Some Important Formulae

1)Binomial Formulae :

1. $(a+b)^2 = a^2 + b^2 + 2ab$
2. $(a-b)^2 = a^2 + b^2 - 2ab$
3. $a^2 - b^2 = (a-b)(a+b)$
4. $a^2 + b^2 = (a+b)^2 - 2ab$
5. $(a^2 + b^2)^2 = (a^2 - b^2)^2 + 4a^2b^2$
6. $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$
7. $(a-b)^3 = a^3 - b^3 - 3ab(a-b)$
8. $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
9. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
10. $(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

2)Perimeters& Areas:

S. No.	Name of Shapes	Parameter(s)	Perimeter or Circumference	Area
1	Circle	$r(\text{radius})$	$2\pi r$	πr^2
2	Square	$a(\text{length of side})$	$4a$	a^2
3	Rectangle	$l(\text{length})$, $b(\text{breadth})$	$2(l+b)$	lb

4	Equilateral Triangle	$a(\text{length of side})$	$3a$	$\frac{\sqrt{3}}{4}a^2$
5	Scalene Triangle	$a, b, c(\text{sides})$	$a+b+c$	$\sqrt{s(s-a)(s-b)(s-c)}$ where $s=\frac{a+b+c}{2}$

3)Surfaces& Volumes :

S. No.	Name of Shapes	Parameter(s)	Lateral or Curved Surface Area	Total Surface Area	Volume
1	Sphere	$r(\text{radius})$	xxxxxxxxxxxxxx	$4\pi r^2$	$\frac{4}{3}\pi r^3$
2	Hemisphere	$r(\text{radius})$	$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$
3	Right Circular Cylinder	$r(\text{radius})$, $h(\text{height})$	$2\pi rh$	$2\pi r(r+h)$	$\pi r^2 h$
4	Right Circular Cone	$r(\text{radius})$, $h(\text{height})$	πrl Where $l=\sqrt{r^2+h^2}$	$\pi r(r+l)$	$\frac{1}{3}\pi r^2 h$

4)Quadratic Equations:

1. If $ax^2+bx+c=0$ then $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
2. If $ax^2+bx+c=0$ then discriminant is given by $D=b^2-4ac$ and
   (i) If $D=0$ then roots of equation are real and equal.

(ii) If $D > 0$ then roots of equation are real and unequal.

(iii) If $D < 0$ then roots of equation are complex conjugate.

3. If α and β are the roots of equation then equation is $x^2 - (\alpha + \beta)x + \alpha\beta = 0$.

4. If quadratic equation is $ax^2 + bx + c = 0$ then :

(i) Sum of the roots, $\alpha + \beta = \frac{-b}{a}$

(ii) Product of the roots, $\alpha\beta = \frac{c}{a}$.

5)Sum of Different Series:

1. $1 + 2 + 3 + \cdots \ldots \ldots \ldots \ldots + n = \frac{n(n+1)}{2}$

2. $1^2 + 2^2 + 3^2 + \cdots \ldots \ldots \ldots . . + n^2 = \frac{n(n+1)(2n+1)}{6}$

3. $1^3 + 2^3 + 3^3 + \cdots \ldots \ldots \ldots . . + n^3 = \left[\frac{n(n+1)}{2}\right]^2$

4. $a + (a + d) + (a + 2d) + \cdots \ldots \ldots \ldots \ldots . + (a + (n - 1)d) = \frac{n}{2}[2a + (n - 1)d]$

5. $a + ar + ar^2 + \cdots \ldots \ldots \ldots \ldots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}$

6)Trigonometry:

