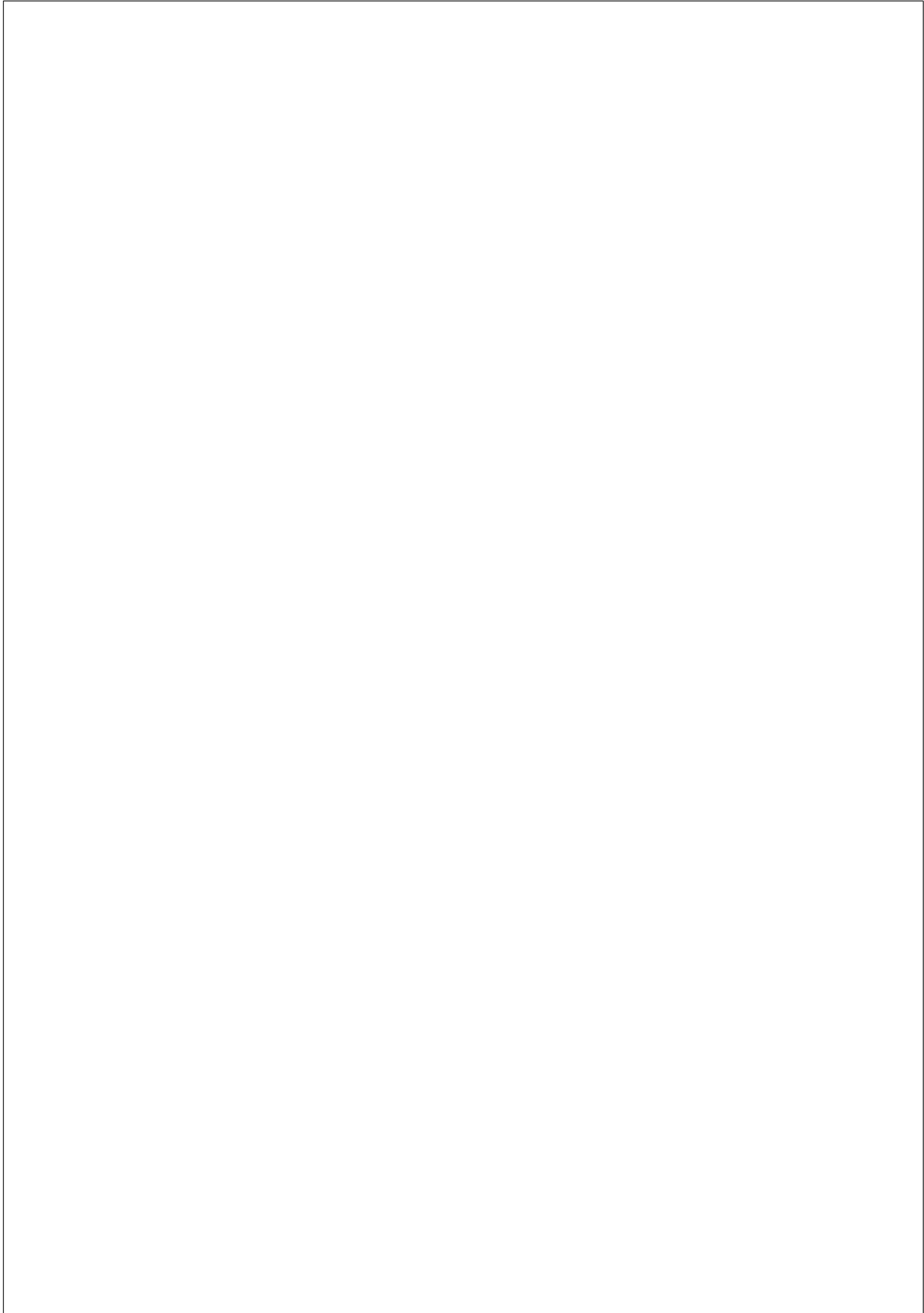




*Shaikh Sir's Diploma Classes*

**Maths-I**  
**{ Basic Maths-22301 }**

**Question wise Question bank**



Question Paper format (Based On Summer 2018 Paper)

**Question 1 Solve any Five (10 Marks)**

a	Logarithm	
b	Determinant : Area of triangle	
c	Trigonometry : Find Value	
d	Mensuration : Problem on Area	
e	Mensuration : Problem on Volume	
f	Statistics : Range and Coeff of range	
g	Statistics: Mean,sd and CV	

**Question 2: Solve any three (12 Marks)**

a	Matrix : Multiplications of matrix	
b	Partial fraction: non repeated factors	
c	Determinant: Cramer's Rule	
d	Stat: SD/MD of Discrete data	

**Question 3: Solve any three (12 Marks)**

a	Trigonometry :Compound angle	
b	Trigonometry : Multiple & submultiple	
c	Trig: factorization/defactorization	
d	Trigonometry : Inverse trig function	

**Question 4: Solve any three (12 Marks)**

a	Transpose and inverse of matrices	
b	Partial Fraction : Linear rep or Quadric	
c	Trigonometry : factorization/defact	
d	Trigonometry : Finding other functions	

**Question 5: Solve any two (12 Marks)**

a	1) Straight line 2) Straight Line	
b	1) Straight line 2) Straight Line	
c	1) Mensuration 2) Mensuration	

**Question 6 : Solve any two (12 Marks)**

a	Mean and standard deviation	
b	1) range and CR 2) Comparison of sets	
c	Solve equation by matrix method	

