MATHEMATICS

F.Sc / ICS – Ist Year

Question Bank

Chapter 1 (Number Systems)

Exercise 1.1 (Short Questions)

1. Prove that $\frac{a}{b}=\frac{c}{d}\Leftrightarrow ad=bc$ **(RWP 24, G-II)**

2. State and prove Golden rule of fractions and rule for quotient of fractions. **(FSD 24, G-I), (FSD 24, G-II)**

3. Define additive inverse and additive identity property of real numbers.

4. Write trichotomy and transitive properties of inequalities of real numbers. **(GRW 24, G-II)**

5. Prove that $\sqrt{3}$ is an irrational number.

6. Which of the following sets have closure property with respect to addition and multiplication?

(i) $\{1\}$ **(ii)** $\{1,-1\}$ **(GRW 24, G-I), (RWP 24, G-II)**

(iii) $\{0,-1\}$ **(RWP 24, G-I), (LHR 24, G-II)**

7. Name the properties used in equations $100+0=100,\ 1000\times 1=1000$

8. Prove the following rules of addition:

(i) $\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$ **(ii)** Prove that $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$ **(SGD 24, G-I)**

9. Simplify by justifying each step.

(i) $\dfrac{\frac{a}{b}+\frac{c}{d}}{\frac{a}{b}-\frac{c}{d}}$ **(ii)** $\dfrac{\frac{1}{4}+\frac{1}{5}}{\frac{1}{4}-\frac{1}{5}}$ **(LHR 24, G-II)**

Exercise 1.2 (Short Questions)

1. Define a complex number, is 0 a complex number? **(RWP 24, G-I)**

2. Simplify the following: **(i)** Simplify i^{10} **(D.G. Khan 24, G-I)** **(ii)** $(-1)^{\frac{-21}{2}}$ **(GRW 24, G-I)**

3. Simplify the following and write the answer as a complex number:

(i) $(7,9)+(3,-5)$ **(D.G. Khan 24, G-I)**

(ii) $(5,-4)(-3,-2)$ **(FSD 24, G-II), (D.G.Khan 24, G-II)**

(iii) $(2,6)\div(3,7)$ **(GRW 24, G-II), (MTN 24, G-I), (MTN 24, G-II)**

4. Prove that sum as well as product of two conjugate complex numbers is a real number. **(FSD 24, G-I), (SGD 24, G-I)**

5. Find the multiplicative inverse of

(i) $(-4,7)$ **(GRW 24, G-II), (SGD 24, G-I), (SWL 24, G-II), (D.G.Khan 24, G-I)**

(ii) $\left(\sqrt{2},-\sqrt{5}\right)$ **(FSD 24, G-I)** **(iii)** $1-2i$ **(FSD 24, G-II)**

(iv) $a+bi$ **(MTN 24, G-II)** **(v)** $-3-5i$ **(SGD 24, G-II), (MTN 24, G-I), (RWP 24, G-I)**

6. Factorize: **(i)** a^2+4b^2 **(RWP 24, G-II)** **(ii)** $9a^2+16b^2$ **(SGD 24, G-I), (SWL 24, G-II)**

(iii) $3x^2+3y^2$ **(RWP 24, G-I)**

7. Separate into real and imaginary parts of **(i)** $\frac{(-2+3i)^2}{1+i}$ **(ii)** $\frac{i}{1+i}$ **(MTN 24, G-I)**

Exercise 1.3 (Short Questions)

1. $\forall z,\ z_1,\ z_2\in C$ prove that

(i) $|-z|=|z|=|\bar{z}|=|-\bar{z}|$ **(MTN 24, G-I)** **(ii)** $\bar{\bar{z}}=z$ **(FSD 24, G-II)**

(iii) $z\bar{z}=|z|^2$ **(LHR 24, G-I), (MTN 24, G-II), (BWP 24, G-II), (D.G.Khan 24, G-I)**

(iv) $\overline{z_1z_2}=\bar{z}_1\bar{z}_2$ **(BWP 24, G-II)** **(v)** $\bar{z}_1+\bar{z}_2=\overline{z_1+z_2}$ **(vi)** $|z_1z_2|=|z_1||z_2|$

2.	Find the moduli of the following complex numbers **(i)** $1-i\sqrt{3}$ **(LHR 24, G-I), (LHR 24, G-II)** **(ii)** $3+4i$ **(GRW 24, G-II)**
3.	Express the complex number $1+i\sqrt{3}$ in polar form. **(GRW 24, G-II), (SWL 24, G-II)**
4.	State the De Moiver's theorem.
5.	Find the real and imaginary parts of $\left(\sqrt{3}+i\right)^3$ **(LHR 24, G-I)**
6.	Prove that $\bar{z}=z$ iff z ir real. **(BWP 24, G-II), (D.G.Khan 24, G-II)**
7.	Show that $\forall z\in C$ **(i)** $z^2+\bar{z}^{-2}$ is a real number. **(ii)** $\left(z-\bar{z}\right)^2$ is a real number.
8.	Simplify : **(i)** $\left(-\frac{1}{2}+\frac{\sqrt{3}}{2}i\right)^3$ **(ii)** $(a+bi)^{-2}$ **(FSD 24, G-I)** **(iii)** $\frac{3}{6-\sqrt{-12}}$ **(MTN 24, G-II)**
Chapter 2 (Sets, Functions and Groups)	
Exercise 2.1 (Short Questions)	
1.	Define power set of a set and give one example.
2.	Differentiate between equal and equivalent sets with example.
3.	Write the descriptive and tabular form of **(i)** $\{x\mid x\in N\wedge x\le 10\}$ **(MTN 24, G-I)** **(ii)** $\{x\mid x\in E\wedge 4\le x\le 10\}$ **(iii)** $\{x\mid x\in P\wedge x<12\}$ **(iv)** $\{x\mid x\in Q\wedge x^2=2\}$ **(SWL 24, G-II)**
4.	What is difference between $\{a,b\}$ and $\{\{a,b\}\}$?
5.	Write down two proper subsets of $\{0,1\}$
6.	Write down the power set of each of the following sets: **(i)** $\{a,\{b,c\}\}$ **(BWP 24, G-II)** **(ii)** $\{+,-,\times,\div\}$ **(iii)** $\{1,2,3\}$ **(RWP 24, G-II)**
Exercise 2.2 (Short Questions)	
1.	Exhibit $A\cup B$ *and* $B\cup A$ by Venn diagram, when **(i)** A and B are overlapping sets. **(ii)** A and B are disjoint sets. **(iii)** $A\subseteq B$
2.	Show that $A-B$ *and* $B-A$ by Venn diagram, when **(i)** A and B are overlapping sets. **(ii)** A and B are disjoint sets. **(iii)** $A\subseteq B$ **(MTN 24, G-I)** **(iv)** $B\subseteq A$
3.	Use Venn diagram, verify that $A-B=A\cap B'$ **(SGD 24, G-I)**
Exercise 2.3 (Short Questions)	
1.	Verify commutative property of union and intersection for sets $A=\{1,2,3,4,5\}$, $B=\{4,6,8,10\}$
2.	Let U = The set of the English alphabet, $A=\{x\mid x\text{ is a vowel}\}$, $B=\{y\mid y\text{ is a consonant}\}$, Verify De Morgan's Laws for these sets.
3.	From suitable properties of union and intersection deduce $A\cap(A\cup B)=A\cup(A\cap B)$
Exercise 2.4 (Short Questions)	
1.	Write down the difference between induction and deduction. **(GRW 24, G-I)**
2.	Define Aristotelian logic.
3.	Define disjunction.
4.	Define tautology and absurdity.
5.	Write the converse, inverse and contrapositive of the following conditionals: **(i)** $\sim p\to q$ **(ii)** $\sim p\to\sim q$ **(GRW 24, G-II)**
6.	Construct the truth tables for the following statements: **(i)** $(p\to\sim p)\vee(p\to q)$ **(ii)** $(p\wedge\sim p)\to q$ **(LHR 24, G-I), (SGD 24, G-II), (D.G.Khan 24, G-I)** **(iii)** $\sim(p\to q)\leftrightarrow(p\wedge\sim q)$
7	Show that each of the the following statements is a tautology: **(i)** $p\to(p\vee q)$ **(ii)** $\sim(p\to q)\to p$ **(RWP 24, G-I)** **(iii)** $\sim q\wedge(p\to q)\to\sim p$ **(iv)** $(p\wedge q)\to p$ is a tautology. **(D.G. Khan 24, G-II), (BWP 24, G-II)**
8.	Prove that $p\vee(\sim p\wedge\sim q)\vee(p\wedge q)=p\vee(\sim p\wedge\sim q)$

Exercise 2.5 (Short Questions)	
1.	Just, convert $(A\cup B)' = A'\cap B'$ and $(A\cap B)' = A'\cup B'$ into logical form. **(SWL 24, G-II)**
2.	Convert the theorem $A\cup(B\cap C)=(A\cup B)\cap(A\cup C)$ to logical form.
Exercise 2.6 (Short Questions)	
1.	Define bijective function.
2.	For the set $A=\{1,2,3,4\}$, find the relations in A. State the domain and range of each relation. **(i)** $\{(x,y)\mid y+x=5\}$ **(MTN 24, G-II)** **(ii)** $\{(x,y)\mid y+x<5\}$ **(iii)** $\{(x,y)\mid y+x>5\}$
3.	Find the inverse of each of the following relations. Tell whether each relation and its inverse is a function or not: **(i)** $\{(1,3),(2,5),(3,7),(4,9),(5,11)\}$ **(ii)** $\{(x,y)\mid y^2=4ax,\ x\geq 0\}$ **(FSD 24, G-II)**
Exercise 2.7 (Short Question)	
1.	Give the table for addition of elements of residue classes of modulo 4.
Exercise 2.8 (Short Questions)	
1.	Define unary and binary operations. **(GRW 24, G-I)**
2.	Define groupoid. **(GRW 24, G-II)**
3.	Define Semi group. **(LHR 24, G-II), (MTN 24, G-II)**
4.	Define Monoid. **(RWP 24, G-I)**
5.	Define a Group.
6.	Prove that the identity element e in a group is unique.
7.	Prove that inverse of each element in a group is unique.
8.	Show that whether set of rational numbers is a group under multiplication.
9.	Show that set of natural numbers is a monoid under multiplication.
10.	If $S=\{0,1,2\}$, then show that S is an abelian group under addition. **(SGD 24, G-II)**
11.	If a,b are elements of a group G, then show that $(ab)^{-1}=b^{-1}a^{-1}$ **(LHR 24, G-I), (SGD 24, G-I), (FSD 24, G-I), (FSD 24, G-II)**
12.	If a,b are elements of a group G, solve $ax=b$
Chapter 3 (Matrices and Determinants)	
Exercise 3.1 (Short Questions)	
1.	Define diagonal matrix and give one example. **(SWL 24, G-II)**
2.	Define scalar matrix and give one example.
3.	If $A=\begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$, show that $A^4=I_2$ **(GRW 24, G-II), (FSD 24, G-II)**
4.	Find x and y if **(i)** $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}=\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$ **(GRW 24, G-I), (D.G.Khan 24, G-I)** **(ii)** $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}=\begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$ **(MTN 24, G-I)**
5.	Find x and y if $\begin{bmatrix} 2 & 0 & x \\ 1 & y & 3 \end{bmatrix}+2\begin{bmatrix} 1 & x & y \\ 0 & 2 & -1 \end{bmatrix}=\begin{bmatrix} 4 & -2 & 3 \\ 1 & 6 & 1 \end{bmatrix}$ **(D.G.Khan 24, G-II)**
6.	If $A=\begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2=\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of a and b. **(LHR 24, G-I), (RWP 24, G-II)**
7.	If $A=\begin{bmatrix} 1 & -1 \\ a & b \end{bmatrix}$ and $A^2=\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find the values of a and b. **(MTN 24, G-I), (FSD 24, G-I)**
8.	Find the matrix X if $\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix}X=\begin{bmatrix} 2 & 1 \\ 5 & 10 \end{bmatrix}$ **(D.G.Khan 24, G-II)**

