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GEMS OUR OWN INDIAN SCHOOL
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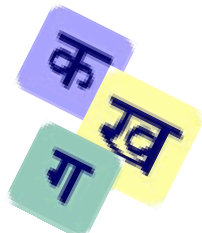


Worksheet Booklet

Name: _____

Grade: 11

Subject: Mathematics



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CHAPTER-1 SETS

Answer the following questions:

1. Write the following sets in the roster form
 - a. $H = \{x / x \text{ is a positive integer and } x^2 = x\}$
 - b. $G = \{x/x \in \mathbb{N}, x \text{ is a multiple of 5 and } x^2 < 400\}$
 - c. $D = \{x / x \text{ is a prime number and } 60 < x < 80\}$
 - d. $A = \{x / x \text{ is a two digit number, the sum of whose digits is 7}\}$
2. Using properties of sets prove that
 - i) $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$
 - ii) $A - (B - C) = (A - B) \cup (A \cap C)$
 - iii) $A \cap (B - C) = (A \cap B) - (A \cap C)$
 - iv) $A - (B \cap C) = (A - B) \cup (A - C)$
 - v) $A - (B \cup C) = (A - B) \cap (A - C)$
3. Write each of the following intervals in the set builder form
 $A = (0, 4], B = (-2, 3) \quad C = [8, 11]$
4. If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{1, 4, 5, 6\}$
Find a) $(A \cup B) - C$ b) $(A \cup B) \cap C$ c) $(A \cap C)$ d) $(B - C)$ e) $A \cap (B - C)$
f) $A - (B \cup C)$ g) $A - (B \cap C)$
5. If $U = \{a, b, c, d, e\}$, $A = \{a, b, c\}$, $B = \{b, c, d, e\}$ then verify that
 - a. $(A \cup B)' = A' \cap B'$
 - b. $(A \cap B)' = A' \cup B'$
6. If $U = \{a, e, i, o, u\}$, $A = \{a, e, i\}$, $B = \{e, o, u\}$ and $C = \{a, i, u\}$ then , verify that
 $A \cap (B - C) = (A \cap B) - (A \cap C)$
7. If A and B are two sets such that $n(A)=20$, $n(A \cup B)=42$ and $n(A \cap B)=4$. Find $n(A)$, $n(A-B)$ and $n(B-A)$.
8. Represent the following set in Venn diagram:- $A' \cap (B \cup C)$ 2) $B \cap (C - A)$
9. Write the power set of $\{\phi, \{\phi\}\}$
10. Let A, B, C be three sets. If $A \in B$ and $B \subset C$, is it true that $A \subset C$. If not, give an example.
11. Verify De Morgan's Laws .given, $U = \{a, b, c, d, e, f, g, h\}$, $A = \{a, b, c, d\}$ and $B = \{b, d, f, h\}$
12. In a joint family of 15 persons, 9 take tea, 8 take milk, and 2 take neither. How many members take both tea and milk?
13. A and B are two sets such that $n(A-B)=20+x$, $n(B-A) = 3x$, $n(A \cap B)=x+1$. Draw a Venn diagram to illustrate this information. If $n(A)=n(B)$, find the value of x .Also find $n(A \cup B)$.
14. Out of 500 T.V. owners investigated, 400 owned brand A and 200 owned brand B, 50 owned both brand A and brand B. Check whether this data is correct ?
15. using set algebra, find out the number of cards which are neither spade nor face cards from a deck of 52 cards.
16. Write the set $A = \{x/ 4x-5 < 29, x \in \mathbb{N}\}$ in the Roster form.

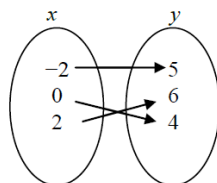
- 17 In a group of 52 persons, 16 drink tea but not coffee and 33 drink tea. Find
a). How many drink tea and coffee both b) How many drink coffee but not tea.
- 18 A survey shows that 73% of the Indians like apples, whereas 65% like oranges .What Percentage of Indians like both apples and oranges?
- 19 Out of 1020 boys in a school, 406 play cricket,324 play hockey and 250 play football. 80 boys play cricket and hockey;64 play hockey and football; 92 play football and cricket while 30 play all the three games. How many boys play none of the games?
- 20 In a town of 10,000 families it was found that40% families buy newspaper A, 20% families buy newspaper B, 10% families buy newspaper C, 5% families buy newspapers A and B, 3 % families buy newspapers B and C, 4% families buy newspapers C and A. If 2% families buy all the three newspapers, find the number of families which buy i) A only, ii) B only iii) none of them.
- 21 Let A and B be two sets such that $n(A)=18$, $n(A \cup B)=45$ and $n(A \cap B)=6$. Find
a). $n(B)$ b) $n(A-B)$ c) $n(B-A)$
- 22 In a class of 25 students, 12 have taken Mathematics, 8 have taken Mathematics but not Biology. Find the number of students who have taken both Mathematics and Biology and the number of those who have taken Biology but not Mathematics. Each student has taken either Mathematics or Biology or both.
23. In a group of 50 people, 30 like to play cricket, 25like to play football and 32 like to play hockey. Assume that each person in the group likes to play at least one of the three games. If 15 people Like to play both cricket and football, 11 like to play football and hockey and 18 like to play cricket and hockey. Find:
a) How many like to play all the three games?
b) How many like to play only football?
c) How many like to play only hockey?
d) How many like to play exactly one game?
24. In a survey of 100 students, the number of students studying the various languages were found to be: English only 18, English but not Hindi 23, English and Sanskrit 8, English 26, Sanskrit 48, Sanskrit and Hindi 8, no language 24. Find
i)How many students were studying Hindi?
ii)How many students were studying English and Hindi?
- 25 In a survey of 100 persons it was found that 28 read magazine A, 30 read magazine B, 42 read magazine C; 8 read magazine A and B; 10 read magazine A and C; 5 read magazine B and C and 3 read all the three. Find i) How many read none of the three magazines? ii) How many read magazine C only?
- 26 In an examination, question number 1 was attempted by67 students, question number 2 by 46 students and question number 3 by 40 students. 28 students attempted both 1 and 2; 8 attempted both 2 and 3; 26 attempted both 1 and 3 and 2 students attempted all the three questions. Find how many attempted question number 1 but not question 2 and 3.
- 27 In a group of 84 persons each plays at least one game out of three viz tennis, badminton and cricket. 28 of them play C, 40 plays T and 48 play B. If 6 play both C and B and 4 play T and B and no one plays all the three games. Find the no: of persons who play cricket but not tennis

CHAPTER-2 RELATIONS AND FUNCTIONS

Answer the following questions:

1. Determine if the relation is a function

1. $\{(3,4), (4,-6), (5,-7), (3,2), (-2,5)\}$ 2. $\{(-4,6), (-3,2), (1,0), (7,6), (8,2)\}$
 3. $\{(-3,4), (-2,5), (0,0), (-2,5), (4,8)\}$ 4.



2. If $A = \{2, 3\}$, $B = \{4, 5\}$, $C = \{5, 6\}$ Find (i) $A \times B$ (ii) $A \times (B \cup C)$ (iii) $A \times (B \cap C)$
 Find (i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
 (ii) $A \times (B - C) = (A \times B) - (A \times C)$
 3. Let $A = \{1, 2\}$ and $B = \{3, 4\}$. Write $A \times B$. How many subsets will $A \times B$ have? List them.
 4. Let $A = \{1, 2, 3, \dots, 14\}$. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$. Write down its domain, co-domain and range.
 5. Let R be a relation from Q to Q defined by $R = \{(a, b) : a, b \in Q \text{ and } a - b \in Z\}$. Show that (a) $(a, a) \in R$ for all $a \in Q$ (b) $(a, b) \in R$ implies that $(b, a) \in R$ (c) $(a, b) \in R$ and $(b, c) \in R$ implies that $(a, c) \in R$.