# Question : 1

## TYPE 1 : Problems on rules of logarithm.. {2 marks Q1 a}

### a) Problems based on Definition of logarithm

1. Find value without using calculator ....  $\log_2 32$
2. Find value without using calculator ..  $\log_{10} 1000$
3. Find value without using calculator ....  $\log_5 0.04$
4. Find value without using calculator ....  $\log_4 0.25$
5. Find value without using calculator ....  $\log_{3\sqrt{2}} 18$
6. Find value without using calculator ....  $\log_3 243$
7. Solve for x ...  $\log_2(7x+2)=3$
8. Solve for x ....  $\log_5(4x+11)=2$
9. Solve the equation ....  $\log_2[\log_3[\log_2 x]]=1$

### b) Problems based on Laws of Logarithm

1. find the value ...  $\log\left(\frac{225}{32}\right) - \log\left(\frac{25}{81}\right) + \log\left(\frac{64}{729}\right)$
2. find ...  $\log\left(\frac{75}{16}\right) - 2\log\left(\frac{5}{9}\right) + \log(32) - \log(243)$
3. find ..  $2\log\left(\frac{6}{7}\right) + \frac{1}{2}\log\left(\frac{81}{16}\right) - \log\left(\frac{27}{196}\right)$
4. find .....  $\log\left(\frac{9}{14}\right) - \log\left(\frac{15}{16}\right) + \log\left(\frac{35}{24}\right)$
5. find ....  $\log\left(\frac{145}{8}\right) - 3\log\left(\frac{3}{2}\right) + \log\left(\frac{54}{29}\right)$
6. find .....  $16\log\left(\frac{10}{9}\right) - 4\log\left(\frac{25}{24}\right) - 7\log\left(\frac{80}{81}\right)$
7. Prove that  $\log\left(\frac{p^2}{qr}\right) + \log\left(\frac{q^2}{pr}\right) + \log\left(\frac{r^2}{pq}\right) = 0$
8. Prove that  $\log\left(\frac{p}{q}\right) + \log\left(\frac{q}{r}\right) + \log\left(\frac{r}{p}\right) = 0$
9. Prove ..  $\log\left(\frac{a-b}{b-c}\right) + \log\left(\frac{b-c}{c-a}\right) + \log\left(\frac{c-a}{a-b}\right) = 0$
10. Prove ...  $\log(x + \sqrt{x^2+1}) + \log(\sqrt{x^2+1} - x) = 0$
11. Prove that  $\frac{1}{(\log_3 6)} + \frac{1}{(\log_8 6)} + \frac{1}{(\log_9 6)} = 3$
12. Prove that  $\frac{1}{(\log_6 24)} + \frac{1}{(\log_{12} 24)} + \frac{1}{(\log_8 24)} = 2$

## TYPE 2 : Problems on Finding area of triangle

- 1) Find the area of the triangle ABC whose vertices are A(1,1) , B(2,1) and C(-3,2). {Ans : ½ sq units}
- 2) Find the value of k. if area of triangle is 9 square, units with vertices (-3,0) , (3,0) and (0,k). { Ans : k=3/2}
- 3) Find the area of triangle with vertices at (1,0) (2,2) and (4,3) . {Ans : 3/2 sq units}
- 4) Show that points (-1,-3), (-4,7) , (2,-13) are collinear.
- 5) Find the area of the triangle passing through the points (1,1) (-1,0) (0,-2) { Ans : 3 sq units }
- 6) Show that points (2,1),(1,2) and (4,-1) are collinear.
- 7) Show that points (8,1), (3,-4) & (2,-5) are collinear.
- 8) find the area of triangle whose vertices are given as (-1,3)(7,-5) and (8,4) {Ans : 40 units}
- 9) Find the area of quadrilateral whose vertices are (3,4) ,(0,5) , (2,-1) ,(3,2) . {Ans : 9 Units}

## TYPE 3 : Without using calculator find the value.

- 1)  $\sin 15^\circ$
- 2)  $\cos 75^\circ$
- 3)  $\cos 105^\circ$
- 4)  $\sin 105^\circ$
- 5)  $\sec(3660^\circ)$
- 6)  $\sin(-765^\circ)$
- 7)  $\cos 330^\circ$
- 8)  $\sin(4620^\circ)$
- 9)  $\cot(-710^\circ)$
- 10)  $\tan(-1940^\circ)$

## TYPE 4 : Area of Triangle and Circle

- 1) Find the area of triangle having base 30 cm and height 20 cm. (A=300 sq cm)
- 2) Find the height of a triangle having area 75 cm<sup>2</sup> and base 25 cm. (h= 6 cm)
- 3) A triangle has sides 7cm, 5cm and 12cm, find its area using Herons formula. (A= 26.83 cm<sup>2</sup> )
- 4) Find the total cost of wooden fencing around a circular garden of diameter 28m , If fencing cost is Rs 300 per meter.
- 5) Find the radius and circumference of circle having area 36.4 m<sup>2</sup>

- 6) A field is triangular in shape with its sides as 12m, 10.5 m and 17 m respectively. Find its area.
- 7) A circular ground has area of  $600 \text{ m}^2$ , is to be fence all around. Find the total cost of fencing if the fence & fitting charges are Rs 600 per running meter.