Exercise 3.2 (Short Questions)

1. If $A=\begin{bmatrix} 2 & -1 & 3 & 0 \\ 1 & 0 & 4 & -2 \\ -3 & 5 & 2 & -1 \end{bmatrix}$, then find $(A^t)^t$.

2. Find the inverses of **(i)** $\begin{bmatrix} 3 & -1 \\ 2 & 1 \end{bmatrix}$ **(ii)** $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$ **(FSD 24, G-I)**

3. Solve the equations $2x_1-3x_2=5,\ 5x_1+x_2=4$

4. If A and B are square matrices of the same order, then explain why in general $(A-B)^2 \neq A^2-2AB+B^2$ **(LHR 24, G-I)**

5. Solve the matrix for X

(i) $3X-2A=B$ if $A=\begin{bmatrix} 2 & 3 & -2 \\ -1 & 1 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & -3 & 1 \\ 5 & 4 & -1 \end{bmatrix}$ **(FSD 24, G-II)**

(ii) $2X-3A=B$ if $A=\begin{bmatrix} 1 & -1 & 2 \\ -2 & 4 & 5 \end{bmatrix}$ and $B=\begin{bmatrix} 3 & -1 & 0 \\ 4 & 2 & 1 \end{bmatrix}$

Exercise 3.3 (Short Questions)

1. Define minor and cofactor of an element of a matrix. **(SWL 24, G-II), (FSD 24, G-II)**

2. If all the entries of a column of a square matrix A are zero, then show that $|A|=0$. **(RWP 24, G-II)**

3. Write any two properties of determinant. **(GRW 24, G-I), (BWP 24, G-II)**

4. Evaluate: **(i)** $\begin{vmatrix} 2a & a & a \\ b & 2b & b \\ c & c & 2c \end{vmatrix}$ **(ii)** $\begin{vmatrix} 1 & 2 & -3 \\ -1 & 3 & 4 \\ -2 & 5 & 6 \end{vmatrix}$ **(FSD 24, G-I)**

5. Without expansion show that **(i)** $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix}=0$ **(ii)** $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}=0$ **(MTN 24, G-I)**

6. Without expansion verify that

(i) $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix}=0$ **(GRW 24, G-II)** **(ii)** $\begin{vmatrix} 1 & 2 & 3x \\ 2 & 3 & 6x \\ 3 & 5 & 9x \end{vmatrix}=0$ **(iii)** $\begin{vmatrix} 1 & a^2 & \frac{a}{bc} \\ 1 & b^2 & \frac{b}{ca} \\ 1 & c^2 & \frac{c}{ab} \end{vmatrix}=0$

(iv) $\begin{vmatrix} bc & ca & ab \\ \frac{1}{a} & \frac{1}{b} & \frac{1}{c} \\ a & b & c \end{vmatrix}=0$ **(v)** $\begin{vmatrix} 2a & 2b & 2c \\ a+b & 2b & b+c \\ a+c & b+c & 2c \end{vmatrix}=0$

7. **(i)** If $A=\begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, then find $A_{12},\ A_{22}$. **(MTN 24, G-II), (D.G.Khan 24, G-II)**

(ii) If $B=\begin{bmatrix} 5 & -2 & 5 \\ 3 & -1 & 4 \\ -2 & 1 & -2 \end{bmatrix}$, then find B_{21} and B_{23}. **(SGD 24, G-II)**

8. Find the values of x if **(i)** $\begin{vmatrix} 3 & 1 & x \\ -1 & 3 & 4 \\ x & 1 & 0 \end{vmatrix}=-30$ **(ii)** $\begin{vmatrix} 1 & 2 & 1 \\ 2 & x & 2 \\ 3 & 6 & x \end{vmatrix}=0$

9. Find $\left|AA^t\right|$ if $A=\begin{bmatrix}3 & 2 & -1\\ 2 & 1 & 3\end{bmatrix}$

10. Find the value of λ if $A=\begin{bmatrix}4 & \lambda & 3\\ 7 & 3 & 6\\ 2 & 3 & 1\end{bmatrix}$ is singular matrix.

11. If $A=\begin{bmatrix}2 & -1\\ 3 & 1\end{bmatrix}$, verify that $(A^{-1})^t=(A^t)^{-1}$ **(LHR 24, G-II)**

12. If A and B are non-singular matrices, then show that:

(i) $(AB)^{-1}=B^{-1}A^{-1}$ **(GRW 24, G-I), (GRW 24, G-II), (SGD 24, G-I)**

(ii) $\left(A^{-1}\right)^{-1}=A$ **(SWL 24, G-II)**

Long Questions

1. Show that:

(i) $\begin{vmatrix}a+\ell & a & a\\ a & a+\ell & a\\ a & a & a+\ell\end{vmatrix}=\ell^2(3a+\ell)$ **(BWP 24, G-II)**

(ii) $\begin{vmatrix}b+c & a & a\\ b & c+a & b\\ c & c & a+b\end{vmatrix}=4abc$

(iii) $\begin{vmatrix}a & b+c & a+b\\ b & c+a & b+c\\ c & a+b & c+a\end{vmatrix}=a^3+b^3+c^3-3abc$ **(FSD 24, G-II)**

(iv) $\begin{vmatrix}a+\lambda & b & c\\ a & b+\lambda & c\\ a & b & c+\lambda\end{vmatrix}=\lambda^2(a+b+c+\lambda)$ **(GRW 24, G-I), (LHR 24, G-I)**

(v) $\begin{vmatrix}b+c & a & a^2\\ c+a & b & b^2\\ a+b & c & c^2\end{vmatrix}=(a+b+c)(a-b)(b-c)(c-a)$

(vi) $\begin{vmatrix}x & 1 & 1 & 1\\ 1 & x & 1 & 1\\ 1 & 1 & x & 1\\ 1 & 1 & 1 & x\end{vmatrix}=(x+3)(x-1)^3$ **(RWP 24, G-II)**

2. If $A=\begin{bmatrix}1 & 2 & -3\\ 0 & -2 & 0\\ -2 & -2 & 1\end{bmatrix}$, then find A_{12}, A_{22}, A_{32} and $|A|$.

3. Find A^{-1} if $A=\begin{bmatrix}2 & 1 & 0\\ 1 & 1 & 0\\ 2 & -3 & 5\end{bmatrix}$ **(MTN 24, G-II)**

Exercise 3.4 (Short Questions)