6. Find the domain of the function $f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$

7. Write the domain of the function, $f(x) = \frac{x^2 - 2x + 3}{x^2 - x - 20}$

8. Find the domain and the range of the real function f defined by $f(x) = |x - 1|$.

9. Let $A = \{1, 2, 6, 8\}$ and let R be a relation on A defined by $\{(a, b) : a, b \in A, b \text{ is exactly divisible by } a\}$.
 a) Write R in roster form. b) Find the domain of R . c) Find the range of R .

10. If f and g are two functions such that $f(x) = 5x + 2$ and $g(x) = x^2 + 3$, then find $f + g$ and $f - g$.

11. If $f(x) = x^2 - \frac{1}{x^2}$, then find the value of: $f(x) + f\left(\frac{1}{x}\right)$.

12. Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real functions find (i) $(f + g)(x)$ (ii) $(f - g)(x)$ (iii) $(f \cdot g)(x)$ (iv) $\frac{f}{g}$

13. Let a function f be defined by $f(x) = \frac{x}{x^2 + 1}$, $x \in R$

Find (i) $f\left(\frac{1}{x}\right)$ $x \neq 0$ (ii) $f(2x)$ (iii) $f(x - 1)$

14. If a real function f is defined by $f(x) = (|x| - x) / 2x$, find its range.

CHAPTER-3 TRIGONOMETRIC FUNCTIONS

Answer the following questions:

1. Prove that $\frac{\operatorname{Cosec}(90 + \theta) + \operatorname{Cot}(450 + \theta)}{\operatorname{Cosec}(90 - \theta) + \tan(180 - \theta)} + \frac{\tan(180 + \theta) + \operatorname{Sec}(180 - \theta)}{\tan(360 + \theta) - \operatorname{Sec}(-\theta)} = 2$
2. If $\sec x = -2$ and $\pi < x < \frac{3\pi}{2}$. Find the values of all the other five Trigonometric ratios.
3. If $\tan \theta = \frac{3}{4}$ and $\frac{\pi}{2} < \theta < \pi$ find the values of all other five trigonometric functions.
4. If $\sin x = -\cos x$, $0 < x < 2\pi$ find the possible values of x
5. In a right angle triangle the difference between the two acute angles is $(\frac{\pi}{15})$. Find the angles in degrees
6.
 - a) P.T. $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$
 - b) P.T. $\tan^2 \frac{\pi}{3} + 2 \cos^2 \frac{\pi}{4} + 3 \sec^2 \frac{\pi}{6} + 4 \cos^2 \frac{\pi}{4} = 8$
 - c) P.T. $\cos \frac{\pi}{6} \sin \frac{\pi}{3} + \sin \frac{\pi}{4} \cos \frac{\pi}{4} + \sin \frac{\pi}{6} \cos 0 = \frac{7}{4}$
 - d) P.T. $4 \sin \frac{\pi}{6} \sin^2 \frac{\pi}{3} + 3 \cos \frac{\pi}{3} \tan \frac{\pi}{4} + \operatorname{cosec}^2 \frac{\pi}{2} = 4$
7. Find the values of a) $\tan(-3\pi/4)$ b) $\cos(-5\pi/6)$ c) $\cot(3\pi/4)$ d) $\sec(5\pi/3)$
8. Prove that $\cos^2 A + \cos^2(A+120^\circ) + \cos^2(A-120^\circ) = 3/2$
9. Prove that:
 - (a) $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan \theta$
 - (b) $\frac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$
 - c) $\left(\frac{\cos x}{1 - \sin x} \right) = \tan \left(\frac{\pi}{4} + \frac{x}{2} \right)$
 - (d) $\tan \left(\frac{\pi}{4} + A \right) = \frac{1 + \tan A}{1 - \tan A}$

$$(e) \frac{1 + \sin \theta - \cos \theta}{1 + \sin \theta + \cos \theta} = \tan \frac{\theta}{2} \quad f) \frac{1 + \sin \theta}{\cos \theta} + \frac{\cos \theta}{1 + \sin \theta} = 2 \sec \theta$$

$$(g) \frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \tan 54^\circ \quad (h) \frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$$

$$(i) \cos 20^\circ \cos 100^\circ + \cos 100^\circ \cos 140^\circ - \cos 140^\circ \cos 200^\circ = -\frac{3}{4}$$

$$j) \sin A + \sin 2A + \sin 4A + \sin 5A = 4 \cos \frac{A}{2} \cos \frac{3A}{2} \sin 3A$$

$$(k) \sqrt{2 + \sqrt{2 + 2 \cos 4\theta}} = 2 \cos \theta$$

$$(l) \text{ If } \tan A = \frac{x}{x-1}, \tan B = \frac{1}{2x-1}, \text{ prove that } A - B = \frac{\pi}{4}$$

$$(m) \frac{1 + \sin 2\theta + \cos 2\theta}{1 + \sin 2\theta - \cos 2\theta} = \cot \theta$$

$$\frac{\sqrt{1 + \sin x} + \sqrt{1 - \sin x}}{\sqrt{1 + \sin x} - \sqrt{1 - \sin x}} = \cot(x/2)$$

10

$$i) \text{ If } \sin x = \frac{3}{5}, \cos y = -\frac{12}{13}, \text{ where } x \text{ and } y \text{ both lie in II quadrant, find the value of } \sin(x + y).$$

$$ii) \text{ If } \sin A = 3/5, \text{ where } A \text{ lies in the first quadrant, find the values of } \sin 2A, \cos 2A \text{ and } \tan 2A \text{ and } \sin 4A$$

11 **Prove that:**

$$\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$$

$$\tan 12x - \tan 5x - \tan 7x = \tan 12x \cdot \tan 7x \cdot \tan 5x$$

$$\text{Prove that } \frac{\sin(x+y)}{\sin(x-y)} = \frac{\tan x + \tan y}{\tan x - \tan y}$$

$$\text{Prove that } \frac{\cos 9^\circ - \sin 9^\circ}{\cos 9^\circ + \sin 9^\circ} = \tan 36^\circ$$

$$\tan 56^\circ = \frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$$

$$\sin^2 6x - \sin^2 4x = \sin 2x \cdot \sin 10x.$$

$$\sin (40 + \theta) \cdot \cos (10 + \theta) - \cos (40 + \theta) \cdot \sin (10 + \theta) = \frac{1}{2}$$

$$\text{If } \sin \alpha + \sin \beta = a \text{ and } \cos \alpha + \cos \beta = b \text{ show that } \cos (\alpha + \beta) = \frac{b^2 - a^2}{b^2 + a^2}$$

12 Prove that

(a) If $\tan x = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$, Find the value of $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$.

(b) $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$

(c) $\cos \frac{\pi}{12} - \sin \frac{\pi}{12} = \frac{1}{\sqrt{2}}$

13 If $\tan A = \frac{x}{x-1}$, $\tan B = \frac{1}{2x-1}$, prove that $A - B = \frac{\pi}{4}$

14 Solve.

a) $\sin 2x + \sin 4x + \sin 6x = 0$

b) $\cos x - \cos 2x + \cos 3x = 0$

c) $2 \tan x - \cot x = -1$

d) $\sin 3x + \sin x + \sin 5x = 0$

(e) $\sec^2 2x = 1 - \tan 2x$.