#### TYPE 5 :Surface area of and Volume of Solids

- 1) A cone has a circular base of radius 10 cm and slant height of 30 cm. Calculate the surface area.
- 2) Find the surface area of a cuboid of dimensions 26 cms ; 20 cms and 12 cms.
- 3) If the volume of sphere is  $\frac{4\pi}{3} \text{ cm}^3$ , find surface area .
- 4) The total surface area of the cube is  $294 \text{ cm}^2$ . Find the volume of cube. {ans : $343 \text{ cm}^3$ }
- 5) The volume of a cube is  $1000 \text{ cm}^3$ . Find its total surface area. {ans:  $600 \text{ cm}^2$ }

#### TYPE 6: To find range and coefficient of range

1. Find range and coefficient of range of data.  
10,5,12,2,15,20,8,10
2. Find range and coefficient of range of data  
120,100,130,50,150,196,137
3. Find the range of data of coefficient of range

$x_i$	10	20	30	40	50
$f_i$	7	5	3	2	1

4. Find range and coefficient of range

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
stud	8	12	10	15	5

5. Calculate range and coefficient of range

Marks	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
stud	6	10	16	14	8	4

6. Calculate range and coefficient of range

temp	25 - 26	27 - 28	29 - 30	31 - 32	33 - 34	35 - 36
days	2	11	12	10	4	1

#### ANSWERS

- 1.{ Range = 18, C.R = 0.81},2.{ Range = 100, C.R = 0.5},3.{ Range = 40, C.R = 0.66}
- 4.{ Range = 50, C.R = 1},5.{ Range = 60, C.R. = 0.76},6.{ Range = 12, C.R. = 0.197}

#### TYPE 7: Problem on mean, SD and variance

- 1) If mean is 82.5 and standard deviation is 7.2 find coefficient of variance.
- 2) If coefficient of variation of a distribution is 75% and standard deviation is 24, find its mean.
- 3) If coefficient of variation of certain data is 5 and mean is 60. find standard deviation.
- 4) If the mean of a data set is 82.5, and standard deviation is 7.2. Find variance and coefficient of variance
- 5) Find the mean of a distribution having sd 25 and cv 70%.

# Question : 2

## TYPE 1 :Problems on Algebra of Matrices

Q1. If  $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$  AND  $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$  Find  $3A - 2B$   $\left\{ \text{Ans} \begin{bmatrix} 4 & 3 \\ 4 & 9 \end{bmatrix} \right\}$

Q2. If  $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & -1 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 & -6 \\ 0 & -1 & 3 \end{bmatrix}$  evaluate  $3A - 4B$   $\left\{ \text{Ans} \begin{bmatrix} 2 & 1 & 27 \\ 0 & 1 & 3 \end{bmatrix} \right\}$

Find  $x, y, z$  if  $\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$

{Ans :  $x=3/2, y=-1, z=2$ }

## Multiplication of matrices

Q1. If  $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ ,  $B = \begin{bmatrix} -1 & -2 \\ 4 & 5 \end{bmatrix}$ , Evaluate  $A.B + 2I$   $\left\{ \text{Ans} = \begin{bmatrix} 4 & 1 \\ 13 & 16 \end{bmatrix} \right\}$

Q2. If  $A = \begin{bmatrix} 3 & 9 \\ -1 & -3 \end{bmatrix}$ , Show that  $A^2$  is null matrix  $\left\{ \text{Ans} = A^2 \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \right\}$

Q3. If  $A = \begin{pmatrix} 3 & -1 \\ 2 & -4 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 \\ -3 & 0 \end{pmatrix}$  Find  $X$  such that  $2X + 3A - 4B = I$

Q4. If  $A = \begin{bmatrix} 1 & -2 \\ 2 & -2 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 5 \\ 3 & 3 \end{bmatrix}$  And  $C = \begin{bmatrix} 2 & 7 \\ 1 & 5 \end{bmatrix}$   
Show  $A.B = A.C$

Q5. If  $A = \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & -2 \\ 3 & 2 \end{bmatrix}$  Verify  $AB \neq BA$

Q6. Find  $AB$  if  $A = \begin{bmatrix} 1 & 2 \\ -1 & -2 \end{bmatrix}$ ,  $B = \begin{bmatrix} -4 & 4 \\ 2 & -2 \end{bmatrix}$   $\left\{ \text{Ans} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \right\}$

Q1. If  $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$  Find  $A^2 - 9A + 14I$  { Ans =  $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$  }

Q2. If  $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$  Show that  $A^2 = A$

Q3. If  $A = \begin{bmatrix} 0 & 1 & -1 \\ 3 & -2 & 3 \\ 2 & -2 & 3 \end{bmatrix}$  Show that  $A^2 = I$

Q4. If  $\left\{ 3 \begin{bmatrix} 4 & 1 & 3 \\ 0 & -1 & -3 \end{bmatrix} - 2 \begin{bmatrix} 3 & 2 & 4 \\ -6 & 1 & -3 \end{bmatrix} \begin{bmatrix} 1 \\ 3 \\ -2 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix} \right\}$  Find  $x$  and  $y$

{ Ans =  $x = 1, y = 3,$  }

Q5. Find  $x, y, z$   $\left\{ \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & 1 \\ 3 & 1 & 2 \end{bmatrix} + 2 \begin{bmatrix} 3 & 0 & 2 \\ 1 & 4 & 5 \\ 2 & 1 & 0 \end{bmatrix} \right\} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

Q6. If  $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 0 & 1 \end{bmatrix}$  And  $C = \begin{bmatrix} 2 & -1 & -1 \\ -2 & 2 & 3 \end{bmatrix}$

Show that  $A(B + C) = AB + AC$

7) Prove that the matrix  $A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 0 & 1 \\ 3 & 4 & 7 \end{pmatrix}$  is a singular matrix.