1. Define upper triangular matrix and give one example.

2. Define rank of a matrix.

3. Define skew-symmetric matrix.

4. Define **(i)** Hermitian matrix. **(BWP 24, G-II)** **(ii)** Skew-hermitain matrix. **(LHR 24, G-I)**

5. If the matrices A and B are symmetric and $AB=BA$, show that AB is symmetric.

6. If $A=\begin{bmatrix}i & 1+i\\ 1 & -i\end{bmatrix}$, show that: **(i)** $A+\left(\overline{A}\right)^t$ is hermitian.

(ii) $A-(\overline{A})^t$ is skew-hermitian. **(SGD 24, G-I), (FSD 24, G-I)**

7. If A is symmetric or skew-symmetric, Show that A^2 is symmetric. **(SGD 24, G-II)**

8. If $A=\begin{bmatrix}1\\ 1+i\\ i\end{bmatrix}$, find $A(\overline{A})^t$. **(LHR 24, G-II), (RWP 24, G-I)**

Long Question	
1.	Find the rank of matrix $\begin{bmatrix} 1 & -1 & 2 & -1 \\ 2 & -6 & 5 & 1 \\ 3 & 5 & 4 & -3 \end{bmatrix}$ **(RWP 24, G-I)**
Exercise 3.5 (Short Question)	
1.	Find the value of λ for which the system of homogenous equations $x_1+4x_2+\lambda x_3=0$, $2x_1+x_2-3x_3=0,\ 3x_1+\lambda x_2-4x_3=0$ has a non-trivial solution.
Long Questions	
1.	Solve the following system of linear equations by Cramer's rule. **(i)** $2x+2y+z=3,\ 3x-2y-2z=1,\ 5x+y-3z=2$ **(LHR 24, G-II), (GRW 24, G-II)** **(ii)** $2x_1-x_2+x_3=8,\ x_1+2x_2+2x_3=6, x_1-2x_2-x_3=1$ **(SWL 24, G-II), (D.G.Khan 24, G-I)**
2.	Use matrices to solve the following systems. **(i)** $x-2y+z=-1, 3x+y-2z=4,\ y-z=1$ **(ii)** $2x_1+x_2+3x_3=3,\ x_1+x_2-2x_3=0,\ -3x_1-x_2+x_3=-4$ **(D.G. Khan 24, G-II)**
Chapter 4 (Quadratic Equations)	
Exercise 4.1 (Short Questions)	
1.	Solve the following equations by factorization: **(i)** $x^2+7x+10=0$ **(FSD 24, G-II)** **(ii)** $x(x+7)=(2x-1)(x+4)$ **(iii)** $\frac{a}{ax-1}+\frac{b}{bx-1}=a+b;\ x\neq\frac{1}{a},\ \frac{1}{b}$
2.	Solve the following equations by completing the square: **(i)** $x^2-2x-899=0$ **(D.G. Khan 24, G-I)** **(ii)** $x^2+4x-1085=0$ **(BWP 24, G-II)** **(iii)** $2x^2+12x-110=0$
3.	Solve the following equations by using quadratic formula: **(i)** $5x^2-13x+6=0$ **(MTN 24, G-I)** **(ii)** $15x^2+2ax-a^2=0$ **(iii)** $(a+b)x^2+(a+2b+c)x+b+c=0$
4.	Solve the equation $4^x=\frac{1}{2}$. **(MTN 24, G-I)**
Exercise 4.2 (Short Questions)	
1.	Define reciprocal equation.
2.	Define an exponential equation.
3.	Solve the following equations: **(i)** $x^{\frac{1}{2}}-x^{\frac{1}{4}}-6=0$ **(GRW 24, G-I), (SWL 24, G-II)** **(ii)** $x^4-6x^2+8=0$ **(SGD 24, G-II)** **(iii)** $x^{-2}-10=3x^{-1}$ **(RWP 24, G-II), (SWL 24, G-II)** **(iv)** $x^{\frac{2}{5}}+8=6x^{\frac{1}{5}}$
4.	Reduce $2x^4-3x^3-x^2-3x+2=0$ into quadratic equation.
5.	Reduce the equation $x^{\frac{2}{3}}+8=6x^{\frac{1}{3}}$ into quadratic form.
Long questions	
1.	Solve the equation: $4^{1+x}+4^{1-x}=10$
2.	Solve the equation: $(x+1)(x+2)(x+3)(x+4)=24$
3.	Solve: $3^{2x-1}-12.3^x+81=0$
4.	Solve the equation: $x^4-3x^3+4x^2-3x+1=0$
5.	Solve the equation: $\left(x-\frac{1}{x}\right)^2+3\left(x+\frac{1}{x}\right)=0$
Exercise 4.3 (Short Question)	
1.	Define radical equation.

Long Questions	
1.	Solve the equation: $\sqrt{x+7}+\sqrt{x+2}=\sqrt{6x+13}$
2.	Solve the equation: $(x+4)(x+1)=\sqrt{x^2+2x-15}+3x+31$
3.	Solve the equation: $\sqrt{3x^2-2x+9}+\sqrt{3x^2-2x-4}=13$
Exercise 4.4 (Short Questions)	
1.	Show that sum of cube roots of unity is zero.
2.	Prove that product of all the three cube roots of unity is one. **(SGD 24, G-II)**
3.	Find the three cube roots of $1,-8,-27$ **(GRW 24, G-II)**
4.	Prove that $\omega^{28}+\omega^{29}+1=0$ where $\omega^3=1$ **(LHR 24, G-I), (D.G.Khan 24, G-I), (D.G.Khan 24, G-II)**
5.	Evaluate $(1+\omega-\omega^2)(1-\omega+\omega^2)$
6.	Prove that $\left(\frac{1+\sqrt{-3}}{2}\right)^9+\left(\frac{1-\sqrt{-3}}{2}\right)^9=-2$
7.	Prove that $\left(-1+\sqrt{-3}\right)^4+\left(-1-\sqrt{-3}\right)^4=16$ **(BWP 24, G-II)**
8.	Show that: **(i)** $x^3-y^3=(x-y)(x-\omega y)(x-\omega^2 y)$ **(SWL 24, G-II)** **(ii)** $x^3+y^3+z^3-3xyz=(x+y+z)(x+\omega y+\omega^2 z)(x+\omega^2 y+\omega z)$ **(GRW 24, G-I)**
9.	Find the four fourth roots of 1, 16, 625 **(RWP 24, G-I), (MTN 24, G-I), (RWP 24, G-II)**
10.	Find the equation whose roots are 2ω and $2\omega^2$ where ω is a cube root of unity.
11.	Solve the equation $x^3+x^2+x+1=0$
Exercise 4.5 (Short Questions)	
1.	State the remainder and factor theorem.
2.	Use remainder theorem to find the remainder when x^2+3x+7 is divided by $x+1$. **(D.G. Khan24,G-II)**
3.	Show that $(x-2)$ is a factor of x^4-13x^2+36. **(GRW 24, G-I)**
4.	Using factor theorem to show that $x-a$ is a factor of x^n-a^n where n is a positive integer.
5.	When the polynomial x^3+2x^2+kx+4 is divided by $x-2$, the remainder is 14. Find the value of k. **(SGD 24, G-I)**
6.	Use synthetic division to show that $x=2$, $x=-3$ are the roots of $2x^4+7x^3-4x^2-27x-18$.
Long Questions	
1.	When $x^4+2x^3+kx^2+3$ is divided by $x-2$, the remainder is 1. Find the value of k. **(LHR 24, G-I)**
2.	Use synthetic division to show that $x=2$ is a root of x^3-7x+6. Find its other two roots also.
3.	Use synthetic division to find the values of p and q if $x+1$ and $x-2$ are the factors of the polynomial x^3+px^2+qx+6. **(MTN 24, G-I)**
4.	Find the values of a and b if -2 and 2 are the roots of the polynomial x^3-4x^2+ax+b. **(SGD 24, G-II), (FSD 24, G-II)**
Exercise 4.6 (Short Questions)	
1.	If α, β are the roots of $3x^2-2x+4=0$, find the values of **(i)** $\frac{1}{\alpha^2}+\frac{1}{\beta^2}$ **(GRW 24, G-II)** **(ii)** $\alpha^2-\beta^2$
2.	If α, β are the roots of $ax^2+bx+c=0$, $a\neq 0$ find the value of **(i)** $\alpha^2+\beta^2$ **(ii)** $(\alpha-\beta)^2$
3.	If α,β are the roots of $x^2-px-p-c=0$, prove that $(1+\alpha)(1+\beta)=1-c$. **(LHR 24, G-I), (SGD 24, G-II)**
4.	Find the condition that one root of $x^2+px+q=0$ is **(i)** Square of the other **(LHR 24, G-II)** **(ii)** additive inverse of the other **(iii)** multiplicative inverse of the other.
5.	If the roots of the equation $x^2-px+q=0$ differ by unity, prove that $p^2=4q+1$ **(LHR 24, G-I)**
Long Questions	
1.	If α,β are the roots of the equation $px^2+qx+q=0$, then prove that $\sqrt{\frac{\alpha}{\beta}}+\sqrt{\frac{\beta}{\alpha}}+\sqrt{\frac{q}{p}}=0$

2.	If α, β are the roots of the equation $ax^2+bx+c=0,\ a\neq 0,$ from the equation whose roots are $\alpha+\frac{1}{\alpha},\ \beta+\frac{1}{\beta}.$
3.	If α, β are the roots of $5x^2-x-2=0,$ from the equation whose roots are $\frac{3}{\alpha}$ and $\frac{3}{\beta}.$ **(FSD 24, G-I)**
4.	If α, β are the roots of $x^2-3x+5=0,$ from the equation whose roots are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}.$ **(LHR 24, G-II), (GRW 24, G-I), (RWP 24, G-I)**
Exercise 4.7 (Short Questions)	
1.	Discuss the nature of roots of the equations: **(i)** $9x^2-12x+4=0$ **(LHR 24, G-II)** **(ii)** $2x^2-5x+1=0$ **(FSD 24, G-II), (D.G.Khan 24, G-II)** **(iii)** $25x^2-30x+9=0$
2.	Show that the roots of the equation $x^2-2\left(m+\frac{1}{m}\right)x+3=0,\ m\neq 0$ are real. **(SGD 24, G-I)**
3.	Show that the roots of the equation $(b-c)x^2+(c-a)x+(a-b)=0,\ a,b,c\in Q$ will be real.
4.	Show that the roots of the equation $px^2-(p-q)x-q=0$ are rational. **(RWP 24, G-II)**
5.	For what values of m will the following equations have equal roots? **(i)** $(m+1)x^2+2(m+3)x+2m+3=0,\ m\neq -1$ **(ii)** $x^2-2(1+3m)x+7(3+2m)=0$ be equal? **(D.G. Khan 24, G-I)**
Long Questions	
1.	Show that the roots of $x^2+(mx+c)^2=a^2$ will be equal, if $c^2=a^2(1+m^2)$
2.	Show that the roots of $(mx+c)^2=4ax$ will be equal, if $c=\frac{a}{m},\ m\neq 0$ **(GRW 24, G-II)**
3.	Prove that $\frac{x^2}{a^2}+\frac{(mx+c)^2}{b^2}=1$ will have equal roots, if $c^2=a^2m^2+b^2,\ a\neq 0,\ b\neq 0$ **(RWP 24, G-II), (MTN 24, G-II)**
4.	Show that the roots of the equation $(a^2-bc)x^2+2(b^2-ca)x+c^2-ab=0$ will be equal, if either $a^3+b^3+c^3=3abc$ or $b=0.$
Exercise 4.8 (Short Questions)	
1.	Solve the system of equations: $x+y=5$ and $x^2+2y^2=17$ **(SWL 24, G-II)**
2.	Solve the system of equations: $(x-3)^2+y^2=5,\ 2x=y+6$
Long Questions	
1.	Solve the system of equations: $x+y=5,\ \frac{2}{x}+\frac{3}{y}=2,\ x\neq 0,\ y\neq 0$
2.	Solve the system of equations: $x^2+(y+1)^2=18,\ (x+2)^2+y^2=21$
Exercise 4.9 (Long Questions)	
1.	Solve the system of equations: $8x^2=y^2,\ x^2+2y^2=19$
2.	Solve the system of equations: $x^2-5xy+6y^2=0\ ;\ x^2+y^2=45$ **(FSD 24, G-I)**
3.	Solve the system of equations: $12x^2-11xy+2y^2=0,\ 2x^2+7xy=60$
4.	Solve the system of equations $y^2-7=2xy,\ 2x^2+3=xy$ **(SGD 24, G-I)**
Exercise 4.10 (Short Questions)	
1.	The sum of a positive number and its square is 380. Find the number.
2.	The sum of a positive number and its reciprocal is $\frac{26}{5}.$ Find the number.
3.	A number exceeds its square root by 56. Find the number.
4.	Find two consecutive numbers whose product is 132. **(FSD 24, G-II)**

Chapter 5 (Partial Fractions)

Exercise 5.1 (Short Questions)

1. Define:

(i) partial fraction with example. **(LHR 24, G-I), (GRW 24, G-II)**

(ii) rational fraction with example. **(FSD 24, G-I), (FSD 24, G-II), (MTN 24, G-I), (SGD 24, G-II)**