1. If p, b and h are perpendicular side, base side and hypotenuse side of a right angled triangle then

$$\sin\theta = \frac{p}{h}, \cos\theta = \frac{b}{h}, \tan\theta = \frac{p}{b}, \operatorname{cosec}\theta = \frac{h}{p}, \sec\theta = \frac{h}{b}, \cot\theta = \frac{b}{p}$$

$$\operatorname{cosec}\theta = \frac{1}{\sin\theta}, \qquad \sec\theta = \frac{1}{\cos\theta}, \qquad \cot\theta = \frac{\cos\theta}{\sin\theta} = \frac{1}{\tan\theta}, \qquad \tan\theta = \frac{\sin\theta}{\cos\theta}$$

2. **Values of different T – ratios at different angles:**

θ/ T-Ratios	0^o or 0	30^o or $\frac{\pi}{6}$	45^o or $\frac{\pi}{4}$	60^o or $\frac{\pi}{3}$	90^o or $\frac{\pi}{2}$
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	n.d.
$\csc\theta$	n.d.	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	n.d.
$\cot\theta$	n.d.	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Where n.d. means "not defined".

3. $\sin^2 x + \cos^2 x = 1, \quad 1 + \tan^2 x = \sec^2 x, \quad 1 + \cot^2 x = \operatorname{cosec}^2 x$

4. $\sin x = \sqrt{1 - \cos^2 x}, \quad \cos x = \sqrt{1 - \sin^2 x}, \quad \sec x = \sqrt{1 + \tan^2 x}$

5. $\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$

6. $\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$

7. $\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$

8. $\sin(x + y)\sin(x - y) = \sin^2 x - \sin^2 y = \cos^2 y - \cos^2 x$

9. $\cos(x + y)\cos(x - y) = \cos^2 x - \sin^2 y = \cos^2 y - \sin^2 x$

10. $\sin 2x = 2 \sin x \cos x = \frac{2 \tan x}{1 + \tan^2 x}$

11. $\cos 2x = \cos^2 x - \sin^2 x = 1 - 2\sin^2 x = 2\cos^2 x - 1 = \frac{1-\tan^2 x}{1+\tan^2 x}$

12. $\tan 2x = \frac{2\tan x}{1-\tan^2 x}$

13. $\sin 3x = 3\sin x - 4\sin^3 x$

14. $\cos 3x = 4\cos^3 x - 3\cos x$

15. $\tan 3x = \frac{3\tan x - \tan^3 x}{1-3\tan^2 x}$

16. $1 - \cos x = 2\sin^2 \frac{x}{2}$, $\quad 1 + \cos x = 2\cos^2 \frac{x}{2}$

17. $\sin x + \sin y = 2\sin \frac{x+y}{2} \cos \frac{x-y}{2}$

18. $\sin x - \sin y = 2\cos \frac{x+y}{2} \sin \frac{x-y}{2}$

19. $\cos x + \cos y = 2\cos \frac{x+y}{2} \cos \frac{x-y}{2}$

20. $\cos x - \cos y = -2\sin \frac{x+y}{2} \sin \frac{x-y}{2}$

21. $2\sin x \cos y = \sin(x+y) + \sin(x-y)$

22. $2\cos x \cos y = \cos(x+y) + \cos(x-y)$

23. $2\sin x \sin y = \cos(x-y) - \cos(x+y)$

24. Values of different T – Ratios in different quadrants :

(a) 1st Quadrant : (i) All T – Ratios positive

(ii)Angles : x **and** $90 - x$

(b) 2nd Quadrant : (i) $\sin x$ **and** $\operatorname{cosec} x$ **are positive**

(ii)Angles : $90 + x$ **and** $180 - x$

(c) 3rd Quadrant : (i) $\tan x$ **and** $\cot x$ **are positive**

(ii)Angles :$180 + x$ and$270 - x$

(d) 4th Quadrant : (i)$\cos x$ and $\sec x$ are positive

(ii)Angles :$270 + x$ and $360 - x$ or $-x$

(e) T – Ratios changes for the angles $90 \pm x$ and $270 \pm x$

(f) T – Ratios does not changes for the angles $180 \pm x$ and $360 \pm x$.