15 In a ΔABC , Prove that

a) $b^2 \sin 2C + c^2 \sin 2B = 2bc \sin A$

b) $(b \cos C - c \cos B) = b^2 - c^2$

c) $\frac{\sin(B-C)}{\sin(B+C)} = \frac{b^2 - c^2}{a^2}$

d) $(a^2 - b^2 + c^2) \tan B = (a^2 + b^2 - c^2) \tan C$

16 In ΔABC , if $\cos A = \frac{\sin B}{2 \sin C}$, Show that the triangle is isosceles.

17 a) If $\sin \theta = 1/3$ and θ lies in the II quadrant, find the value of $\cos \theta$

b) If $\tan \theta = 5$ and θ lies in the III quadrant, find the value of $\sec \theta$.

c) If $\cos \theta = -1/2$ and θ lies in the III quadrant, find the value of $\sin \theta$

d) If $\cot x = -5/12$, and x lies in the II quadrant, find the value of the other trigonometric functions.

e) If $\sec \theta = 13/5$, and θ lies in the IV quadrant, find the value of the other trigonometric functions.

f) If $\tan x = 4/3$, and x lies in the III quadrant, find the value other trigonometric functions.

18 Evaluate the following

a) $\sin 120^\circ$

b) $\cos 315^\circ$

c) $\tan 240^\circ$

d) $\sin 765^\circ$

e) $\tan(-480^\circ)$

f) $\operatorname{cosec}(-1410^\circ)$

g) $\sec(-60^\circ)$

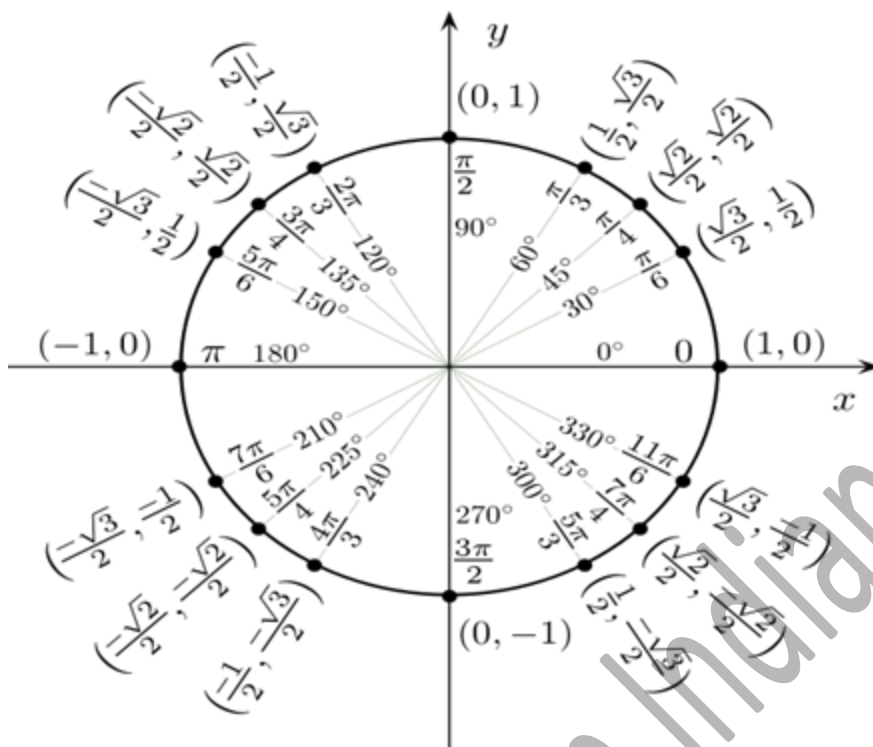
h) $\sin 225^\circ$

i) $\sin \frac{31\pi}{3}$

j) $\sin(-\frac{11\pi}{3})$

k) $\tan(-\frac{15\pi}{4})$

l) $\operatorname{Cosec} \frac{11\pi}{4}$



Apply reflex angle to find x so that $0 \leq x \leq 2\pi$

		QUADRANT IN WHICH THE ANGLE LIES	Reflex angle	x
1.	$\sin x = \frac{1}{2}$	II QUADRANT		
2.	$\tan x = -1$	III QUADRANT		
3.	$\cos x = 1/\sqrt{2}$	IV QUADRANT		
4.	$\operatorname{Cosec} x = 2/\sqrt{3}$	II QUADRANT		
5.	$\sec x = -2$	III QUADRANT		
6.	$\sin x = -1/2$	IV QUADRANT		
7.	$\tan x = -\sqrt{3}$	IV QUADRANT		
8.	$\cos x = -\sqrt{3}/2$	II QUADRANT		
9.	$\sin x = -1/2$	III QUADRANT		
10.	$\tan x = -\sqrt{3}$	IV QUADRANT		

CHAPTER-4 PRINCIPLE OF MATHEMATICAL INDUCTION

Answer the following Questions:

1. Suppose $P(n)$: $n(n+1)(n+2)$ is divisible by 6. Show that $P(1)$, $P(2)$ and $P(3)$ are true.
2. Let $P(n)$ be the statement $n(n+1)$ is an even number then find $P(6)$.
3. Prove the following by using the principle of mathematical induction for all $n \in \mathbb{N}$:

$$1 + \frac{1}{(1+2)} + \frac{1}{(1+2+3)} + \dots + \frac{1}{(1+2+3+\dots+n)} = \frac{2n}{(n+1)}$$
4. Prove by using the principle of mathematical induction $3^{2n+2} - 8n - 9$ is divisible by 8 for $n \in \mathbb{N}$.
5. Prove the following by using the principle of mathematical induction for all $n \in \mathbb{N}$:

$$1 + 3 + 3^2 + \dots + 3^{n-1} = \frac{(3^n - 1)}{2}$$
6. Prove the following by using the principle of mathematical induction for all $n \in \mathbb{N}$.
 $(2n+7) < (n+3)^2$
7. Use the principle of mathematical induction to prove that
 $1+5+9+13+\dots+(4n-3) = n(2n-1), n \in \mathbb{N}$
8. Prove that : $2 \cdot 7^n + 3 \cdot 5^n - 5$ is divisible by 24 for all $n \in \mathbb{N}$.
9. Prove the following by using the principle of mathematical induction for all $n \in \mathbb{N}$:

$$\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right)\dots\left(1 + \frac{(2n+1)}{n^2}\right) = (n+1)^2$$
10. Prove by using the principle of mathematical induction $3^n < 4^n$ for all $n \in \mathbb{N}$.
11. For every positive integer n , prove that $7^n - 3^n$ is divisible by
12. Prove by using the principle of mathematical induction for $n \in \mathbb{N}$: $(2n+7) < (n+3)^2$
13. Prove the following by using the principle of mathematical induction for all $n \in \mathbb{N}$:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots + \frac{1}{2^n} = 1 - \frac{1}{2^n}$$
14. Prove using P.M.I., $10^n + 3 \cdot 4^{n+2} + 5$ is divisible by 9, $n \in \mathbb{N}$.
15. Prove using P.M.I. 5^{2n} when divided by 24 leaves remainder 1.

Show that the following statements are true using the Principle of Mathematical Induction

- a) $n(n^2+5)$ is divisible by 6
- b) $\left(1 - \frac{1}{2^2}\right)\left(1 - \frac{1}{3^2}\right)\left(1 - \frac{1}{4^2}\right)\dots\left(1 - \frac{1}{n^2}\right) = \frac{(n+1)}{2n}$
- c) $a+(a+d)+(a+2d)+\dots+(a+(n-1)d) = n/2(2a+(n-1)d)$

CHAPTER-5 COMPLEX NUMBERS AND QUADRATIC EQUATIONS

1. Find the real values of x and y, if

(i) $(x + y)(2 - 3i) = 4 + i$

(ii) $\frac{(1 + i)x - 2i}{3 + i} + \frac{(2 - 3i)y + i}{3 - i} = i$

(iii) $(x - iy)(3 + 5i)$ is the conjugate of $6 + 24i$.