8) If  $A = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 2 \\ 3 & -2 \end{pmatrix}$  Whether  $AB$  is singular or non singular matrix

9)

If  $A = \begin{pmatrix} 2 & -1 & 1 \\ 3 & -4 & 0 \end{pmatrix}$  and  $B = \begin{pmatrix} 0 & 2 \\ -3 & 1 \\ 4 & -1 \end{pmatrix}$  Whether  $AB$  is singular or non singular matrix

10) If  $A = \begin{pmatrix} -2 & 0 & 1 \\ 1 & 2 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 0 & 1 \\ 2 & 3 \\ 1 & 1 \end{pmatrix}$  Show that  $AB$  is non-singular matrix

**TYPE 2 :Problems on Linear non repeated terms**

1.Resolve into partial fractions  $\frac{x+4}{x(x+1)(x+2)}$

2.Resolve into partial fractions  $\frac{x-5}{x^3+x^2-6x}$

3.Resolve into pf  $\frac{13x+19}{(x+3)(x-2)(x-3)}$

4.Resolve into partial  $\frac{(x^2+5x+7)}{(x-1)(x+2)(x+4)}$

5.Resolve into pf  $\frac{2x+1}{(2x-3)(2x+5)}$

6. Resolve into partial fractions  $\frac{x^2-1}{x(x+5)}$

7. Resolve into pf  $\frac{x+18}{(x-3)(2x+1)}$

**Problems with Substitution**

8.Resolve into pf  $\frac{x^2+1}{(x^2+2)(x^2+3)}$

9.Resolve into partial fractions  $\frac{e^x+4}{e^x+4e^x+3}$

10.Resolve into pf  $\frac{\tan x+4}{\tan x(\tan x+1)(\tan x+2)}$  11.Resolve into p f  $\frac{2x^4+x^2+4}{(x^2+1)(2x^2+3)(x^2-1)}$

12 Resolve into pf  $\frac{e^x}{e^{2x}+4e^x+3}$

**Answers :**

{1.A=2, B=-3,C=1 , 2.A=5/6, B=-8/15,C=-3/10 3.A=3, B=-2,C=-1 , 4.A=13/15,B=-1/6,C=3/10  
 5.A= 1/2, B=1/2, 6. A=-1/5, B=-24/5 7. A=3, B=-5 , 8.A=-1 B=2, 9.A=3/2 B=-1/2,  
 10.A=2, B=-3,C=1 , 11.A=-5/2,B=28/5,C=7/10 12. A=3/2, B=-1/2}

**TYPE 3 :Problems on Cramer's rule****Q1. Using Cramer's rule find x if**

$x + y + z = 1, 2x + 3y + z - 4 = 0, 4x + z + 9y = 16$

{Ans x = -3}

**Q2. Find x using Cramer's rule if**

$x + z = 4, y + z = 2, x + y = 0$

{Ans x = 1}

**Q3. Using determinant method find x, if**

$x + 3z = 2y + 4, 2x + y = 3z + 5, 2z + y = 3 + x$

{Ans x = 4}

**Q4. Using Cramer's rule find x,y,z if**

$3x + 3y - z = 11, 2x - y + 2z = 9, 4x + 3y + 2z = 25$

{Ans x=2,y=3,z=4}

**Q5. Using Cramer's rule find values of x and y**

$x + y - z = 0, 2x + y + 3z = 9, x - y + z = 2$

{Ans x=1,y=1,z=2}



**Q.6. Using Cramer's rule find values of x,y & z.**

$$2x+3y=5, y-3z=-2, z+3x=4$$

{Ans x=1,y=1,z=1}

**Q.7. Using Cramer's rule Solve the equations.**

$$2x+4z=5y+28, x+11y=5z-41, 3x-3=2y+z$$

{Ans x=1,y=-2,z=4}

**Q.8. Using Cramer's rule Solve the equations.**

$$P_1+P_2-P_3=0, 2P_1+P_2-P_3=26, P_2+P_3=14, \text{ find } P_1, P_2 \text{ and } P_3.$$

**Q.9. Using Cramer's rule Solve the equations.**

$$V_1+V_2+V_3=9; V_1-V_2+V_3=3; V_1+V_2-V_3=1$$

{Ans 2,3,4}

#### **TYPE 4 : Finding SD and MD of discrete data**

**1. Calculate mean deviation about mean**

3, 6, 5, 7, 10, 12, 15, 18

{ MD = 4.25 }

**2. Calculate mean deviation from mean**

12,6,7,3,15,10,18,5

{MD =4.25 }

**3. Find S.D of the following data**

1,2,3,4,5,6,7,8,9

{SD =2.581}

**4, Find standard deviation**

6,7,10,12,13,4,8,12

{SD =3.04 }

**5. Find S.D ,**

25,50,30,70,42,36,48,34,60

{SD = 13.779 }

# Question : 3

## Type 1 : Problem on Compound angle

“The sum or difference of two or more angles are called the compound angle.”

$$\sin(A+B) = \sin A \cdot \cos B + \cos A \cdot \sin B$$

$$\sin(A-B) = \sin A \cdot \cos B - \cos A \cdot \sin B$$

$$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$$

$$\cos(A-B) = \cos A \cdot \cos B + \sin A \cdot \sin B$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B} \quad \tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$$