(iii) proper rational fraction with example. **(LHR 24, G-II), (GRW 24, G-I)**

(iv) improper rational fraction with example. **(GRW 24, G-I), (SWL 24, G-II)**

(v) an identity with example. **(RWP 24, G-II), (MTN 24, G-II), (D.G.Khan 24, G-I)**

(vi) conditional equation with example. **(SGD 24, G-I), (RWP 24, G-I), (BWP 24, G-II)**

2. Resolve $\frac{7x+25}{(x+3)(x+4)}$ into partial fractions. **(LHR 24, G-I), (FSD 24, G-II), (D.G.Khan 24, G-II)**

3. Resolve $\frac{1}{x^2-1}$ into partial fractions. **(BWP 24, G-II), (RWP 24, G-II)**

4. Resolve $\frac{x^2+1}{(x+1)(x-1)}$ into partial fractions. **(GRW 24, G-I), (SWL 24, G-II)**

5. Resolve into partial fraction without determining the constants $\frac{3x^2-4x-5}{(x-2)(x^2+7x+10)}$ **(SGD 24, G-II)**

6. Change $\frac{6x^3+5x^2-7}{2x^2-x-1}$ in to proper fraction. **(D.G. Khan 24, G-I)**

7. If $\frac{x}{(x-a)(x-b)(x-c)}=\frac{A}{x-a}+\frac{B}{x-b}+\frac{C}{x-c}$, find the value of A.

Long Questions

1. Resolve $\frac{x^2-10x+13}{(x-1)(x^2-5x+6)}$ into partial fractions. **(SWL 24, G-II)**

2. Resolve into partial fractions $\frac{1}{(1-ax)(1-bx)(1-cx)}$ **(D.G. Khan 24, G-I)**

Exercise 5.2 (Short Question)

1. Resolve $\frac{2x+1}{(x+3)(x-1)(x+2)^2}$ into partial fractions without finding the values of unknown constants.

Long Questions

1. Resolve $\frac{5x^2-2x+3}{(x+2)^3}$ into partial fractions. **(GRW 24, G-II)**

2. Resolve $\frac{1}{(x-3)^2(x+1)}$ into partial fractions. **(LHR 24, G-I)**

3. Resolve $\frac{x-1}{(x-2)(x+1)^3}$ into partial fractions.

4. Resolve $\frac{4x^3}{(x^2-1)(x+1)^2}$ into partial fractions.

Exercise 5.3 (Short Question)

1. Resolve $\frac{x^2+2x+2}{(x^2+3)(x+1)(x-1)}$ into partial fractions without finding the values of unknown constants.

Long Questions

1. Resolve $\frac{9x-7}{(x^2+1)(x+3)}$ into partial fractions.

2. Resolve $\frac{x^2+15}{(x^2+2x+5)(x-1)}$ into partial fractions.

3. Resolve $\frac{x^2+1}{x^3+1}$ into partial fractions. **(MTN 24, G-II), (BWP 24, G-II)**

4. Resolve $\frac{x^4}{1-x^4}$ into partial fractions. **(LHR 24, G-II), (SGD 24, G-I), (FSD 24, G-I), (FSD 24, G-II)**

5. Resolve into partial fractions $\frac{1}{(x-1)^2(x^2+2)}$ **(MTN 24, G-I), (RWP 24, G-I)**

6. Resolve $\frac{x^2-2x+3}{x^4+x^2+1}$ into partial fractions.

Exercise 5.4 (Short Question)	
1.	Resolve $\frac{8x^2}{(x^2+1)^2(1-x)^2}$ into partial fractions without finding the values of unknown constants. **(MTN 24, G-I)**

Long Questions			
1.	Resolve $\frac{4x^2}{(x^2+1)^2(x-1)}$ into partial fractions.	**2.**	Resolve $\frac{2x-5}{(x^2+2)^2(x-2)}$ into partial fractions.

Chapter 6 (Sequences and Series)

Exercise 6.1 (Short Questions)	
1.	Write the first four terms of the following sequences, if: **(i)** $a_n=(-1)^n n^2$ **(D.G.Khan 24, G-II)** **(ii)** $a_n-a_{n-1}=n+2,\ a_1=2$ **(GRW 24, G-II)** **(iii)** $a_n=na_{n-1},\ a_1=1$ **(iv)** $a_n=\frac{n}{2n+1}$ **(RWP 24, G-I)**
2.	Find the next two terms of the following sequences: **(i)** $1,3,7,15,31,\ldots$ **(LHR 24, G-II), (D.G.Khan 24, G-I)** **(ii)** $-1,2,12,40,\ldots$ **(iii)** $1,-3,5,-7,9,-11,\ldots$

Exercise 6.2 (Short Questions)	
1.	Define arithmetic progression. **(FSD 24, G-II)**
2.	Prove that nth term of A.P. is $a_n=a_1+(n-1)d$ where a_1 and d are the first term and common difference respectively.
3.	Find the number of terms in the A.P. if; $a_1=3,\ d=7$ and $a_n=59$. **(LHR 24, G-I)**
4.	If $a_{n-3}=2n-5$, find the nth term of the sequence. **(MTN 24, G-II), (D.G.Khan 24, G-I)**
5.	Find the 13th term of the sequence $x,1,2-x,3-2x,\ldots$
6.	Find the 18th term of the A.P. if its 6th term is 19 and the 9th term is 31.
7.	Which term of the A.P. $5,2,-1,\ldots$ is -85? **(GRW 24, G-I), (D.G.Khan 24, G-II)**
8.	How many terms are there in the A.P. in which $a_1=11,\ a_n=68,\ d=3$? **(LHR 24, G-II), (MTN 24, G-I)**
9.	If the nth term of the A.P. is $3n-1$, find the A.P.
10.	Determine whether -19 is the term of the A.P. $17,13,9,\ldots$ or not. **(SGD 24, G-I), (RWP 24, G-I)**
11.	Find the nth term of the sequence $\left(\frac{4}{3}\right)^2,\left(\frac{7}{3}\right)^2,\left(\frac{10}{3}\right)^2,\ldots$
12.	If $\frac{1}{a},\frac{1}{b}$ and $\frac{1}{c}$ are in A.P., show that $b=\frac{2ac}{a+c}$ **(SGD 24, G-II)**
13.	If $\frac{1}{a},\frac{1}{b}$ and $\frac{1}{c}$ are in A.P., show that the common difference is $\frac{a-c}{2ac}$.

Exercise 6.3 (Short Questions)	
1.	Prove that $A=\frac{a+b}{2}$, where A is A.M. between two numbers a and b.
2.	Find A.M. between: **(i)** $x-3$ and $x+5$ **(D.G.Khan 24, G-I)** **(ii)** $1-x+x^2$ and $1+x+x^2$
3.	If 5, 8 are two A.Ms between a and b, find a and b. **(GRW 24, G-II), (MTN 24, G-II)**
4.	Find three A.Ms between 3 and 11.
5.	Find three A.Ms between $\sqrt{2}$ and $3\sqrt{2}$. **(LHR 24, G-II), (FSD 24, G-II)**

Long Questions	
1.	Find n so that $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ may be the A.M. between a and b. **(LHR 24, G-I), (D.G.Khan 24, G-II)**
2.	Show that the sum of n A.Ms. between a and b is equal to n times their A.M. **(MTN 24, G-I), (SWL 24, G-II)**

Exercise 6.4 (Short Questions)	
1.	How many terms of the series $-9-6-3+0+\ldots$ amount to 66? **(SGD 24, G-II)**
2.	Sum the series: **(i)** $-3+(-1)+1+3+5+\ldots+a_{16}$ **(ii)** $\frac{3}{\sqrt{2}}+2\sqrt{2}+\frac{5}{\sqrt{2}}+\ldots a_{13}$ **(RWP 24, G-I)** **(iii)** $-8-3\frac{1}{2}+1+\ldots+a_{11}$ **(iv)** $(x-a)+(x+a)+(x+3a)+\ldots$ to n terms **(v)** $\frac{1}{1+\sqrt{x}}+\frac{1}{1-x}+\frac{1}{1-\sqrt{x}}+\ldots$ to n terms
3.	How many terms of the series $-7+(-5)+(-3)+\ldots\ldots$ amount to 65? **(RWP 24, G-II)**
4.	Sum the series: $3+5-7+9+11-13+15+17-19\ldots\ldots$to$3n$ terms. **(GRW 24, G-I)**
5.	Find the sum of 20 terms of the series whose rth term is $3r+1$.
6.	Obtain the sum of all integers in the first 1000 integers which are neither divisible by 5 nor by 2.
Long Questions	
1.	If $S_n=n(2n-1)$, then find the series. **(SGD 24, G-II), (BWP 24, G-II)**
2.	The ratio of the sums of n terms of two series in A.P. is $3n+2:n+1$. Find the ratio of their 8th terms.
3.	The sum of 9 terms of an A.P. is 171 and its eighth term is 31. Find the series.
4.	The sum of three numbers in an A.P. is 24 and their product is 440. Find the numbers. **(MTN 24, G-II)**
5.	Find the five numbers in A.P. whose sum is 25 and the sum of whose squares is 135.
6.	The sum of the 6th and 8th terms of an A.P. is 40 and the product of 4th and 7th terms is 220. Find the A.P.
Exercise 6.6 (Short Questions)	
1.	Find the 5th term of the G.P. $3,6,12,\ldots$ **(RWP 24, G-I)**
2.	Find the 11th term of the sequence, $1+i,2,\frac{4}{1+i},\ldots$
3.	Find the 12th term of $1+i,2i,-2+2i,\ldots$ **(LHR 24, G-II)**
4.	Which term of the sequence $x^2-y^2,x+y,\frac{x+y}{x-y},\ldots$ is $\frac{x+y}{(x-y)^9}$?
5.	If a, b, c, d are in G.P., prove that $a-b,b-c,c-d$ are in G.P.
6.	Show that the reciprocals of the terms of the geometric sequence $a_1,a_1r^2,a_1r^4,----$ form another geometric sequence. **(D.G. Khan 24, G-I)**
7.	Find the nth term of the geometric sequence if; $\frac{a_5}{a_3}=\frac{4}{9}$ and $a_2=\frac{4}{9}$.
8.	If $\frac{1}{a},\frac{1}{b}$ and $\frac{1}{c}$ are in G.P. show that the common ratio is $\pm\sqrt{\frac{a}{c}}$ **(LHR 24, G-I), (SWL 24, G-II), (D.G.Khan 24, G-II)**
Long Questions	
1.	Find a_n of a G.P if $a_4=\frac{8}{27}$ and $a_7=-\frac{64}{729}$ **(GRW 24, G-I)**
2.	Find three, consecutive numbers in G.P. whose sum is 26 and their product is 216.
3.	If three consecutive numbers in A.P. are increased by 1, 4, 15 respectively, the resulting numbers are in G.P. Find the original numbers if their sum is 6.
Exercise 6.7 (Short Questions)	
1.	Find G.M. between $-2i$ and $8i$ **(SGD 24, G-I)**
2.	Insert two G.Ms. between 2 and 16 **(RWP 24, G-II)**
3.	Insert three G.Ms. between 2 and 32
4.	Insert four real geometric means between 3 and 96.