- 2 Find the conjugate the following:-

$\frac{1}{3 + 4i}$

(ii) $7 + 5i$

(iii) $\frac{1}{(2 - 5i)^2}$

(iv) $\frac{(3 - 2i)(2 + 3i)}{(1 + 2i)(2 - i)}$

- 3 Find the modulus and arguments of each of the following and represent it in the argand plane (i) $z = -1 - i\sqrt{3}$ (ii) $z = -\sqrt{3}$

+ i (iii) $1 - i$ (iv) $\frac{1 + 2i}{1 - 2i}$

- 4 Express the following complex number in form $a + ib$

$\left(\frac{1}{3} + 3i\right)^3$ (ii) $(1 - i)^4$ (iii) $\frac{6 + 3i}{2 - i}$

$\left(\frac{1}{3} + \frac{7}{3}i\right) + \left(4 + \frac{1}{3}i\right) - \left(\frac{-4}{3} + i\right)$ (iv) $i^{26} + i^5$

- 5 Express $i^9 + i^{10} + i^{11} + i^{12}$ in the form $a + bi$.

- 6 Express the given complex number in the form $a + ib$: $(1 - i)^4$.

7. If $z = x + iy$ and $w = \frac{1 - iz}{z - i}$, show that $|w| = 1 \Rightarrow z$ purely real.

8. Show that the images of the complex numbers $3 + 2i$, $5i$, $-3 + 2i$ and $-i$ form a square.

- 9 Solve each of the following equations:-

(i) $\sqrt{3}x^2 - \sqrt{2}x + 2\sqrt{3} = 0$ (iv) $x^2 - \sqrt{2}xi + 12 = 0$

(ii) $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$ (v) $3x^2 - 7xi + 6 = 0$

(iii) $3x^2 - 4x + \frac{20}{3} = 0$

- 10

If $x - iy = \sqrt{\frac{a - ib}{c - id}}$, then prove that $(x^2 + y^2)^2 = \frac{a^2 + b^2}{c^2 + d^2}$.

- 11 Find the square root of the following complex numbers:

a) $5 - 12i$ b) $8 - 15i$

- 12 If the roots of the equation $x^2 + px + q = 0$ differ from the roots $x^2 + px + p = 0$ by the same quantity, then find the value of $p + q$

CHAPTER-6 LINEAR INEQUALITIES

Answer the following questions:

1. Solve :- $-4x > 30$ when (i) $x \in \mathbb{R}$ (ii) $x \in \mathbb{Z}$ (iii) $x \in \mathbb{N}$
 Solve : $4x - 2 < 8$, when :- (i) $x \in \mathbb{R}$ (ii) $x \in \mathbb{Z}$ (iii) $x \in \mathbb{N}$
2. Solve $4x - 7 > 5x - 2$ when (i) x is a natural number (ii) x is an integer (iii) x is a real number.
3. Solve the following linear inequations, show the solution on number line:-
 (i) $\frac{2x-3}{4} + 9 \geq 3 + \frac{4x}{3}$ (v) $3x + 17 \leq 2(1 - x)$
 (ii) $\frac{3(x-2)}{5} \geq \frac{5(2-x)}{3}$ (vi) $\frac{2x+4}{x-1} \geq 5$ (iii) $\frac{x+3}{x-2} \leq 2$
 (iv) $\frac{5x-2}{3} - \frac{7x-3}{5} > x/4$
4. Solve graphically :-
 (i) $3x + 4y > 12, y > 1, x > 0$ (ii) $x - 2y > 0, 2x - y < -2, x > 0, y > 0$
 (iii) $2x + y < 24, x + y < 11, 2x + 5y < 40, x > 0, y > 0$
5. Solve the following system of inequalities graphically: $x + 2y \leq 10, x + y \geq 1, x - y \leq 0, x \geq 0, y \geq 0$.
6. Solve the following system of inequalities graphically: $4x + 3y \leq 60, y \geq 2x, x \geq 3, x, y \geq 0$.
7. Solve the following system of inequalities graphically: $x + y \geq 4, 2x - y > 0$.
8. Solve the following Problems graphically:
 Minimise $Z = -3x + 4y$
 subject to $x + 2y \leq 8, 3x + 2y \leq 12, x \geq 0, y \geq 0$.
 Maximise $Z = 5x + 3y$
 subject to $3x + 5y \leq 15, 5x + 2y \leq 10, x \geq 0, y \geq 0$.
 Minimise $Z = 3x + 5y$
 such that $x + 3y \geq 3, x + y \geq 2, x, y \geq 0$.
 Maximise $Z = 3x + 2y$
 subject to $x + 2y \leq 10, 3x + y \leq 15, x, y \geq 0$.
 Minimise $Z = x + 2y$
 subject to $2x + y \geq 3, x + 2y \geq 6, x, y \geq 0$.
9. Determine graphically the minimum value of the objective function
 $Z = -50x + 20y$
 subject to the constraints:
 $2x - y \geq -5$
 $3x + y \geq 3$
 $2x - 3y \leq 12$
 $x \geq 0, y \geq 0$
10. Solve the system of inequalities : $3x - 7 < 5 + x$ and $11 - 5x \leq 1$ and represent the solution on the number line.

CHAPTER-7 PERMUTATIONS AND COMBINATIONS

Answer the following questions:

1. How many 3-digit number can be formed without using digits 1, 2, 3, 9, 5 if repetition of digits is not allowed?
2. Find n if $9P_5 + 5 \times 9P_4 = 10P_n$
3. How many numbers can be formed from the digits 2, 4, 6, 9 if repetition of digits is not allowed?
4. Evaluate n , if $P(15, n-1) : P(16, n-2) = 3:4$
5. Eight Children are to be seated on a bench
 - (i) In how many ways can the children be seated?
 - (ii) How many arrangements are possible if the youngest child sits at the left hand end of the bench?
6. From 30 teachers in school, 1 Principal & 1 Vice Principal are to be appointed. In how many ways can this be done?
7. Find total number of ways of answering 5 objectives type questions each questions having 4 choices.
8. How many numbers are there between 100 and 1000 such that 5 is in the unit place?
9. A gentleman has 6 friends to invite. In how many ways can he send invitation cards to them if he has 3 servants to carry the cards?
10. 3 married couples are to be seated in a row having 6 seats in a cinema hall. If spouses are to be seated next to each other, in how many ways can they be seated? Find also number of ways of their seating if all the ladies together.
11. How many different words can be formed with the letters of the word HARYANA? How many of these (i) Have H & N together? (ii) Begin with H and end with N? (iii) Have three vowels together?
12. How many numbers are there between 100 and 1000 such that every digit is either 2 or 9?
13. If $8C_r - 7C_3 = 7C_2$, find the value of r .
14. A committee of 5 is to be selected from among 6 boys and 5 girls. Determine the no. of ways of selecting the committee if it is to consist of at least one boy and one girl.
15. How many different words, each containing 2 vowels and 3 consonants can be formed with 5 vowels and 17 consonants.
16. In a meeting after everyone had shaken hands with everyone else, it was found that 66 handshakes were exchanged. How many members were present at the meeting?