### Problems A) $\sin(A \pm B)$ & $\cos(A \pm B)$

- 1] Prove that  $1 + \tan\theta \cdot \tan 2\theta = \sec 2\theta$
- 2] Prove that  $\frac{\sin 2\theta}{\sin\theta} - \frac{\cos 2\theta}{\cos\theta} = \sec\theta$
- 3] Prove that  $\cot\theta - \cot 2\theta = \operatorname{cosec} 2\theta$
- 4] Prove that  $\frac{1 - \tan 2\theta \cdot \tan\theta}{1 + \tan 2\theta \cdot \tan\theta} = \frac{\cos 3\theta}{\cos\theta}$
- 5] prove that  $\frac{\cot A - \cot 2A}{\cot A + \cot 2A} = \frac{\sin A}{\sin 3A}$
- 6] prove that  $\frac{\tan 3A + \tan A}{\tan 3A - \tan A} = \frac{\sin 4A}{\sin 2A}$
- 7] Prove that  $\frac{\cot 6A - \tan A}{\cot 6A + \tan 2A} = \frac{\cos 8A}{\cos 4A}$
- 8] Prove that  $\sin(A+B) \cdot \sin(A-B) = \sin^2 A - \sin^2 B$
- 9] Prove that  $\sin(A+B) \cdot \sin(A-B) = \cos^2 B - \cos^2 A$
- 10] Prove that  $\cos(n+2)A \cdot \cos(n+1)A + (\sin+2)A \cdot \sin(n+1)A = \cos A$
- 11] Prove that  $\sin\left(\frac{\pi}{3} + A\right) \cdot \cos\left(\frac{\pi}{3} + B\right) - \cos\left(\frac{\pi}{3} + A\right) \cdot \sin\left(\frac{\pi}{3} + B\right) = \sin(A-B)$
- 12] Prove that  $\sin\alpha \cdot \cos(\beta - \alpha) + \cos\alpha \cdot \sin(\beta - \alpha) = \sin\beta$

### Problems b) Problems on $\tan(A \pm B)$

- 1) Prove that  $\tan 70 - \tan 50 - \tan 20 = \tan 70 \cdot \tan 50 \cdot \tan 20$
- 2) Prove that  $\tan 50 - \tan 30 - \tan 20 = \tan 50 \cdot \tan 30 \cdot \tan 20$
- 3) Prove that  $\tan 3A - \tan 2A - \tan A = \tan 3A \cdot \tan 2A \cdot \tan A$
- 4) In Triangle ABC Prove that  $\tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$
- 5] If  $A + B = \frac{\pi}{4}$  prove that,  $\tan A + \tan B + \tan A \cdot \tan B = 1$
- 6] If  $A + B = 45^\circ$  prove that  $(1 + \tan A)(1 + \tan B) = 2$
- 7] If  $\tan(x+y) = \frac{3}{4}$ ,  $\tan(x-y) = \frac{8}{15}$ , prove that  $\tan 2x = \frac{77}{36}$
- 8] Evaluate  $\frac{\tan 66 + \tan 69}{1 - \tan 66 \cdot \tan 69}$
- 9] Evaluate  $\frac{\tan 75 - \tan 50}{1 + \tan 75 \cdot \tan 50}$
- 10] Evaluate  $\frac{\tan 32 + \tan 88}{1 - \tan 32 \cdot \tan 88}$

**Type 2 : Problem on Multiple/Sub-Multiple angles****Formulas**

$$\sin 2A = 2 \sin A \cos A \dots \sin A = 2 \sin \frac{A}{2} \cdot \cos \frac{A}{2} \dots \cos 2A = \cos^2 A - \sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A} \dots \sin 2A = \frac{2 \tan A}{1 + \tan^2 A} \dots \cos 2A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$$

$$\sin 3A = 3 \sin A - 4 \sin^3 A \qquad \qquad \qquad \cos 3A = 4 \cos^3 A - 3 \cos A$$

**Problems**

- 1) If  $A=60^\circ$  Verify that  $\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$
- 2) If  $A=60^\circ$  Verify that  $\cos 2A = 1 - 2 \sin^2 A$
- 3) If  $\sin A=0.4$  find  $\sin 3A$
- 4) If  $\cos A=0.4$  find  $\cos 3A$
- 5) If  $\sin A = \frac{1}{2}$  Find  $\sin 3A$
- 6) If  $\sin A = 30^\circ$  Verify that  $\sin 3A = 3 \sin A - 4 \sin^3 A$
- 7) If  $\sin A = \frac{3}{5}$  Find the value of  $\sin 2A$

**Type: 5 : Problem on Inverse trig. function (4m)**

- 1] Prove that,  $\tan^{-1}\left(\frac{2}{11}\right) + \tan^{-1}\left(\frac{7}{24}\right) = \tan^{-1}\left(\frac{1}{2}\right)$
- 2] Prove that,  $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \left(\frac{\pi}{4}\right)^c$
- 3] Prove that,  $\tan^{-1}\left(\frac{1}{11}\right) + \cot^{-1}\left(\frac{6}{5}\right) = \left(\frac{\pi}{4}\right)^c$
- 6]  $\sin^{-1}\left(\frac{3}{5}\right) + \cot^{-1}(7) = \frac{\pi}{4}^c$
- 7]  $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \frac{\pi}{4}^c$
- 8]  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$
- 9]  $\tan^{-1}\left(\frac{1}{2}\right) + \sin^{-1}\left(\frac{1}{\sqrt{10}}\right) = \cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$
- 10]  $\sin^{-1}\left(\frac{5}{13}\right) + \cot^{-1}(4) = \tan^{-1}\left(\frac{32}{43}\right)$
- 11]  $\tan^{-1}\left(\frac{1}{11}\right) + \cot^{-1}\left(\frac{6}{5}\right) = \sec^{-1}(\sqrt{2})$
- 12]  $\sec^{-1}\left(\frac{5}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$
- 13]  $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \sin^{-1}\left(\frac{77}{85}\right)$

# Question : 4

## Type 1 :Transpose of Matrix, Adjoint and inverse

Q1. If  $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$  Very that  $(AB)^T = B^T \cdot A^T$

