

(A) $\frac{1}{3}$ (B) 3 (C) -3 (D) $-\frac{1}{3}$

(ix) Equation of the line passing through (1,0) and parallel to y-axis is:

(A) $x + 1 = 0$ (B) $y + 1 = 0$ (C) $x - 1 = 0$ (D) $y - 1 = 0$

(x) In which octant, point $(-3, -1, -9)$ lies in:

(A)VI (B) VII (C) VIII (D) V

(xi)The derivative of $\sqrt{x}$ at $x = 4$ is:

(A) $\frac{1}{4}$ (B) $\frac{1}{8}$ (C) 2 (D) $\frac{1}{2}$

(xii) The derivative of $\sin x$ at $x = \frac{\pi}{3}$ is:

(A) $-\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $-\frac{\sqrt{3}}{2}$ (D) $\frac{1}{2}$

(xiii) Number of elements in the sample space when a die is thrown thrice are:

(A)6 (B)12 (C)36 (D)216

(xiv) Three coins are tossed. Probability of getting at least 2 tails is:

(A)$\frac{1}{2}$ (B)$\frac{7}{8}$ (C)$\frac{1}{8}$ (D)$\frac{3}{8}$

(xv) Which of the following is not a measure of dispersion?

(A) Range (B) Mean deviation (C) Mode (D) Standard deviation

2. Fill in the blanks:

(i) The set of all second elements in a relation R from a set A to a set B is called … of the relation R.

(ii) The solution set of $4x > 8$ is …

(iii) Number of terms in the expansion of $(3 + x)^5$ is …

(iv) If slope of a line is 5, then slope of the line perpendicular to this line is …

(v) Distance between the points $(2, 1, 2)$ and $(5, 1, 6)$ is …

Section-B (2 marks each)

3. Show that $\sin(n+1)x\cos(n+2)x - \cos(n+1)x\sin(n+2)x = -\sin x$
4. Which term of the sequence $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$, …is $(4096)^{-1}$?
5. Expand $\left(x - \frac{3}{x}\right)^5, x \neq 0$ using binomial theorem.
6. How many 4-digit even numbers can be formed using the digits 2,3,4,6,7,8,9, if no digit is repeated?
7. Find the distance of origin from the line $15x - 8y = -56$.

   Or

   Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, – 8) is divided by the YZ-plane
8. Find the coordinates of the focus, axis of the parabola, the equation of the directrix and the length of the latus rectum for the parabola $x^2 = -16y$

   Or

   Find the equation of the ellipse whose vertices are (± 13, 0) and foci are (± 5, 0).
9. A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If die is rolled once, determine (i) P(2) (ii) P(not 3).

   Or

   Find the probability that when a hand of 8 cards is drawn from a well shuffled deck of 52 cards, it contains all Kings.

Section-C (4 marks each)

10. If $A = \{2,3,5,6,8,\}, B = \{3,6,8,9,10\}$, then find (i) $A \cup B$ (ii) $A \cap B$ (iii) $A - B$ (iv) $n(A \times B)$

11. (a) Find the value of $\sin 150^\circ - \cos 180^\circ$

(b) In a circle of diameter 60 cm, the length of a chord is 30 cm. Find the length of minor arc of the chord.

12. Insert two numbers between 3 and 81 so that the resulting sequence is G.P.

Or

The sum of first three terms of a G.P. is $\frac{13}{12}$ and their product is – 1. Find the common ratio and the terms.

13. Find the conjugate of $\frac{2(3+i)}{1-i}$.

Or

Find the real numbers x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.

14. Find the equation of the line passing through $(-3, 5)$ and perpendicular to the line through the points $(2, 5)$ and $(-3, 6)$.

Or

A line perpendicular to the line segment joining the points (1, 0) and (2, 3) divides it in the ratio 1: 3. Find the equation of the line.

15. Find $\frac{dy}{dx}$ when (i) $y = 9\sin x - 6\cos x$ (ii) $5x^3 - 7x + 4$

16. Calculate mean and variance for the following distribution:

Classes	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Section-D (6 marks each)

17. Solve $5(2x - 7) - 3(2x + 3) \leq 0, 2x + 19 \leq 6x + 47$.

Or

A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl? (ii) at least one boy and one girl? (iii) at least 3 girls?

18. Prove that $cos^2 x + cos^2\left(x + \frac{\pi}{3}\right) + cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

Or

Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ *and* $\tan\frac{x}{2}$ when $\tan x = -\frac{24}{7}$, x lies in 4th quadrant.

19. Find derivative of $\tan x$ using first principle.

Or

(a) Differentiate $x^5 \sin x$ w.r.t. x

(b) Differentiate $\frac{3-5x}{5-3x}$ w.r.t. x