17. If a polygon has 44 diagonals, then what is the number of its sides?
18. If ${}^{16}C_r = {}^{16}C_{r+2}$, find rC_4 .
19. If $nPr = nPr+1$ and $nCr = nCr-1$, find the values of n and r .
20. In an examination, a question paper consists of 12 questions divided into parts, i.e. Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting at least 3 from each part. In how many ways can a student select the questions?
21. How many 4-digit numbers are there with no digit repeated?
22. 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 at least one boy and one girl?
23. How many 3-digit even numbers can be made using the digits 1, 2, 3, 4, 5, 6, if no digit is repeated?
24. What is number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (i) four cards are of the same suits, (ii) are face cards.
25. How many words with or without meaning each of 3 vowels and 2 consonants can be formed from the letters of the word INVOLUTE?
26. Eighteen guests have to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on the other on side. Determine the number of ways in which the sitting arrangement can be made.
27. In how many of the distinct permutations of the letters in MISSISSIPPI do the four 1's not come together?
28. Find the number of different 8-letters arrangements that can be made from the letters of the word DAUGHTER so that (i) all vowels occur together, (ii) all vowels do not occur together.
29. If $nC_2 - nC_1 = 35$, then find the value of n .
30. In a class there are 27 boys and 15 girls. The teacher wants to select a boys and a girl for the monitor ship of the class. In how many ways can the teacher make this selection?
31. A person has got 15 acquaintances of whom 10 are relatives. In how many ways he may invite 9 guests so that 7 of them would be relatives?
32. A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women?
33. A box contains 7 red 6 white and 4 blue balls. How many selection of three balls can be made so that all three are red balls?

CHAPTER-8 BINOMIAL THEOREM

Answer the Following Questions:

1. 1. Using binomial theorem, write down the expansion of the following:-

(i) $\left(x + 1 - \frac{1}{x}\right)^3$ (ii) $(\sqrt[3]{x} - \sqrt[3]{a})^6$ (iii) $(2x + 3y)^4$

2. 2. Evaluate the following :-

(i) $(\sqrt{3} + 1)^5 - (\sqrt{3} - 1)^5$ (ii) $(3 + \sqrt{2})^4 + (3 - \sqrt{2})^4$ (iii) $(.99)^3 + (1.01)^3$

3. Find the middle term / terms in the expansion of :-

(i) $\left(2x - \frac{3}{2x}\right)^{20}$ (ii) $\left(x^4 - \frac{1}{x^3}\right)^{11}$

4. Find the term independent of x in the expansion of :-

(i) $\left(2x - \frac{1}{x^2}\right)^{10}$ (ii) $\left(3x^2 - \frac{1}{2x}\right)^9$

5. Find the value of a so that the term independent of x in $\left(\sqrt{x} + \frac{a}{x^3}\right)^{10}$ is 405.

6. The 3rd, 4th and 5th terms in the expansion of $(x + a)^n$ are respectively 84, 280 and 560, find the values of x, a and n.

7. If the coefficient of $(2r + 4)^{\text{th}}$ and $(r - 2)^{\text{th}}$ terms in the expansion of $(1 + x)^{18}$ are equal, find r.

8. The coefficients of three consecutive terms in the expansion of $(1 + x)^n$ be 76, 95 and 76, find n.

9. The sum of first two terms of a G.P. is $-1/64$ and the sum of first three terms is $6/34$. What is the 7th term?

10. Find the coefficient of a^4 in the product $(1+2a)^4 \cdot (2-a)^5$, using binomial theorem.

11. If the coefficients of T_r , T_{r+1} , T_{r+2} terms of $(1 + x)^{14}$ are in arithmetic progression, then find the value of r.

12. If the coefficients of 7th and 13th terms in the expansion of $(1 + x)^n$ are equal then find the value of n.

13. Using binomial theorem, prove that $2^{3n} - 7n - 1$ is divisible by 49, where $n \in \mathbb{N}$.

14. Using binomial theorem, prove that $3^{2n+2} - 8n - 9$ is divisible by 64, for all natural numbers.

CHAPTER-9 SEQUENCES AND SERIES

Answer the following questions:

1. The first term of a G.P. is 1. The sum of third and fifth terms is 90. Find the common ratio of the G.P.
2. The product of three numbers in G.P. is 216, but sum of their product in pairs is 156. Find the numbers.
3. Find the sum of 32 terms of an A.P. whose third term is 1 and the 6th term is 11.
4. How many terms are there in an A.P. whose first and fifth term are -14 and 2 respectively and the sum of terms is 40?
5. Find the sum of n terms of:-
 - (i) $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots$
 - (ii) $\frac{1}{2.4} + \frac{1}{4.6} + \frac{1}{6.8} + \dots$
6. Find the sum of 50 terms of the sequence:- $.7 + .77 + .777 + .7777 + \dots$
7. The sum of first three terms of a G.P. is to the sum of the first six terms is 125:152. Find the common ratio of the G.P.
8.
$$\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$$
 Find the value of n so that $\frac{a^n + b^n}{a^n + b^n}$ may be the geometric mean between a and b.
9. If the pth, qth and rth terms of a G.P. are a, b and c, respectively. Prove that a^{q-r}, b^{r-p} and $c^{p-q} = 1$.
10. If the fourth term of a G.P. is 3. Find the product of first 7 terms.
11. The ratio of the sum of m and n terms of an A.P is $m^2 : n^2$. Show that the ratio of mth term and nth term is $(2m - 1) : (2n - 1)$.
12. If 4th, 10th and 16th terms of a GP are x, y and z, respectively. Prove that x, y and z are in GP.
13. If 'a' and 'b' are the roots of $x^2 - 3x + p = 0$ and c and d are the roots of $x^2 - 12x + q = 0$ where a, b, c and d form a G.P, prove that $(q+p):(q-p) = 17:15$.

CHAPTER-10 STRAIGHT LINES

Answer the following questions:

1. Find the value of K such that the line joining the points (2, K) and (-1, 3) is parallel to the line joining (0, 1) and (-3, 1).
2. Show that points (a, b + c), (b, c + a), (c, a + b) are collinear.
3. Prove that the lines $7x - 2y + 5 = 0$ and $14x - 4y - 8 = 0$ are parallel to each other and find the distance between them.
4. Prove that the lines $3x - 2y + 5 = 0$ and $4x + 6y - 23 = 0$ are perpendicular.
5. Determine x so that 2 is the slope of the line through points (2,5) and (x,3).
6. If the Points (h, 0), (a, b), (0, k) lie on a line Show that $\frac{a}{h} + \frac{b}{k} = 1$
7. A line through $(\frac{22}{9}, 3)$ and (4, k) intersects the line $7x - 9y - 19 = 0$ at right angles. Find the value of k.
8. Find out the angle between the following pair of lines
 - a) $y - \sqrt{3}x - 5 = 0$ and $\sqrt{3}y - x + 6 = 0$
 - b) $y = (2 - \sqrt{3})x + 5$ and $y = (2 + \sqrt{3})x - 2$
9. The line through the points (-2,6) & (4,8) is perpendicular to the line through the points (8,12) & (x,24) find x
10. Find the equation of a line parallel to $2x + 3y + 11 = 0$ and the sum of its intercepts on the axis is 15.
11. Find equation of line passing through intersection of lines $x + y + 3 = 0$ & $x - y + 2 = 0$ and having y - intercept equal to 4.
12. Prove that the perpendicular drawn from the point (4, 1) on the join of (2, -1) and (6, 5) divides it in the ratio 5:13.
13. Prove that the points (1, 3), (3, 5) and (5, 7) are collinear. Also find the equation of the line.
14. Transform the equation of the line $x + y + 4 = 0$ to (i) slope intercept form and find its slope and y intercept (ii) intercept form and find intercepts on the coordinate axes (iii) normal form and find the inclination of the perpendicular segment from the origin on the line with x-axis and also find its length.
15. Find equation of line passing through intersection of lines $x + y + 3 = 0$ & $x - y + 2 = 0$ and having y - intercept equal to 4.
16. The vertices of a triangle are A (-2, 1), B (6, -2) and C (4, 3). Find the lengths of the altitudes of the triangle.
17. Find the equation of the line joining the points (3, -1) and (2, 3). Also find equation of line perpendicular to this line and passing through point (5, 2).
18. The vertices of ΔPQR are P (2, 1), Q (-2, 3) and R (4, 5). Find equation of the median through the vertex R.