Q2. If  $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}$  And  $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$   
Very that  $(AB)^T = B^T \cdot A^T$

Q3. If  $A = \begin{bmatrix} 2 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}$  And  $B = \begin{bmatrix} 6 & 1 \\ 0 & 4 \\ 5 & 7 \end{bmatrix}$  Very that  $(AB)^T = B^T \cdot A^T$

Q3. Find adjoint of matrix  $A = \begin{bmatrix} 1 & 3 & 2 \\ -1 & 0 & 2 \\ 3 & 1 & -1 \end{bmatrix}$

$$\left\{ \text{Ans} = \begin{bmatrix} -2 & 5 & 6 \\ 5 & -7 & -4 \\ -1 & 8 & 3 \end{bmatrix} \right\}$$

Q4. Find adjoint of matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

$$\left\{ \text{Ans} = \begin{bmatrix} 4 & 2 & -7 \\ -3 & 1 & 5 \\ 1 & 0 & -1 \end{bmatrix} \right\}$$

## Type 4 : Problem on Factorization Formulas

### Formulas

$$\sin C + \sin D = 2 \sin\left(\frac{C+D}{2}\right) \cdot \cos\left(\frac{C-D}{2}\right)$$

$$\sin C - \sin D = 2 \cos\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{C-D}{2}\right)$$

$$\cos C + \cos D = 2 \cos\left(\frac{C+D}{2}\right) \cdot \cos\left(\frac{C-D}{2}\right)$$

$$\cos C - \cos D = -2 \sin\left(\frac{C+D}{2}\right) \cdot \sin\left(\frac{C-D}{2}\right)$$

### Problems

1) Prove that  $\frac{\cos A - \cos 3A}{\sin 3A - \sin A} = \tan 2A$

2) Prove that  $\frac{\sin 5A + \sin 3A}{\cos 5A + \cos 3A} = \tan 4A$

3) Prove that  $\frac{\sin 7\theta + \sin 3\theta}{\cos 7\theta - \cos 3\theta} = -\cot 2\theta$

4) Prove that  $\frac{\cos 2A - \cos 3A}{\sin 3A + \sin 2A} = \tan\left(\frac{A}{2}\right)$

5) Prove that  $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$

6) Prove that  $\frac{\sin A + \sin 3A + \sin 5A + \sin 7A}{\cos A + \cos 3A + \cos 5A + \cos 7A} = \tan 4A$

7) Prove that  $\frac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = \tan\left(\frac{5A}{2}\right)$

8) Prove that  $\frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \cdot \cot x$

9) Prove that  $\frac{\cos 2A + 2\cos 4A + \cos 6A}{\cos A + 2\cos 3A + \cos 5A} = \cos A - \sin A \cdot \tan 3A$

10) Prove that  $\frac{\cos 3A - 2\cos 5A + \cos 7A}{\cos A - 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A \cdot \tan 3A$

**Type 5 : Problem on De-factorization Formulas**

**Formulas**

$\sin A \cdot \cos B = \frac{1}{2} [\sin(A+B) + \sin(A-B)]$

$\cos A \cdot \sin B = \frac{1}{2} [\sin(A+B) - \sin(A-B)]$

$\cos A \cdot \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$

$\sin A \cdot \sin B = -\frac{1}{2} [\cos(A+B) - \cos(A-B)]$

**Problems**

1) Prove that  $\frac{\sin 11x \cdot \sin x + \sin 7x \cdot \sin 3x}{\cos 11x \cdot \sin x + \cos 7x \cdot \sin 3x} = \tan 8x$

2) Prove that  $\frac{\sin 8\theta \cdot \cos \theta - \cos 3\theta \cdot \sin 6\theta}{\cos 2\theta \cdot \cos \theta - \sin 3\theta \cdot \sin 4\theta} = \tan 2\theta$

3) Prove that  $\frac{\sin x \cdot \sin 2x + \sin 3x \cdot \sin 6x}{\sin x \cdot \cos x + \sin 3x \cdot \cos 6x} = \tan 5x$

4) Prove that  $\frac{\cos 3A \cdot \sin 9A - \sin A \cdot \cos 5A}{\cos A \cdot \cos 5A - \sin 3A \cdot \sin 9A} = \tan 8A$

5) Prove that  $\sin 15^\circ \cdot \sin 30^\circ \cdot \sin 60^\circ \cdot \sin 75^\circ = \frac{\sqrt{3}}{16}$

6) Prove that  $\sin 20^\circ \cdot \sin 40^\circ \cdot \sin 60^\circ \cdot \sin 80^\circ = \frac{3}{16}$

7) Prove that  $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 60^\circ \cdot \cos 80^\circ = \frac{1}{16}$  8) Prove that  $\cos 15^\circ \cdot \cos 30^\circ \cdot \cos 60^\circ \cdot \cos 75^\circ = \frac{\sqrt{3}}{16}$

**TYPE 6: Problems on finding other ratios from given ratios**

- 1) If A and B both are obtuse angles and  $\sin A = \frac{5}{13}$ ,  $\cos B = \frac{4}{5}$  calculate  $\cos(A+B)$
- 2) If  $\sin A = -\frac{3}{5}$ ,  $\cos B = -\frac{12}{13}$  Find  $\sin(A+B)$  and  $\cos(A+B)$ . State the quadrant in which A+B lies if A is in third quadrant and B is in second quadrant.
- 3) If  $\cos A = \frac{1}{7}$ ,  $\cos B = \frac{13}{14}$ , A and B being positive and acute angles Prove that  $A-B=60^\circ$ .
- 4) If  $\sin \alpha = \frac{-5}{13}$ ,  $\cos \beta = \frac{-7}{25}$  and  $\alpha, \beta$  lies in the third quadrant find  $\sin(\alpha - \beta)$