	Long Questions
1.	For what value of n, $\frac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is the positive geometric mean between a and b?
2.	The A.M of two positive integral numbers exceeds their (positive) G.M by 2 and their sum is 20, find the numbers. **(SGD 24, G-I)**
3.	The A.M between the two numbers is 5 and their positive G.M. is 4 find the numbers. **(RWP 24, G-II), (SGD 24, G-II)**
	Exercise 6.8 (Short Questions)
1.	Find the first term of the geometric series if $a_n=(-3)\left(\frac{2}{5}\right)^n$ **(SWL 24, G-II)**
2.	Find the sum of first 15 terms of the geometric sequence $1,\frac{1}{3},\frac{1}{9},\ldots$ **(RWP 24, G-II)**
3.	Find the sums of the following infinite geometric series: **(i)** $\frac{1}{5}+\frac{1}{25}+\frac{1}{125}+\cdots$ **(ii)** $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots$ **(MTN 24, G-I)** **(iii)** $\frac{9}{4}+\frac{3}{2}+1+\frac{2}{3}+\cdots$ **(LHR 24, G-I), (GRW 24, G-II)** **(iv)** $2+1+0.5+\cdots$ **(v)** $4+2\sqrt{2}+2+\sqrt{2}+1+\cdots$ **(SGD 24, G-I)** **(vi)** $2,\sqrt{2},1,\cdots$ **(GRW 24, G-I)**
4.	Find vulgar fractions equivalent to the following recurring decimals. **(i)** $1.\dot{3}\dot{4}$ **(ii)** $0.\dot{7}$ **(iii)** $1.5\dot{3}$ **(FSD 24, G-I)** **(iii)** $1.1\dot{4}\dot{7}$
5.	If $y=\frac{x}{2}+\frac{1}{4}x^2+\frac{1}{8}x^3+\ldots$ and if $0<x<2$, then prove that $x=\frac{2y}{1+y}$
6.	If $y=\frac{2}{3}x+\frac{4}{9}x^2+\frac{8}{27}x^3+\cdots$ and if $0<x<\frac{3}{2}$, then show that $x=\frac{3y}{2(1+y)}$ **(D.G.Khan 24, G-I)**
7.	If $y=1+\frac{x}{2}+\frac{x^2}{4}+\cdots$ **(i)** Show that $x=2\left(\frac{y-1}{y}\right)$ **(ii)** Find the interval in which the series is convergent. **(MTN 24, G-II)**
	Long Questions
1.	Sum to n terms, the series: **(i)** $0.2+0.22+0.222+\cdots$ **(ii)** $3+33+333+\cdots$
2.	Sum the series $2+(1-i)+\left(\frac{1}{i}\right)+\cdots$ to 8 terms. **(FSD 24, G-II)**
3.	Find the sum to infinity of the series; $r+(1+k)r^2+(1+k+k^2)r^3+\cdots$ r and k being proper fractions.
4.	The sum of an infinite geometric series is 9 and the sum of the squares of its terms is $\frac{81}{5}$. Find the series. **(LHR 24, G-II), (GRW 24, G-II)**
	Exercise 6.10 (Short Questions)
1.	Find the nth and 8th term of H.P. $\frac{1}{2},\frac{1}{5},\frac{1}{8},\cdots$ **(GRW 24, G-II)**
2.	Find the 12th terms of the harmonic sequences $\frac{1}{3},\frac{2}{9},\frac{1}{6},\cdots$ **(SGD 24, G-I), (FSD 24, G-I)**
3.	If the 7th and 10th terms of an H.P. are $\frac{1}{3}$ and $\frac{5}{21}$ respectively, find its 14th term. **(RWP 24, G-II)**
4.	If 5 is the harmonic mean between 2 and b, find b. **(LHR 24, G-I), (SGD 24, G-II)**

5.	If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k. **(GRW 24, G-I), (MTN 24, G-II)**
6.	If A, G and H are the arithmetic, geometric and harmonic means between a and b respectively, show that $G^2 = AH$. **(BWP 24, G-II)**
7.	Show that $G^2 = AH$ if $a = 2i,\ b = 4i$ **(D.G. Khan 24, G-II), (SWL 24, G-II)**
8.	Find A, G, H and verify that $A < G < H\ (G < 0)$, if $a = -2,\ b = -8$.
	Long Questions
1.	Insert four harmonic means between $\frac{7}{3}$ and $\frac{7}{11}$.
2.	The first term of an H.P. is $-\frac{1}{3}$ and the fifth term is $\frac{1}{5}$. Find its 9th term.
3.	Find n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be H.M. between a and b.
	Exercise 6.11 (Short Questions)
1.	Write formulas for **(i)** $\sum_{k=1}^{n} k$ **(ii)** $\sum_{k=1}^{n} k^2$ **(iii)** $\sum_{k=1}^{n} k^3$
2.	Find the sum to n terms of the series whose nth term is n^2+4n+1.
	Long Question
1.	Sum the following series upto n terms: **(i)** $1\times3+3\times6+5\times9+\cdots$ **(ii)** $3\times2^2+5\times3^2+7\times4^2+\cdots$ **(iii)** $2+(2+5)+(2+5+8)+\cdots$
	Chapter 7 (Permutation, Combination and Probability)
	Exercise 7.1 (Short Questions)
1.	Evaluate: **(i)** $\frac{8!}{6!}$ **(FSD 24, G-I)** **(ii)** $\frac{8!}{4!2!}$ **(FSD 24, G-II)** **(iii)** $4!.0!.1!$
2.	Write each of the following in the factorial form: **(i)** $\frac{10.9}{2.1}$ **(ii)** $\frac{8.7.6}{3.2.1}$ **(iii)** $n(n-1)(n-2)$ **(iv)** $(n+2)(n+1)(n)$ **(v)** $\frac{(n+1)(n)(n-1)}{3.2.1}$ **(LHR 24, G-I)** **(vi)** $n(n-1)(n-2)\ldots(n-r+1)$ **(BWP 24, G-II)**
	Exercise 7.2 (Short Questions)
1.	Find the value of n when: **(i)** ${}^nP_2 = 30$ **(D.G.Khan 24, G-II)** **(ii)** ${}^{11}P_n = 11.10.9$ **(GRW 24, G-II)** **(iii)** ${}^nP_4 : {}^{n-1}P_3 = 9:1$ **(SGD 24, G-II), (D.G.Khan 24, G-I)**
2.	Prove that: ${}^nP_r = n.{}^{n-1}P_{r-1}$ **(LHR 24, G-I)**
3.	How many signals can be given by 6 flags of different colours when any number of flags can be used at a time?
4.	How many words can be formed from the letters of the word PLANE using all letters when no letter is to be repeated?
5.	How many 3-digit numbers can be formed by using each one of the digits 2, 3, 5, 7, 9 only once?
6.	How many 5-digit multiples of 5 can be formed from the digits 2, 3, 5, 7, 9, when no digit is repeated.
7.	In how many ways can 8 books including 2 on English be arranged on a shelf in such a way that the English books are never together?
8.	In how many ways can 5 boys and 4 girls be seated on a bench so that the girls and the boys occupy alternate seats?

	Long Question
1.	Find the numbers greater than 23000 that can be formed from the digits 1, 2, 3, 5, 6, without repeating any digit.
	Exercise 7.3 (Short Questions)
1.	How many arrangements of the letters of the following words, taken all together, can be made: **(i)** PAKPATTAN **(ii)** PAKISTAN **(ii)** MATHEMATICS
2.	How many arrangements of the letters of the word ATTACKED can be made if each arrangement begins with C and ends with K?
3.	How many permutations of the letters of the word PANAMA can be made, if P is to the first letter in each arrangement? **(GRW 24, G-I)**
4.	The Governor of the Punjab calls a meeting of 12 officers. In how many ways can they be seated at a round table?
5.	In how many ways can 4 keys be arranged on a circular key ring? **(SGD 24, G-I), (MTN 24, G-II)**
6.	How many necklaces can be made from 6 beads of different colours?
	Long Question
1.	How many numbers greater than 1000,000 can be formed from the digits 0, 2, 2, 2, 3, 4, 4?
	Exercise 7.4 (Short Questions)
1.	Prove that: ${}^nC_r = {}^nC_{n-r}$ **(GRW 24, G-II)**
2.	Find the value of n, when **(i)** ${}^nC_8 = {}^nC_{12}$, find n. **(SWL 24, G-II), (RWP 24, G-II), (MTN 24, G-I)** **(ii)** ${}^nC_{10} = \frac{12\times11}{2!}$ **(FSD 24, G-I), (D.G.Khan 24, G-I)** **(iii)** ${}^nC_{12} = {}^nC_6$ **(RWP 24, G-I)**
3.	How many (a) diagonals and (b) triangles can be formed by joining the vertices of the polygon having: **(i)** 6 sides **(GRW 24, G-I), (FSD 24, G-II), (D.G. Khan 24, G-II)** **(ii)** 8 sides **(SWL 24, G-II)** **(iii)** 12 sides **(MTN 24, G-II)**
4.	In how many ways can a hockey team of 11 players be selected out of 15 players? How many of them will include a particular player?
5.	Show that: ${}^{16}C_{11} + {}^{16}C_{10} = {}^{17}C_{11}$ **(LHR 24, G-II)**
	Long Questions
1.	Prove that: ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$ **(GRW 24, G-I), (SGD 24, G-I), (RWP 24, G-II), (D.G.Khan 24, G-I)**
2.	Find the values of n and r, when **(i)** ${}^nC_r = 35$ and ${}^nP_r = 210$ **(MTN 24, G-I), (BWP 24, G-II)** **(ii)** ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3:6:11$ **(LHR 24, G-II), (SGD 24, G-II)**
3.	Prove that: ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$ **(SWL 24, G-II), (FSD 24, G-I)**
	Exercise 7.5 (Short Questions)
1.	What is sample space and event? **(LHR 24, G-II), (FSD 24, G-I), (FSD 24, G-II)**
2.	A dice is rolled. What is the probability that the dots on the top are greater than 4? **(D.G.Khan 24, G-II)**
3.	What is the probability that a slip of number divisible by 4 is picked from the slips bearing number $1,2,3,\ldots,10$? **(GRW 24, G-II)**
4.	A die is rolled, what is the probability that the top shows dot 3 or 4. **(SGD 24, G-II)**
5.	Determine the probability of gettting 2 heads and 2 tails when a coin is tossed four times. **(D.G. Khan 24, G-I)**
	Exercise 7.7 (Short Questions)
1.	If sample space $=\{1,2,3,\ldots,9\}$, Event $A=\{2,4,6,8\}$ and Event $B=\{1,3,5\}$, find $P(A\cup B)$.
2.	Two dice are thrown. What is the probability that the sum of the number of dots appearing on them is 4 or 6?