- 19 Find the value of p so that the three lines $3x + y - 2 = 0$, $px + 2y - 3 = 0$ and $2x - y - 3 = 0$ may intersect at one point.
- 20 Find the distance of the point $A(2, 3)$ from the line $2x - 3y + 9 = 0$ measure along a line making an angle of 45° with X .
- 21 Find the equation of line making an angle $\tan^{-1}3$ with the x -axis and cuts off an intercept of 4 units on $-ve$ direction of y axis.
- 22 Find the equation of lines which pass through the origin and trisect the portion of the straight line $3x+y=12$ which is intercepted between the axes
- 23 Find the new co-ordinates of the point in each of the following cases if the origin is shifted to the point $(-1, -2)$ by translation of axes.
 a) $(2,3)$
 b) $(-5, -4)$
 c) $(-1, 4)$
- 24 Find the equation of the straight line which makes an angle of 60° with the x - axis and cuts of an intercept -2 from the y - axis.
- 25 Find the equation of the lines which pass through the point $(4,5)$ and make equal angles with the lines $5x-12y+6=0$ and $3x=4y+7$
- 26 The points $(1, 3)$ and $(5,1)$ are the opposite vertices of a rectangle. The other two vertices lie along the line $y=2x+c$. Find c and the other two vertices.
- 27 Find the image of the point $(1, -2)$ on the line $y = 2x + 1$. A ray of light is sent along the line $x - 2y - 3 = 0$. Upon reaching the line $3x - 2y - 5 = 0$ the ray is reflected from it. Find the equation of the line containing the reflected ray.
- 28 One side of a rectangle lie along the line $4x + 7y + 5 = 0$. Two of its vertices are $(-3,1)$ and $(1,1)$. Find the equation of the diagonals of the rectangle.
- 29 If the p & q are the lengths of perpendicular from the origin to the lines $x\cos\alpha - y\sin\alpha = k\cos 2\alpha$ and $x\sec\alpha + y\csc\alpha = k$ respectively. Prove that $p^2 + 4q^2 = k^2$
- 30 Find the equation of a line which passes through the point $(-2,3)$ and perpendicular to the line $5x-3y = a^2$
- 31 The line through $(4, 3)$ & $(-6,0)$ intersects the line $5x+y=0$. Find the angle of intersections.
- 32 Find the equation of a line which makes an angle of $\tan^{-1}3$ with the x -axis and cuts off an intercept of 4 units on $-ve$ direction of y axis
- 33 A line forms a triangle of area $54\sqrt{3}$ square units with the coordinate axes. Find its equation if the perpendicular drawn from the origin to the line makes an angle of 60° with the x -axis.
- 34 Two vertices of a triangle are $(0,1)$ and $(1,-2)$. If the ortho-centre is at $(-7,-6)$ find the third vertex.
- 35 Find the equation of the line perpendicular to $3x-2y+11=0$ and is such that the sum of the intercepts of the axes is 15.

CHAPTER-11 CONIC SECTIONS

Answer the following questions:

1. The orbit of Venus is nearly circular. An astronomer develops a model for the orbit in which the Sun has coordinates $(-5, 20)$, the circular orbit of Venus passes through $(62, 20)$, and each unit of the coordinate plane represents 1 million miles.
 - a. Write an equation for the orbit of Venus.
 - b. How far is Venus from the Sun?
 - c. How far does Venus travel as it makes one complete orbit of the Sun?
2. **Entertainment** A radio station emits a signal that can be received by anyone within 120 miles of the station's transmitter. Write and graph an inequality for the region covered by the radio station with the transmitter located at $(0, 0)$.
3. The lines $y = -3x + 1$ and $y = 2x - 9$ each contain diameters of a particular circle. The point $(9, 19)$ is on the circle.
 - a. Find the center of the circle.
 - b. Write the equation of the circle.
4. A beam is supported at its ends by supports which are 12 metres apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected b

5. Engineers are constructing a parabolic microphone for use at sporting events. The surface of the parabolic microphone will reflect sounds to the focus of the microphone at the end of a part called a feedhorn. The equation for the cross section of the parabolic microphone dish is $x = \frac{1}{32}y^2$, measured in inches. How long should the engineers make the feedhorn?



6. **Communications** The equation for the cross section of a parabolic satellite TV dish is $y = \frac{1}{38}x^2$, measured in inches. How far is the focus from the vertex of the cross section?

- 7 The figure shows the elliptical orbit of Mars, where each unit of the coordinate plane represents 1 million kilometers. As shown, the planet's maximum distance from the Sun is 249 million kilometers and its minimum distance from the Sun is 207 million kilometers.

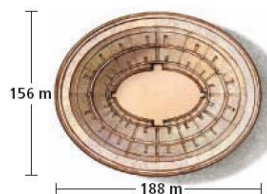


- The Sun is at one focus of the ellipse. What are the coordinates of the Sun?
- What is the length of the minor axis of the ellipse?
- Write an equation that models the orbit of Mars.

- 8 **Astronomy** The path that the Moon travels around Earth is an ellipse with Earth at one focus. The length of the major axis is about 477,700 mi, and the length of the minor axis is about 476,980 mi.

- Write an equation for the Moon's orbit.
- Find the minimum and maximum distances from Earth to the Moon.

- 9 **History** The Roman Colosseum is shaped like a large ellipse, with an external width of 188 m and a length of 156 m. Write an equation that can be used to model the shape of the Colosseum.



- 10 Engineers have designed a tunnel with the equation $\frac{x^2}{64} + \frac{y^2}{36} = 1$, measured in feet. A design for a larger tunnel needs to be twice as wide and 3 times as tall.

- Find the dimensions for the larger tunnel.
- Write an equation for the design of the larger tunnel.

- 11 A man running a racecourse notes that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m. Find the equation of the posts traced by the man.

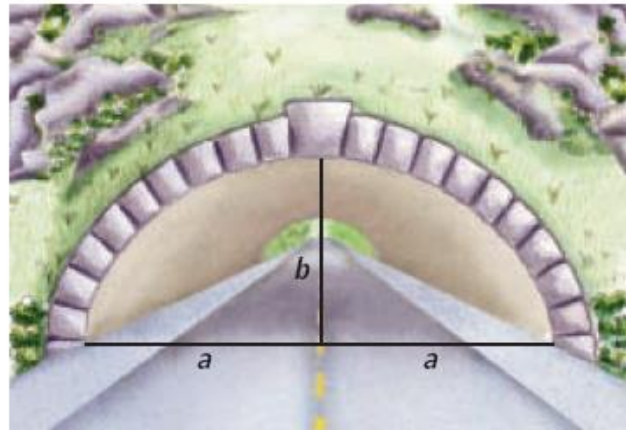
- 12 **Architecture** As a result of their unique elliptical shapes, whispering galleries enable the smallest sound generated at one focus to be carried across the room to the other focus. The whispering gallery at the Chicago Museum of Science and Industry is 47 ft 4 in. long and 13 ft 6 in. wide.



- Supposing that the center of the floor of the whispering gallery is located at the origin, write an equation for the gallery floor.
- Find the coordinates of the foci. How far apart are they?

13 **Engineering Application**

A road passes through a tunnel in the form of a semi-ellipse. In order to widen the road to accommodate more traffic, engineers must design a larger tunnel that is twice as wide and 1.5 times as tall as the original tunnel. The design for the original tunnel can be modeled by the equation $\frac{x^2}{100} + \frac{y^2}{64} = 1$, measured in feet.