# Question : 5

## Type 1: To find Equation of the straight line

- 1) Find the equation of line passing through (3,-4) and having slope  $3/2$ . {Ans :  $3x-2y-17=0$ }
- 2) Find the equation of straight line passing through the points (-4,6) and (8,-3) {Ans :  $3x+4y-12=0$ }
- 3) Find the equation of a straight line passing through the points (3,4) and (5,6). {Ans :  $x-y+1=0$ }
- 4) Find the equation of line passing through (5,6) and slope  $-1/2$ . {Ans :  $x+2y-17=0$ }
- 5) Find the equation of line passing through (2,-3) and inclined at an angle of 135 degrees positive direction of x-axis. {Ans :  $x+y+1=0$ }
- 6) Find the equation of line making x intercept 3 and y intercept 4. {Ans :  $4x+3y-12=0$ }
- 7) Find the equation of a straight line passing through the point (5,6) and making equal intercept on x and y axes. {Ans :  $x+y-11=0$ }
- 8) Find the equation of line passing through (2,3) and having slope  $1/2$ .

## Type : 2: To find slope and intercept of line

- 1) Find the slope and both intercepts of the line  $5x-4y+7=0$  on both the axes.
- 2) Find the slope and both intercepts of the line  $x-5y+7=0$  on both the axes.
- 3) Find the slope and both intercepts of the line  $2x+4y+4=0$  on both the axes.
- 4) Find the slope and both intercepts of the line  $2x+3y-6=0$  on both the axes.

## Type 3: Problems on parallel and perpendicular lines

- 1) Find the equation of line passing through the point (4,5) and perpendicular to the line  $7x-5y-420=0$ . {Ans :  $5x+7y-55=0$ }
- 2) Find the equation of line passing through the point (3,4) and perpendicular to the line  $2x-4y+5=0$ . {Ans :  $2x+y-10=0$ }
- 3) Find the equation of line passing through (3,-1) and parallel to the line  $x+2y-4=0$ . {Ans :  $x+2y-1=0$ }
- 4) Find the equation of line passing through (4,5) and parallel to line  $2x-3y-5=0$ . {Ans :  $2x-3y+7=0$ }
- 5) Find the equation of line passing through (2,-3) and parallel to the line  $4x-y+7=0$ . {Ans :  $4x-y-11=0$ }
- 6) Find the equation of line passing through the point (4,-5) and perpendicular to the line  $3x+4y+5=0$ . {Ans :  $4x-3y-31=0$ }

## Type 4: Acute angle between two lines

Find the angle between the lines,

- 1) Having slopes  $(-5/6)$  and  $(1/11)$ . {ans: $45^\circ$ }
- 2)  $3x-y=4$  and  $2x+y=3$  {ans: $45^\circ$ }
- 3)  $3x-2y+4=0$ ,  $2x-3y-7=0$  {ans: $22.63^\circ$ }
- 4)  $3x-4y=420$ ,  $4x+3y=420$  {ans: $90^\circ$ }
- 5)  $x-\sqrt{3}y+4=0$  and  $x+\sqrt{3}y-3=0$  {ans:  $60^\circ$ }
- 6)  $x+3y+5=0$  and  $7x+y-10=0$  {ans:  $45^\circ$ }

## Type 5: Distance of a point from a line

- 1) Find the distance of (1,-1) from  $3x-4y+8=0$  {Ans: 3 Units }
- 2) Find the length of perpendicular on the line  $3x+4y-5=0$  from the point (3,4) {Ans: 4 Units }
- 3) Find the length of perpendicular from the point (2,-4) on the line  $3x-2y=7$ . {Ans:  $7/\sqrt{13}$  Units }
- 4) Find the length of perpendicular from the point (-2,3) on the line  $12x=5y+13$ . {Ans: 4 Units }
- 5) Find the length of perpendicular from the point (1,-1) on the line  $3x-4y+8=0$ . {Ans: 3 Units }
- 6) Find the length of perpendicular from the point (0,9) on the line  $x+2y-3=0$ . {Ans:  $3\sqrt{5}$  Units }

## Type 6: Distance between two parallel lines

- 1) Find the distance between the parallel lines  $3x+2y-6=0$  and  $3x+2y-12=0$ . {ans:  $6/\sqrt{13}$  }
- 2) Find the distance between the parallel lines  $3x+4y+5=0$  and  $6x+8y=25$  {ans:  $7/2$  }
- 3) Find the distance between the lines  $4x-3y+2=0$ , and  $4x+3y-9=0$  {ans:  $11/5$  }
- 4) Find the distance between parallel lines  $y=2x-4$  and  $y=2x+3$ . {ans:  $7/\sqrt{5}$  }
- 5)  $5x-12y+1=0$  and  $10x-24y-1=0$  are parallel lines, find the distance between them. {ans:  $3/26$  }

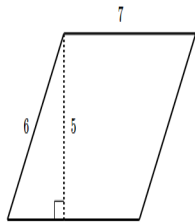
## **TYPE 7 : Area of Rectangle, square, parallelogram ,rhombus and trapezium**

### **RECTANGLE AND SQUARE**

- 1) A square grassy plot is of side 100 metre. It has a gravel path 10 metres wide all round it on the inside. Find the area of the path.
- 2) The area of rectangle with one side 8 cm is  $172 \text{ cm}^2$ . Find length of the other side.
- 3) A rectangle is 3.2 m horizontal and 2.4 m vertical, has the same perimeter as that of a square. Find the side of square and its area.
- 4) A rectangular shaped pool has dimensions 25 m by 30 m. It has 4 m wide cemented path all round the pool. Find the cost of cementing the path if rate of cementing is 200 per square meter.
- 1) A kite has two diagonals of length 40cm and 70 cm respectively. Find the area of the kite.