3.	If $P(A)=\frac{1}{2};\ P(B)=\frac{1}{2};\ P(A\cap B)=\frac{1}{3}$, then find $P(A\cup B)$. **(MTN 24, G-II)**
Long Questions	
1.	A dice is thrown. Find the probability that dots on the top are prime numbers or odd numbers. **(RWP 24, G-I)**
2.	A natural number is chosen out of the first fifty natural numbers. What is the probability that the chosen number is multiple of 3 or 5? **(D.G. Khan 24, G-II), (MTN 24, G-II)**
3.	A card is drawn from a deck of 52 playing cards. What is the probability that it is a diamond card or an ace? **(RWP 24, G-II), (FSD 24, G-II)**
4.	There are 10 girls and 20 boys in a class. Half of the boys and half of the girls have blue eyes. Find the probability that one student chosen as monitor is either a girl or has blue eyes.
Exercise 7.8 (Short Question)	
1.	Determine the probability of getting 2 heads in two successive tosses of a balanced coin. **(LHR 24, G-I), (MTN 24, G-I)**
Long Questions	
1.	A die is rolled twice: Event E_1 is the appearance of even number of dots and event E_2 is the appearance of more than 4 dots. Prove that: $P(E_1\cap E_2)=P(E_1).P(E_2)$ **(LHR 24, G-I)**
2.	Two coins are tossed twice each. Find the probability that the head appears on the first toss and the same faces appear in the two tosses. **(BWP 24, G-II)**
3.	Two dice are thrown twice. What is probability that sum of the dots shown in the first throw is 7 and that of the second throw is 11?
4.	A fair die is thrown twice. Find the probability that a prime number of dots appear in the first thrown and the number of dots in the second throw is less than 5.
Chapter 8 (Mathematical Induction and Binomial Theorem)	
Exercise 8.1 (Short Questions)	
1.	State the principle of mathematical induction. **(LHR 24, G-II), (SGD 24, G-II)**
2.	Prove the formula $2+4+6+\cdots+2n=n(n+1)$ **(SGD 24, G-II)**
3.	Prove that the formula $3+3\cdot5+3\cdot5^2+\cdots\cdots+3\cdot5^n=\frac{3\left(5^{n+1}-1\right)}{4}$ whenever n is a non-negative integer. **(RWP 24, G-II)**
4.	Use mathematical induction to prove that $1+3+5+\cdots\cdots+(2n-1)=n^2$ is true for $n=1$ and $n=2$.
5.	Use mathematical induction to prove that $1+4+7+\cdots\cdots+(3n-2)=\frac{n(3n-1)}{2}$ is true for $n=1$ and $n=2$.
6.	Prove that the formula $\frac{1}{1\times2}+\frac{1}{2\times3}+\frac{1}{3\times4}+\cdots\cdots+\frac{1}{n(n+1)}=1-\frac{1}{n+1}$ is true for $n=1,\ 2$.
7.	Show that n^3-n is divisible by 6 for $n=2,3$.
8.	Show that 5^n-1 is divisible by 4 if $n=4,5$. **(FSD 24, G-I)**
9.	Show that 5^n-2^n is divided by 3 for $n=3,4$. **(FSD 24, G-II)**
10.	Show that 8.10^n-2 is divisible by 6 for $n=1$ and $n=2$. **(LHR 24, G-I)**
11.	Show that $\frac{n^3+2n}{3}$ represents an integer for $n=2,\ 3$.
12.	Prove that the inequality $n^2>n+3$ for $n=3,4$. **(GRW 24, G-II)**
13.	Prove that $n!>2^n-1$ for $n=4,\ 5$. **(LHR 24, G-II), (RWP 24, G-I)**
14.	Prove that $n!>n^2$ for $n=4,\ 5$. **(GRW 24, G-I)**
15.	Show that inequality $4^n>3^n+4$ holds for $n=2,\ 3$. **(D.G.Khan 24, G-II)**
Long Questions	
1.	Show that: $\frac{n^3+2n}{3}$ represents an integer $\forall n\in N$ **(GRW 24, G-I)**

2. Use mathematical induction to prove the following formulae for every positive integer n.

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

(ii) $1^2+3^2+5^2+\ldots+(2n-1)^2=\frac{n(4n^2-1)}{3}$

(iii) $\binom{3}{3}+\binom{4}{3}+\binom{5}{3}+\ldots+\binom{n+2}{3}=\binom{n+3}{4}$

(iv) $x+y$ is a factor of $x^{2n-1}+y^{2n-1}$; $(x\neq -y)$

3. Use the principle of extended mathematical induction to prove that $n!>n^2$ for integral values of $n\geq 4$.

Exercise 8.2 (Short Questions)

1. Using binomial theorem, expand the following:

(i) $(a+2b)^5$ **(ii)** $\left(3a-\frac{x}{3a}\right)^4$ **(MTN 24, G-II)** **(iii)** $\left(\frac{x}{2y}-\frac{2y}{x}\right)^8$

2. Calculate the following by means of binomial theorem:

(i) $(0.97)^3$ **(BWP 24, G-II), (D.G.Khan 24, G-I), (D.G.Khan 24, G-II)**

(ii) $(2.02)^4$ **(LHR 24, G-II), (RWP 24, G-I), (RWP 24, G-II)**

(iii) $(9.9)^5$ **(GRW 24, G-II)**

(iv) $(21)^5$ **(MTN 24, G-I)**

3. Find the general term of $\left(\frac{a}{2}-\frac{2}{3a}\right)^6$ **(SGD 24, G-II)**

4. Find the specified term in the expansion of $\left(\frac{3}{2}x-\frac{1}{3x}\right)^{11}$

(i) the fifth term **(ii)** the sixth term from the end **(SWL 24, G-II)**

5. Find the term involving:

(i) x^{-2} in the expansion of $\left(x-\frac{2}{x^2}\right)^{13}$ **(ii)** a^4 in the expansion of $\left(\frac{2}{x}-a\right)^9$ **(GRW 24, G-I)**

(iii) y^3 in the expansion of $\left(x-\sqrt{y}\right)^{11}$

6. Find the coefficient of x^5 in the expansion of $\left(x^2-\frac{3}{2x}\right)^{10}$ **(SGD 24, G-I), (RWP 24, G-II)**

7. Determine the middle term in the expansions of $\left(\frac{1}{x}-\frac{x^2}{2}\right)^{12}$ **(FSD 24, G-I), (FSD 24, G-II)**

Long Questions

1. Find 6^{th} term in the expansion of $\left(x^2-\frac{3}{2x}\right)^{10}$ **(LHR 24, G-I)**

2. Find the term independent of x in the following expansions:

(i) $\left(x-\frac{2}{x}\right)^{10}$ **(ii)** $\left(\sqrt{x}+\frac{1}{2x^2}\right)^{10}$ **(GRW 24, G-II)** **(iii)** $\left(1+x^2\right)^3\left(1+\frac{1}{x^2}\right)^4$

3.	Find $(2n+1)^{\text{th}}$ term from the end in the expansion of $\left(x-\frac{1}{2x}\right)^{3n}$
4.	Show that: $\binom{n}{1}+\binom{n}{3}+\binom{n}{5}+\ldots+\binom{n}{n-1}=2^{n-1}$

Exercise 8.3 (Short Questions)

1.	Expand $(8-5x)^{-2/3}$ upto three terms. **(D.G. Khan 24, G-I), (SWL 24, G-II)**
2.	Evaluate $\sqrt[3]{30}$ correct to three places of decimal.
3.	Expand the following upto 4 terms, taking the values of x such that the expansion in each case is valid. **(i)** $(1-2x)^{\frac{1}{3}}$ **(FSD 24, G-I), (FSD 24, G-II)** **(ii)** $(1-x)^{1/2}$ **(GRW 24, G-II), (RWP 24, G-II), (BWP 24, G-II), (D.G.Khan 24, G-II)** **(iii)** $(1+x)^{-1/3}$ **(MTN 24, G-I)** **(iv)** $(4-3x)^{1/2}$ **(v)** $(8-2x)^{-1}$ **(v)** $(2-3x)^{-2}$
4.	Using Binomial theorem find the value of the following to three places of decimals: **(i)** $\sqrt{99}$ **(ii)** $(1.03)^{1/3}$ **(iii)** $\sqrt[3]{65}$ **(LHR 24, G-I)** **(iv)** $\sqrt[4]{17}$ **(v)** $\sqrt[5]{31}$ **(SWL 24, G-II)**
5.	If x is so small that its square and higher powers can be neglected, then show that: **(i)** $\frac{1-x}{\sqrt{1+x}}\approx 1-\frac{3}{2}x$ **(D.G.Khan 24, G-I)** **(ii)** $\frac{\sqrt{1+2x}}{\sqrt{1-x}}\approx 1+\frac{3}{2}x$

Long Questions

1.	If x is so small that is cube and higher powers can be neglected, then show that : $\sqrt{\frac{1-x}{1+x}}\approx 1-x+\frac{x^2}{2}$ **(LHR 24, G-II), (RWP 24, G-I)**
2.	If x is so small that its square and higher powers can be neglected, then show that $\frac{(1+x)^{1/2}(4-3x)^{3/2}}{(8+5x)^{1/3}}\approx 4\left(1-\frac{5x}{6}\right)$ **(FSD 24, G-II)**
3.	Find the coefficient of x^n in the expansion of $\frac{(1+x)^2}{(1-x)^3}$
4.	If x is very nearly equal 1, then prove that $px^p-qx^q\approx(p-q)x^{p+q}$ **(SWL 24, G-II)**
5.	Identify the series as binomial expansion and find the sum of $1-\frac{1}{2}.\frac{1}{3}+\frac{1.3}{2.4}\left(\frac{1}{3}\right)^2-\frac{1.3.5}{2.4.6}\left(\frac{1}{3}\right)^3+\ldots$
6.	Use binomial theorem to show that $1+\frac{1}{4}+\frac{1.3}{4.8}+\frac{1.3.5}{4.8.12}+\ldots=\sqrt{2}$ **(BWP 24, G-II)**
7.	If $y=\frac{1}{3}+\frac{1.3}{2!}\left(\frac{1}{3}\right)^2+\frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3+\cdots$, then prove that $y^2+2y-2=0$ **(LHR 24, G-I), (SGD 24, G-I)**
8.	If $2y=\frac{1}{2^2}+\frac{1.3}{2!}.\frac{1}{2^4}+\frac{1.3.5}{3!}.\frac{1}{2^6}+\ldots$, then prove that $4y^2+4y-1=0$ **(SGD 24, G-II), (FSD 24, G-I)**