- 14 A man running a racecourse notes that the sum of the distances from the two flag posts from him is always 10 m and the distance between the flag posts is 8 m. Find the equation of the posts traced by the man. eam is in the shape of a parabola. How far from the centre is the deflection 1 cm?
- 15 A comet's path as it approaches the Sun is modeled by one branch of the hyperbola $\frac{y^2}{900} - \frac{x^2}{44,896} = 1$, where the Sun is at the corresponding focus. Each unit of the coordinate plane represents 1 million miles.
- Find the coordinates of the Sun, assuming that it is at the focus with nonnegative coordinates.
 - How close does the comet come to the Sun?
 - When the comet is far from the Sun, the comet's path can be modeled by the hyperbola's asymptotes. Write the equations of the asymptotes.
- 16 A rod of length 12 cm moves with its ends always touching the coordinate axes. Determine the equation of the locus of a point P on the rod, which is 3 cm from the end in contact with the x-axis

CHAPTER-12 INTRODUCTION TO THREE DIMENSIONSL GEOMETRY

Answer the following questions:

- 1 A point P is at a distance of 6 units from the origin on the Z axis. Write the coordinates of P.
- 2 Name the octants in which the following points lie: (2, 3, 4), (1, -2, 6).
- 3 Find the distance between the points P(1, 0, 4) and Q (-4, 1, 0).
- 4 Given that P (3, 2, -4), Q (5, 4, -6) and R (9, 8, -10) are collinear. Find the ratio in which Q divides PR.
- 5 Find the ratio in which the line joining the points (2, 4, 16) and (3, 5, -4) is divided by the plane $2x - 3y + z + 6 = 0$. Also find the co-ordinates of the point of division.
- 6 Find the ratio in which the line segment joining the points (2, 4, 5) and (3, 5, -4) is divided by the YZ plane. Also find the co-ordinate of the point of division.
- 7 The x co-ordinate of a point is 9. Find its other co-ordinates if this point lies on the line joining the points (7, 2, 1) and (10, 5, 7)
- 8 Show that the points (-1, -6, 10), (1, -3, 4), (-5, -1, 1) and (-7, -4, 7) are the vertices of a rhombus.
- 9 A point P (x, y, z) is such that $3PA = 2PB$, when A and B are the points (1, 3, 4) and (1, -2, -1) respectively.
Find the equation to the locus of the point P.
- 10 Find the co-ordinates of the point which divides the line segment joining the points (-2, 3, 5) and (1, -4, -6) in the ratio (i) 2:3 internally (ii) 2:3 externally
- 11 Using section formula, prove that the three points (-2, 3, 5), (1, 2, 3) and (7, 0, -1) are collinear.
- 12 Find the equation of set of points P such that $PA^2 + PB^2 = 2k^2$, where A and B are the points (1, 2, 3) and (1, 0, 0), respectively.
- 13 Find the image of (-2, 3, 4) in the yz- plane.
- 14 Find the point in XY-plane which is equidistant from three points A(2, 0, 3), B(0, 3, 2) and C(0, 0, 1).
- 15 Three vertices of a parallelogram ABCD. Find the coordinates of the fourth vertex.
 - a) A (4, 0, 3), B (3, 4, -2) and C (-2, 0, 1)
 - b) A(3, -1, 2), B(1, 2, -4), and C(-1, 1, 2).
- 16 Find centroid of a triangle, mid-points of whose sides are (1, 2, -3), (2, 0, 1) and (-1, 1, -4).
- 17 Find lengths of the medians of the triangle with vertices A (0, 0, 6), B (0, 4, 0) and (6, 0, 0).
- 18 Are the points A(3, 6, 9), B(10, 20, 30) and C(25, -41, 5) the vertices of a right angles triangle?
- 19 A point R with x-coordinate 4 lies on the line segment joining the points P (2, -3, 4) and Q (8, 0, 10). Find the coordinates of the point R.
- 20 Find the coordinates of the point which divides the line segment joining the points (-2, 3, 5), & (1, -6, 6) in the ratio 2:3 internally.

CHAPTER-13 LIMITS AND DERIVATIVES

Answer the following questions:

1. Evaluate:
- a) $\lim_{x \rightarrow 0} \frac{x \tan 4x}{1 - \cos 4x}$ b) $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$
- c) $\lim_{x \rightarrow \frac{\pi}{4}} \frac{1 - \tan x}{x - \frac{\pi}{4}}$ d) $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{\sin x}$ e) $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{x - \frac{\pi}{4}}$
- f) $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{x - \frac{\pi}{4}}$ g) $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$ h) $\lim_{x \rightarrow \pi} \frac{\sin 3x - 3 \sin x}{(\pi - x)^3}$
- i) $\lim_{x \rightarrow 0} \frac{\operatorname{cosec} x - \cot x}{x}$ j) $\lim_{x \rightarrow 2} \frac{3x^2 - x - 10}{x^2 - 4}$ k) $\lim_{x \rightarrow 1} \frac{z^{1/3} - 1}{z^{1/6} - 1}$
- l) $\lim_{x \rightarrow 0} \frac{ax + x \cos x}{b \sin x}$ m) $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$ n) $\lim_{x \rightarrow 0} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3x+x} - 2\sqrt{x}}$
- o) $\lim_{x \rightarrow 0} \frac{ax+b}{bx+a}$ p) $\lim_{x \rightarrow a} \frac{x^4 - a^4}{x - a}$ q) $\lim_{x \rightarrow 0} \frac{ax+b/x}{cx+d/x}$
- r) $\lim_{x \rightarrow 1} \frac{3x^2 - 4x + 1}{x^2 - 4x + 3}$ s) $\lim_{x \rightarrow 0} \frac{(a+x)^2 \sin(a+x) - a^2 \sin a}{x}$
- t) $\lim_{x \rightarrow 0} f(x)$ where $f(x) = \frac{x - |x|}{x}, x \neq 0$ u) $\lim_{x \rightarrow 2} f(x)$ where $f(x) = \frac{|x-2|}{x^2-4}, x \neq 2$

1. If $f(x) = \begin{cases} \frac{x^2}{2}, & \text{if } 0 \leq x \leq 1 \\ 2x^2 - 3x + \frac{3}{2}, & \text{if } 1 < x \leq 2 \end{cases}$, Show that $\lim_{x \rightarrow 1} f(x) = f(1)$

2. If $f(x) = \begin{cases} a+bx, & x < 1 \\ 4, & x = 1 \\ b-ax, & x > 1 \end{cases}$ and if $\lim_{x \rightarrow 1} f(x) = f(1)$, what are the possible values of a and b.

3. If $\lim_{x \rightarrow 1} f(x) = f(1)$. Find a and b so that the function f given by

$$f(x) = \begin{cases} 3ax+b, & \text{if } x > 1 \\ 11, & \text{if } x = 1 \\ 5ax-2b, & \text{if } x < 1 \end{cases}$$

4. Find dy/dx a) $y = (ax^2 + \sin x)(p + q \cos x)$

b) $y = \frac{x \tan x}{\sec x + \tan x}$

c) $y = \frac{x^2 \cos\left(\frac{\pi}{4}\right)}{\sin x}$

d) $y = (ax+b)^n (cx+d)^m$

e) $y = x^2 e^x \sin x$

f) $y = e^x (x^3 + \sqrt{x})$

g) $y = \frac{x^2 + 5x - 6}{4x^2 - x + 3}$

5. $y = \frac{\cos x - \sin x}{\cos x + \sin x}$, show that $\frac{dy}{dx} + y^2 + 1 = 0$

6. $y = \frac{\cos x + \sin x}{\cos x - \sin x}$, show that $\frac{dy}{dx} = \sec^2\left(x + \frac{\pi}{4}\right)$

7. $F(x)$ is defined by the following, is continuous at $x = \pi$, find the values of a and b .