- 2) The diagonals of a rhombus are 7 cm and 6 cm respectively. Find its area.
- 3)
- 4) Find the area of a parallelogram having vertical side 20 cm , horizontal side 25 cm and height 10 cm.

What is the area of the parallelogram?



- 1) A trapezium has parallel sides of 1.2 m and 1m each while distance between them is 0.8 m. Find the area of trapezium.

- 2) Area of a trapezium is 1245 square meters. Its two parallel sides are 120 m and 46 m respectively. Find the height of trapezium. (Ans: 15 m)

## **TYPE 8 :Surface area of and Volume of Solids**

- 1) The internal measures of a cuboidal room are  $12 \text{ m} \times 8 \text{ m} \times 4 \text{ m}$ . Find the total cost of whitewashing all four walls of a room, if the cost of white washing is ` 8 per square meter ,will be the cost of white washing if the ceiling of the room is also whitewashed?

- 2) A cone has a circular base of radius 10 cm and slant height of 30 cm. Calculate the surface area.
- 3) The diameter of base of cylinder is 14 cm and its height is 18 cm. Find whole surface area and volume.
- 4) Find the volume of a cuboid if the length is 17 cm, breadth is 8 cm and height is 25 cm
- 5) A solid cube has 12 cm side is cut into eight cubes of equal volume. What will be side of new cube.

- 6) A cuboid water tank is 6m long,5m wide and 4.5 m deep. How many litres and water can it hold. ( Take  $1 \text{ m}^3 = 1000 \text{ Litres}$ )
- 7) A matchbox measures 4 cm by 2.5 cm by 1.5 cm. What will be the volume of a packet containing 12 such boxes?

- 8)A wall of length 10 m was to be built from bricks of dimensions 24cm by 12 cm by 8 cm, if the width of wall is same as 24 cm of brick and height of wall is 4m. How many bricks will be required?

- 9) A wooden box 3.3m long,2.25 m wide and 65 cm deep is to be made with its top open from sheet metal. Find the surface area of the sheet required.

- 10) If the radius of cone is doubled by keeping height same , how much volume will increase.

- 12) A steel tube has inner diameter 24 cm and thickness of pipe is 2 cm. If the height of pipe is 35 cm find the volume of the pipe.

- 13) Find the surface area of a sphere having volume of 200 cubic meter.

- 14) A solid cone has base diameter 250 mm and height 300 mm. Find the volume and curved surface area of the cone.

- 15) Find the volume of a cuboid if the length is 18 cm, breadth is 8 cm and height is 20 cm, Also find the total surface area.

# Question : 6

## TYPE 2: To find mean deviation (M.D)

1.. Calculate mean deviation from mean

$x_i$	10	11	12	13	14
$f_i$	3	12	18	12	3

2. Calculate the mean deviation from mean

$x_i$	3	4	5	6	7	8
$f_i$	4	9	10	8	6	3

3. Calculate mean deviation from mean

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Students	5	8	15	16	6

4. Calculate mean deviation from mean.

Marks	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
Students	4	6	10	18	9	3

ANSWERS

1. {  $\bar{x} = 12$ , M.D = 0.75} 2. {  $\bar{x} =$  , MD = 1.195} 3. { M.D = 9.44} 4. { M.D = 10.56}

## TYPE 3: To find standard deviation (S.D)

1. Find Standard deviation,

$x_i$	5	15	25	35	45	55
$f_i$	10	20	30	50	40	30

2. Find Standard deviation, variance and coefficient of variance.

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	8	3	1

3. Calculate variance and coefficient of variance,

Weight	36-40	41-45	46-50	51-55	56-60	61-65	66-70
No. of students	4	17	23	28	17	6	3

4. Find Variance and coefficient of variance for the following data

strength	145-155	155-165	166-175	175-185	185-195	195-205
No. blocks	6	7	9	14	4	5

5. The mean and variance of 5 items are 64 and 68 respectively. If two more items of values 62 and 66 are added to the data, Find the new variance of 7 items.



6. Calculate the standard deviation of the following table

Weekly Expenditure Below	05	10	15	20	25
No of student	06	16	28	38	46

10. Calculate Mean, Standard deviation and Coff of variance of the following

Class-Interval	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	15

ANSWERS

## TYPE 4: Comparison of two sets.

1. Two sets of observations are given below,

Set - 1	Set -2
$\bar{x} = 82.5$	$\bar{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

2. Two factories A and B engaged in same industry, the average weekly wages are

Factory	Average wages	S.D
A	34.5	5.0
B	28.5	4.5

Which factory is more consistent ?

3. Which set has greater variability ?

Set - 1	$\bar{x} = 32.5$	$\sigma = 4.28$
Set -2	$\bar{x} = 27.8$	$\sigma = 3.98$

4. The two sets of observations are given below :

Set I	Set II
$\bar{x} = 75.5$	$\bar{x} = 65.3$
$\sigma = 5.4$	$\sigma = 6.4$

Which of the two sets is more consistent?

5. An analysis of monthly wages paid to workers in two firms given below

	Firm A	Firm B
Average monthly wages	186	175
variance of distribution	81	100

Which set is more consistent ?