Chapter 9 (Fundamentals of Trigonometry)

Exercise 9.1 (Short Questions)

1.	Define Degree and Radian measure of an angle. **(GRW 24, G-I), (FSD 24, G-II)**	**2.**	Convert $18^\circ 6' 21''$ to decimal form.
3.	Convert 21.256° into $D^\circ M' S''$ form.	**4.**	Find θ, when $l=3.2\text{m}$, $r=2\text{m}$
5.	**(i)** Express $75^\circ 6' 30''$ in radian. **(FSD 24, G-II)** **(ii)** Convert $54^\circ 45'$ into radians. **(LHR 24, G-II)** **(iii)** Express $\theta=120^\circ 40''$ in radians. **(SWL 24, G-II)**		

6.	**(i)** Convert $\frac{19\pi}{32}$ radians into degree. **(ii)** Convert $\frac{9\pi}{5}$ into the measure of Sexagesimal System. **(BWP 24, G-II)**		
7.	Find ℓ, when $\theta = 65^{\circ}20'$, $r = 18mm$ **(D.G.Khan 24, G-II)**	**8.**	Find r, when $\ell = 56\ cm$, $\theta = 45^{\circ}$ **(RWP 24, G-II)**
9.	What is the length of the arc intercepted on a circle of radius 14cm by the arms of a central angle of 45°? **(LHR 24, G-II)**		
10.	The pendulum of a clock is 20 cm long and it swings through an angle of 20° each second. How far does the tip of the pendulum move in 1 second?		
	Long Questions		
1.	A railway train is running on a circular track of radius 500 meters at the rate of 30 km per hour. Through what angle will it turn in 10 sec?		
2.	A horse is tethered to a peg by a rope of 9 meters length and it can move in a circle with the peg as centre. If the horse moves along the circumference of the circle, keeping the rope tight, how far will it have gone when the rope has turned through an angle of 70° ?		
3.	A circular wire of radius 6 cm is cut straightened and then bent so as to lie along the circumference of a hoop of radius 24 cm. Find the measure of the angle which it subtends at the centre of the hoop. **(RWP 24, G-I)**		
4.	Show that area of a sector of a circular region of radius r is $\frac{1}{2}r^2\theta$, where θ is the circular measure of the central angle of the sector. **(LHR 24, G-II)**		
5.	Two cities A and B lie on the equator such that their longitudes are 45° E and 25° W respectively. Find the distance between the two cities, taking radius of the earth as 6400 kms.		
	Exercise 9.2 (Short Questions)		
1.	Define angle and angle in standard position.		
2.	Define quadrantal angle.		
3.	State fundamental identities. **(SGD 24, G-II)**		
4.	If $\sin\theta = -\frac{3}{4}$ and $\pi < \theta < \frac{3\pi}{2}$, find $\cos\theta$.		
5.	$\sin\theta = \frac{12}{13}$, terminal arm of the angle is in quadrant. Find the values of $\sec\theta, \cos\theta$. **(GRW 24, G-I)**		
6.	If $\cos\theta = \frac{9}{41}$ and the terminal arm of the angle is in quadrant IV, find the values of the remaining trigonometric functions.		
7.	For any real number θ, prove that $1 + \tan^2\theta = \sec^2\theta$		
	Long Questions		
1.	If $\tan\theta = -\frac{1}{3}$, and terminal arm of angle θ is in quadrant II. Find the values of remaining trigonometric functions. **(GRW 24, G-I)**		
2.	If $\cot\theta = \frac{15}{8}$ and the terminal arm of the angle is not in quadrant I, find the values of $\cos\theta$ and $\cos ec\theta$.		
3.	If $\cos ec\theta = \frac{m^2+1}{2m}$ and $m > 0\left(0 < \pi < \frac{\pi}{2}\right)$, find the values of remaining trigonometric ratios. **(SGD 24, G-II), (FSD 24, G-II)**		

4. If $\tan\theta = \frac{1}{\sqrt{7}}$ and the terminal arm of the angle is not in the III quadrant, find the value of $\frac{\cos ec^2\theta - \sec^2\theta}{\cos ec^2\theta + \sec^2\theta}$.

5. If $\cot\theta = \frac{5}{2}$ and the terminal arm of the angle is in the I quadrant, find the value of $\frac{3\sin\theta + 4\cos\theta}{\cos\theta - \sin\theta}$. **(RWP 24, G-II), (D.G.Khan 24, G-I)**

Exercise 9.3 (Short Questions)

1. Verify the following.

(i) $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ = \sin 30^\circ$ **(ii)** $\sin^2\frac{\pi}{6} + \sin^2\frac{\pi}{3} + \tan^2\frac{\pi}{4} = 2$ **(MTN 24, G-II)**

(iii) $2\sin 45^\circ + \frac{1}{2}\cos ec 45^\circ = \frac{3}{\sqrt{2}}$ **(D.G.Khan 24, G-II)**

(iv) $\sin^2\frac{\pi}{6} : \sin^2\frac{\pi}{4} : \sin^2\frac{\pi}{3} : \sin^2\frac{\pi}{2} = 1:2:3:4$ **(SGD 24, G-II)**

2. Verify the following when $\theta = 30^\circ, 45^\circ$.

(i) $\sin 2\theta = 2\sin\theta\cos\theta$ **(RWP 24, G-II)** **(ii)** $\cos 2\theta = 2\cos^2\theta - 1$ **(FSD 24, G-I)**

3. Find x, if $\tan^2 45^\circ - \cos^2 60^\circ = x\sin 45^\circ \cos 45^\circ \tan 60^\circ$ **(GRW 24, G-II)**

4. Find the values of all trigonometric functions of the following angles

(i) 420° **(ii)** $-\frac{7\pi}{4}$ **(iii)** $\frac{19\pi}{3}$

(iv) -675° **(LHR 24, G-I)** **(v)** 1530° **(vi)** -2430°

Exercise 9.4 (Short Questions)

1. Prove that $\cos^4\theta - \sin^4\theta = \cos^2\theta - \sin^2\theta$

2. Prove that $\sec^2 A + \cos ec^2 A = \sec^2 A \cos ec^2 A \left(\text{where } A \neq \frac{n\pi}{2},\ n \in Z\right)$

3. Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$, where θ is not an odd multiple of $\frac{\pi}{2}$. **(SGD 24, G-I), (D.G.Khan 24, G-II)**

4. Prove that $\cot^4\theta + \cot^2\theta = \cos ec^4\theta - \cos ec^2\theta$, where θ is not an integral multiple of $\frac{\pi}{2}$.

5. Prove that $\tan\theta + \cot\theta = \cos ec\theta \sec\theta$

6. Prove that $\cos\theta + \tan\theta\sin\theta = \sec\theta$

7. Prove that $\sec^2\theta - \cos ec^2\theta = \tan^2\theta - \cot^2\theta$ **(D.G.Khan 24, G-I)**

8. Prove that $\cot^2\theta - \cos^2\theta = \cot^2\theta\cos^2\theta$ **(RWP 24, G-I), (MTN 24, G-I)**

9. Prove that $\cos^2\theta - \sin^2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$

10. Prove that $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \cos ec\theta$ **(SGD 24, G-I)**

11. Prove that $\frac{2\tan\theta}{1+\tan^2\theta} = 2\sin\theta\cos\theta$

12. Prove that $(\sec\theta - \tan\theta)^2 = \frac{1-\sin\theta}{1+\sin\theta}$

13. Prove that $\frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

14. Prove that $(\tan\theta + \cot\theta)^2 = \sec^2\theta\cos ec^2\theta$

15. Prove that $\sin^3\theta - \cos^3\theta = (\sin\theta - \cos\theta)(1 + \sin\theta\cos\theta)$

16. Prove that $\frac{1}{1+\sin\theta} - \frac{1}{1-\sin\theta} = 2\sec^2\theta$ **(MTN 24, G-II)**

Long Questions

1. Prove that: $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \tan\theta + \sec\theta$ **(MTN 24, G-I), (SWL 24, G-II)**

2. Prove that: $\frac{1}{\cos\sec\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\cos\sec\theta + \cot\theta}$

3. Prove that: $\sin^6\theta - \cos^6\theta = (\sin^2\theta - \cos^2\theta)(1 - \sin^2\theta\cos^2\theta)$ **(BWP 24, G-II)**

4.	Prove that: $\sin^6\theta+\cos^6\theta=1-3\sin^2\theta\cos^2\theta$ **(MTN 24, G-II), (FSD 24, G-I)**
5.	Prove that: $\dfrac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}+\dfrac{\cos\theta-\sin\theta}{\cos\theta+\sin\theta}=\dfrac{2}{1-2\sin^2\theta}$

Chapter 10 (Trigonometric Identities)

Exercise 10.1 (Short Questions)

1. Without using calculator, find the values of

(i) $\tan(1110^\circ)$ **(ii)** $\cos(315^\circ)$ **(FSD 24, G-II)** **(iii)** $\tan(-135^\circ)$

(iv) $\sin(540^\circ)$ **(FSD 24, G-II)** **(v)** $\sec(-300^\circ)$ **(SWL 24, G-II)**

2. Prove that $\sin(180^\circ+\alpha)\sin(90^\circ-\alpha)=-\sin\alpha\cos\alpha$ **(MTN 24, G-II)**

3. Prove that without using calculator $\cos330^\circ\sin600^\circ+\cos120^\circ\sin150^\circ=-1$ **(SGD 24, G-II)**

4. Prove that without using calculator $\cos306^\circ+\cos234^\circ+\cos162^\circ+\cos18^\circ=0$

5. Prove that without using calculator $\sin780^\circ\sin480^\circ+\cos120^\circ\sin30^\circ=\dfrac{1}{2}$

6. If α, β, γ are the angles of a triangle ABC, then prove that

(i) $\sin(\alpha+\beta)=\sin\gamma$ **(ii)** $\cos\left(\dfrac{\alpha+\beta}{2}\right)=\sin\dfrac{\gamma}{2}$ **(LHR 24, G-II), (SGD 24, G-I)**