(g) T – Ratios changes : $\sin x \leftrightarrow \cos x$, $\tan x \leftrightarrow \cot x$, $\sec x \leftrightarrow \operatorname{cosec} x$

7)Some Important Sets:

1. Natural Number, $N = \{1, 2, 3, 4, \ldots\ldots\ldots\ldots\ldots\}$
2. Whole Number, $W = \{0, 1, 2, 3, 4, \ldots\ldots\ldots\ldots\}$
3. Integers, I or $Z = \{\ldots\ldots\ldots -3, -2, -1, 0, 1, 2, 3, \ldots\ldots\ldots\ldots\}$
4. Rational Numbers, $Q = \{\frac{p}{q} : p, q \in Z, q \neq 0$ and $g.c.d(p, q) = 1\}$
5. Real Numbers, $R = (-\infty, \infty)$
6. Irrational Numbers $= R - Q$
7. Complex Numbers, $C = \{x + iy : x, y \in R$ and $i = \sqrt{-1}\}$
8. $N \subset W \subset Z \subset Q \subset R \subset C$, where$\subset$ means “is subset of”.

8)Some Equations:

1. Straight Line :

(a) General Form : $ax + by = c$

(b) Slope Point Form: $y - y_1 = m(x - x_1)$

(c) Two Point Form: $y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

(d) **Slope Intercept Form:** $y = mx + c$

(e) **Intercept Form:** $\frac{x}{a} + \frac{y}{b} = 1$

2. **Circle :**

(a) **General Form :** $x^2 + y^2 + 2gx + 2fy + c = 0$

(b) **Standard Form :** $(x - h)^2 + (y - k)^2 = r^2$

(c) **Diameter Form :** $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$

3. **Parabola :**

(a) **Right Handed Parabola :** $y^2 = 4ax$

(b) **Left Handed Parabola :** $y^2 = -4ax$

(c) **Upwards Parabola :** $x^2 = 4ay$

(d) **Downwards Parabola :** $x^2 = -4ay$

4. **Ellipse :** $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

5. **Hyperbola :** $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

Sets

Relations & Functions

MCQ

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

CRQ

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.

A relation is defined as $R = \{(x-1, x^2+1) : \ x \in \{3, 4, 7, 8, 9\}\}$ then

Q8

(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
MCQ

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 ΔABC $\angle A = 35^\circ$ 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 $ax^2 + bx + c = 0$ $(\text{where } a, b, c \in \mathbb{R})$, $b^2 - 4ac < 0$ 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) $\frac{\sqrt{3}-i}{2}$

CRQ

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)$\cos 1710^\circ$

7. 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) $\sin 3x + \sin 5x + \sin 7x = 4\cos x \cos 2x \sin 4x$

8. 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

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

10. 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

MCQ

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)$C(10, 3)$

CRQ

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 $C(n,10)$.

7. 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

8. Find n if :

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

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

9. 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.

10. 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 ?

11. 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.**

12. In how many ways can a team of 3 boys and 4 girls be selected from 7 boys and 5 girls?

13. 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

14. 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

MCQ

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)** $\sum_{r=0}^{r=n}(-1)^r C(n,r)x^{n-r} y^r$

CRQ

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

MCQ

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 4th 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)$y^2 = xz$

CRQ

1. If 4th , 10th and 16th 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

MCQ

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) $\frac{m_1 - m_2}{1 + m_1 m_2}$ (b) $\frac{m_1 + m_2}{1 + m_1 m_2}$ (c) $\frac{m_1 + m_2}{1 - m_1 m_2}$ (d) $\frac{m_1 - m_2}{1 - m_1 m_2}$

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) $m_1 m_2 = 1$ (c) $m_1 m_2 = -1$ (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) $m_1 m_2 = 1$ (c) $m_1 m_2 = -1$ (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

Length of latusrectum of parabola $y^2 = 16x$ is :

13 (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)$(0, \pm 3)$ (b)$(\pm 3, 0)$ (c)$(\pm\sqrt{5}, 0)$ (d)$(0, \pm\sqrt{5})$