$$f(x) = \begin{cases} \frac{\sin 3x - 3 \sin x}{(\pi - x)^3}, & \text{when } x < \pi \\ a, & \text{when } x = \pi \\ \frac{b(\sqrt{5 + \cos x} - 2)}{(\pi - x)^2}, & \text{when } x > \pi \end{cases}$$

8. Let $f(x) = \begin{cases} \frac{1 - \sin^3 x}{3 \cos^2 x}, & \text{if } x < \frac{\pi}{2} \\ a, & \text{if } x = \frac{\pi}{2} \\ \frac{b(1 - \sin x)}{(\pi - 2x)^2}, & \text{if } x > \frac{\pi}{2} \end{cases}$ be a continuous function at $x = \frac{\pi}{2}$, find a and b

9. Find the value of a and b so that the function given is continuous at $x=1$,

$$f(x) = \begin{cases} 3ax + b, & \text{if } x > 1 \\ 11, & \text{if } x = 1 \\ 5ax - 2b, & \text{if } x < 1 \end{cases}$$

10. Find the value of a and b such that the function defined by

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a & \text{if } x < 4 \\ a + b & \text{if } x = 4 \\ \frac{x-4}{|x-4|} + 2b & \text{if } x > 4 \end{cases} \quad \text{is a continuous function at } x = 4$$

CHAPTER-14 STATISTICS

Answer the following questions:

- 1 Calculate the variance and standard deviation of the following data 8,12,13,15,22,14

- 2 Calculate the mean deviation about the mean from the following data

x_i	2	15	17	23	27
f_i	12	6	12	9	5

- 3 Find the mean deviation about the median for the following data :

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Number of girls	8	10	10	16	4	2

- 4 . The following table gives the distribution of income of 100 families in a village. Calculate mean and variance.

Income (in Rs.)	0-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000
No. of families	18	26	30	12	10	4

- 5 i. Find the mean deviation from the mean and from median of the following distribution:-

Marks	0-10	10-20	20-30	30-40	40-50
No. of students	5	8	15	16	6

- 6 . An analysis of monthly wages paid to workers of two firms A & B belonging to the same industry gives following result:

	Firm A	Firm B
No. of workers	1000	1200
Average monthly wages	Rs. 2800	Rs. 2800
Variance of distribution of wages	100	169

in which firm, A or B is there greater variability in individual wages ?

- 7 Find the mean deviation about the median for the data given:-

22, 24, 30, 27, 29, 31, 25, 28, 41, 42

- 8 . Calculate the mean, variance and standard deviation for the following distribution :-

Marks	above 30&below 40	below 50	below 60	below 70	below 80	below 90	below 100
No. of Students	3	10	22	37	45	48	50

- 9 The mean and standard deviation of a group of 100 observations were found to be 20 and 3, respectively. Later on it was found that three observations were incorrect, which were recorded as 21, 21 and 18. Find the mean and standard deviation if the incorrect observations are omitted.

- 10 From the data given below state which group is more variable, A or B?

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Group A	9	17	32	33	40	10	9
Group B	10	20	30	25	43	15	7

- 11 The mean and standard deviation of marks obtained by 50 students of a class in three subjects, Mathematics, Physics and Chemistry are given below:

Subject	Mathematics	Physics	Chemistry
Mean	42	32	40.9
Standard deviation	12	15	20

Which of the three subjects shows the highest variability in marks and which shows the lowest?

- 12 Find the mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17

- 13 Find the Mean and Variance of the data

x_i	6	10	14	18	24	28	30
f_i	2	4	7	12	8	4	3

- 14 An analysis of monthly wages paid to workers in two firms A and B, belonging to the same industry, gives the following results:

	Firm A	Firm B
No. of wage earners	586	648
Mean of monthly wages	Rs 5253	Rs 5253
Variance of the distribution of wages	100	121

- (i) Which firm A or B pays larger amount as monthly wages?
(ii) Which firm, A or B, shows greater variability in individual wages?

- 15 The mean and standard deviation of six observations are 8 and 4, respectively. If each observation is multiplied by 3, find the new mean and new standard deviation of the resulting observations.

CHAPTER-15 PROBABILITY

Answer the following questions:

- 1 In single throw of three dice, find the probability of getting a total of 17 or 18.
- 2 The letter of word "SOCIETY" are placed at random in a row. What is probability that 3 vowels came together ?
- 3 A card is drawn at random from well-shuffled deck of 52 cards. Find probability that it is neither ace, nor a king?
- 4 Out of the students attending a lecture, 50% could not see what was written on the board and 40% could not hear. What the lecturer was saying. Most unfortunate 30% fell into both of these categories. What is the probability that a student picked at random was able to hear and see satisfactorily
- 5 The probability that a student will pass final examination in both Hindi & Eng. is 0.5 & probability of passing neither is 0.1. If probability of passing Eng. examination is 0.75, what is probability of passing Hindi examination
- 6 The probability that a person will get an electric contract is $\frac{2}{5}$ and the probability that he will not get plumbing contract is $\frac{4}{7}$. If the probability of getting atleast one contract is $\frac{2}{3}$, what is the probability that he will get both ?
- 7 (i) A and B are 2 events such that $P(A) = 0.42$, $P(B) = 0.48$ and $P(A \text{ and } B) = 0.16$. Determine (a) $P(\text{not } A)$ (b) $P(A \text{ or } B)$
(ii) E and F are two events such that $P(E) = 0.4$, $P(F) = 0.5$, $P(E \cup F) = 0.6$, find $P(E \cap F)$.
(iii) $P(E) = 0.60$, $P(E \text{ or } F) = 0.85$, $P(E \text{ and } F) = 0.42$ Find $P(F)$.
- 8 In a class of 60 students, 32 like Math, 30 like Biology and 24 like both Math and Biology. If one of these students is selected at random, find the probability that the selected student
(a) likes Math or Biology (b) likes neither Math nor Biology (c) likes Math but not Biology.
- 9 A box contains 10 red marbles, 20 blue marbles and 30 green marbles, 5 marbles are drawn from the box, what is the probability that (i) all will be blue? (ii) at least one will be green?
- 10 A die is thrown, find the probability of the following events :
(i) A prime number will appear. (ii) A number less than 6 will appear. (iii) A number greater than or equal to 3 will appear.
- 11 Four cards are drawn at random from a pack of 52 playing cards. Find the probability of getting:
(a) all the four cards of the same suit. (b) two red cards and two black cards. (c) all cards of the same color. (d) one card from each suit.
- 12 The probability that a student will pass the final examination in both English and Hindi is 0.5 and the probability of passing neither is 0.1. If the probability of passing the English examination is 0.75, what is probability of passing the Hindi examination?
- 13 Two dice are thrown and the sum of the numbers which come up on the dice is noted. Let us consider the following events associated with this experiment
A: 'the sum is even' B: 'the sum is multiple of 3' C: 'the sum is less than 4' D: 'the sum is greater than 11' Which pairs of these events are mutually exclusive?

- 14 Three dice are thrown simultaneously. Find the probability that:
(a) all of them show the same face. (b) all show different faces. (c) two of them show the same face.
- 15 Two students Anil and Ashima appeared in an examination. The probability that Anil will qualify the examination is 0.05 and that Ashima will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that (i) both Anil and Ashima will not qualify the examination (ii) at least one of them will not qualify the examination, and (iii) only one of them will qualify the examination.
- 16 The probability that a person visiting a doctor will have his blood test done is 0.75 and the probability that he will be admitted is 0.30. The probability that he will have his blood test done or be admitted is 0.45. Find the probability that a person visiting the doctor will have his blood test done and be admitted?
- 17 Find the probability that in a random arrangement of the word 'society' all the three vowels come together.
- 18 In a lottery, a person chooses six different natural numbers at random from 1 to 20, and if these six numbers match with the six numbers already fixed by the lottery committee, he wins the prize. What is the probability of winning the prize in the game?