CRQ

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 :**

    (i) $x^2 + y^2 - 6x - 8y - 11 = 0$,

    (ii) $x^2 + y^2 - 9y + 14 = 0$,

    (iii) $2x^2 + 2y^2 - x = 0$

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:**

    (i) $y^2 = 15x$,

    (ii) $y^2 = -16x$,

    (iii) $x^2 = 10y$,

    (iv) $x^2 = -24y$

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 :**

    (i) $36x^2 + 4y^2 = 144$,

    (ii) $16x^2 + y^2 = 16$,

    (iii) $4x^2 + 9y^2 = 36$,

    (iv) $16x^2 + 9y^2 = 576$

Intro to 3-D Geometry

Limits & Derivatives

MCQ

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)4^{th} **(b)6^{th}** **(c)7^{th}** **(d)8^{th}**

3 Point $(-5, 4, -2)$ is in the octant

(a)4^{th} **(b)6^{th}** **(c)7^{th}** **(d)8^{th}**

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) 1^{st} (b) 3^{rd} (c) 5^{th} (d) 7^{th}

11 In which octant all axes are positive

(a) 1^{st} (b) 3^{rd} (c) 5^{th} (d) 7^{th}

12 $\lim_{x\to 0} \frac{\tan x}{x}$ is equal to :

(a) 0 (b) -1 (c) 1 (d) 2

13 $\lim_{x\to 0} \frac{\sin x}{x}$ is equal to :

(a) 0 (b) -1 (c) 1 (d) 2

14 $\lim_{x\to 0} \frac{x^n-a^n}{x-a}$ is equal to :

(a) a^n (b) na^n (c) n^a (d) na^{n-1}

15 $\lim_{x\to 0} \frac{x^2-4}{x-2}$ is equal to :

(a)6 (b)2 (c)4 (d)8

16 $\lim_{x\to 0}\frac{\sin 7x}{5x}$ is equal to :

(a)$\frac{2}{5}$ (b)$\frac{7}{5}$ (c)$\frac{5}{2}$ (d)$\frac{5}{7}$

17 $\lim_{x\to 0}\cos 10x$ 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)$\frac{d}{dx}(f\big(g(x)\big)=f'\big(g'(x)\big)g(x)$ (d)$f'(x)=\lim_{h\to 1}\frac{f(x+h)-f(x)}{h}$

CRQ

1. Show that the points $(0,7,-10),(1,6,-6),(4,9,-6)$ are vertices of an isosceles triangle.
2. Show that the points $(0,7,10),(-1,6,6),(-4,9,6)$ are vertices of a right angled triangle.
3. Find the points which trisect the line segment joining the points $(4,2,-6),(10,-16,6)$.
4. Find the ratio in which the line segment joining the points $(4,8,10)$, $(6,10,-8)$ is divided by the YZ – plane.

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

6. **Evaluate the following limits :**

$\lim_{x\to 3} x^2 + 2x - 8$, $\lim_{x\to 6} \frac{5x+3}{2x-5}$,

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

$\lim_{x\to 3} \frac{x^4-81}{x-3}$, $\lim_{x\to 6} \frac{x^2-36}{x-6}$, $\lim_{x\to 2} \frac{x^3-8}{x^2-4}$,

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

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

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

9. **Evaluate the following limits :**

$\lim_{x\to 0} \frac{\sin 3x}{5x}$, $\lim_{x\to 0} \frac{\sin 9x}{\sin 7x}$,

$\lim_{x\to 0} \frac{\tan mx}{\tan nx}$, $\lim_{x\to 0} \frac{3\sin 2x+2x}{3x+2\tan 3x}$,

$\lim_{x\to 0} \frac{3\sin x+2x\cos 5x}{15x-2\tan x}$

10. **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

MCQ

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)$\frac{4}{7}$

CRQ

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) **3 diamonds and 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 $P(A \cap B)$.**

11. **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**