(iii) $\tan(\alpha+\beta)+\tan\gamma=0$ **(LHR 24, G-I), (BWP 24, G-II), (FSD 24, G-II), (D.G.Khan 24, G-I)**

Exercise 10.2 (Short Questions)

1. Find the values of **(i)** $\cos\dfrac{\pi}{12}$ **(LHR 24, G-II)** **(ii)** $\cos75^\circ$ **(D.G.Khan 24, G-I)**

2. Prove that: **(i)** $\sin(180^\circ+\theta)=-\sin\theta$ **(ii)** $\sin(\theta+270)=-\cos\theta$ **(iii)** $\tan(270^\circ-\theta)=\cot\theta$

(iv) $\cos(\theta-180^\circ)=-\cos\theta$

3. Find the values of the following: **(i)** $\sin15^\circ$ **(ii)** $\cos105^\circ$ **(MTN 24, G-II)**

(iii) $\tan105^\circ$ **(SGD 24, G-I), (BWP 24, G-II)**

4. Prove that: $\sin(45^\circ+\alpha)=\dfrac{1}{\sqrt{2}}(\sin\alpha+\cos\alpha)$

5. Prove that:

(i) $\tan(45^\circ+A)\tan(45^\circ-A)=1$ **(ii)** $\tan\left(\dfrac{\pi}{4}-\theta\right)+\tan\left(\dfrac{3\pi}{4}+\theta\right)=0$ **(MTN 24, G-I)**

(iii) $\sin\left(\theta+\dfrac{\pi}{6}\right)+\cos\left(\theta+\dfrac{\pi}{3}\right)=\cos\theta$ **(SWL 24, G-II)**

(iv) $\sin(\alpha+\beta)\sin(\alpha-\beta)=\cos^2\beta-\cos^2\alpha$ **(GRW 24, G-II)**

(v) $\cos(\alpha+\beta)\cos(\alpha-\beta)=\cos^2\beta-\sin^2\alpha$ **(FSD 24, G-I)**

6. Show that $\dfrac{\sin(\alpha+\beta)+\sin(\alpha-\beta)}{\cos(\alpha+\beta)+\cos(\alpha-\beta)}=\tan\alpha$

7. Show that: **(i)** $\cot(\alpha+\beta)=\dfrac{\cot\alpha\cot\beta-1}{\cot\alpha+\cot\beta}$ **(SGD 24, G-II)** **(ii)** $\dfrac{\tan\alpha+\tan\beta}{\tan\alpha-\tan\beta}=\dfrac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)}$

8. **(i)** Prove that without using calculator $\dfrac{\cos8^\circ-\sin8^\circ}{\cos8^\circ+\sin8^\circ}=\tan37^\circ$ **(GRW 24, G-II), (D.G.Khan 24, G-I)**

(ii) Prove that $\dfrac{\cos11^\circ+\sin11^\circ}{\cos11^\circ-\sin11^\circ}=\tan56^\circ$ **(GRW 24, G-I)**

Long Questions

1. If $\sin\alpha=\dfrac{4}{5}$ and $\cos\beta=\dfrac{40}{41}$, where $0<\alpha<\dfrac{\pi}{2}$ and $0<\beta<\dfrac{\pi}{2}$, show that $\sin(\alpha-\beta)=\dfrac{133}{205}$

2.	Find $\sin(\alpha+\beta)$ and $\cos(\alpha+\beta)$, given that $\tan\alpha=-\frac{15}{8}$ and $\sin\beta=-\frac{7}{25}$ and neither the terminal side of the angle of measure α nor that of β is in the IV quadrant. **(FSD 24, G-I)**		
3.	If α, β, γ are the angles of a triangle ABC, show that $\cot\frac{\alpha}{2}+\cot\frac{\beta}{2}+\cot\frac{\gamma}{2}=\cot\frac{\alpha}{2}\cot\frac{\beta}{2}\cot\frac{\gamma}{2}$		
4.	If $\alpha+\beta+\gamma=180^\circ$, show that $\cot\alpha\cot\beta+\cot\beta\cot\gamma+\cot\gamma\cot\alpha=1$ **(SWL 24, G-II)**		
Exercise 10.3 (Short Questions)			
1.	Find the value of $\sin 2\alpha$ and $\cos 2\alpha$ when $\cos\alpha=\frac{3}{5}$, where $0<\alpha<\frac{\pi}{2}$		
2.	Prove that: $\cot\alpha-\tan\alpha=2\cot 2\alpha$ **(FSD 24, G-I)**	**3.**	Prove that: $\frac{\sin 2\alpha}{1+\cos 2\alpha}=\tan\alpha$
4.	Prove that: $\frac{1-\cos\alpha}{\sin\alpha}=\tan\frac{\alpha}{2}$ **(SGD 24, G-I)**	**5.**	Prove that: $\sqrt{\frac{1+\sin\alpha}{1-\sin\alpha}}=\frac{\sin\frac{\alpha}{2}+\cos\frac{\alpha}{2}}{\sin\frac{\alpha}{2}-\cos\frac{\alpha}{2}}$
6.	Prove that: $1+\tan\alpha\tan 2\alpha=\sec 2\alpha$ **(LHR 24, G-I), (D.G.Khan 24, G-II)**	**7.**	Prove that: $\frac{\sin 3\theta}{\cos\theta}+\frac{\cos 3\theta}{\sin\theta}=2\cot 2\theta$
Long Questions			
1.	Reduce $\cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power. **(LHR 24, G-II), (SGD 24, G-I), (RWP 24, G-I)**		
2.	Prove that: $\frac{2\sin\theta\sin 2\theta}{\cos\theta+\cos 3\theta}=\tan 2\theta\tan\theta$	**3.**	Prove that: $\frac{\cos 3\theta}{\cos\theta}+\frac{\sin 3\theta}{\sin\theta}=4\cos 2\theta$
4.	Reduce $\sin^4\theta$ to an expression involving only function of multiples of θ, raised to the first power. **(LHR 24, G-I), (RWP 24, G-II), (BWP 24, G-II)**		
Exercise 10.4 (Short Questions)			
1.	Prove that $\cos 20^\circ\cos 40^\circ\cos 80^\circ=\frac{1}{8}$ (without using calculator) **(D.G.Khan 24, G-I), (D.G.Khan 24, G-II)**		
2.	Express the following as sums or differences: **(i)** $2\sin 3\theta\cos\theta$ **(ii)** $\cos(x+y)\sin(x-y)$ **(iii)** $\cos(2x+30^\circ)\cos(2x-30^\circ)$ **(iv)** $\sin 12^\circ\sin 46^\circ$ **(GRW 24, G-I), (MTN 24, G-I), (RWP 24, G-I)**		
3.	Express the following sums or differences as products: **(i)** $\sin 5\theta+\sin 3\theta$ **(LHR 24, G-II)** **(ii)** $\sin 8\theta-\sin 4\theta$ **(iii)** $\cos 6\theta+\cos 3\theta$ **(LHR 24, G-I)** **(iv)** $\cos 7\theta-\cos\theta$ **(GRW 24, G-II)**		
4.	Prove that $\frac{\sin 3x-\sin x}{\cos x-\cos 3x}=\cot 2x$ **(FSD 24, G-I)**		
5.	Prove that $\sin\left(\frac{\pi}{4}-\theta\right)\sin\left(\frac{\pi}{4}+\theta\right)=\frac{1}{2}\cos 2\theta$		
6.	Prove that $\cos 20^\circ+\cos 100^\circ+\cos 140^\circ=0$ (without using calculator) **(D.G.Khan 24, G-I)**		
Long Questions			
1.	Prove without using calculator that $\sin 19^\circ\cos 11^\circ+\sin 71^\circ\sin 11^\circ=\frac{1}{2}$ **(MTN 24, G-II)**		
2.	Prove that $\frac{\sin\theta+\sin 3\theta+\sin 5\theta+\sin 7\theta}{\cos\theta+\cos 3\theta+\cos 5\theta+\cos 7\theta}=\tan 4\theta$ **(GRW 24, G-I)**		
3.	Prove that (without using calculator) $\cos 20^\circ\cos 40^\circ\cos 60^\circ\cos 80^\circ=\frac{1}{16}$		
4.	Prove that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9}=\frac{3}{16}$ without using calculator. **(GRW 24, G-II)**		
5.	Prove that (without using calculator) $\sin 10^\circ\sin 30^\circ\sin 50^\circ\sin 70^\circ=\frac{1}{16}$ **(SGD 24, G-II)**		

Chapter 11 (Trigonometric Functions and their Graphs)

Exercise 11.1 (Short Questions)

1.	Define Periodicity. **(GRW 24, G-II), (SGD 24, G-I)**	**2.**	Define periodic function and period of trigonometric function. **(LHR 24, G-II), (RWP 24, G-II), (MTN 24, G-I), (SWL 24, G-II)**
3.	Write the domain and range of $y=\sin x$ **(MTN 24, G-II), (FSD 24, G-II), (D.G.Khan 24, G-II)**	**4.**	What is the domain and range of $y=\cos x$? **(FSD 24, G-I), (SGD 24, G-I), (RWP 24, G-I)**
5.	Write the domain and range of $y=\tan x$ **(D.G. Khan 24, G-I), (SWL 24, G-II)**	**6.**	Write the domain and range of $y=\sec x$ **(SGD 24, G-II)**

7. **(i)** Prove that period of sin function is 2π. **(SWL 24, G-II)**
(ii) Prove that period of $\cos ine$ is 2π **(LHR 24, G-I)**
(iii) Prove that period of tangent is π. **(GRW 24, G-I), (BWP 24, G-II)**

8. Find the periods of the following functions:

(i) $\tan 4x$ **(SGD 24, G-II), (MTN 24, G-II)** **(ii)** $\sin\frac{x}{3}$ **(BWP 24, G-II),(RWP 24, G-I)**

(iii) $\cos ec\frac{x}{4}$ **(MTN 24, G-I)** **(iv)** $\cos\frac{x}{6}$ **(LHR 24, G-II)**

(v) $\tan\frac{x}{7}$ **(vi)** $\cot 8x$ **(vii)** $\sec 9x$ **(viii)** $3\sin x$ **(GRW 24, G-I)**

(ix) $3\cos\frac{x}{5}$ **(GRW 24, G-II), (SGD 24, G-I), (FSD 24, G-I)**

(x) $\cos ec10x$ **(LHR 24, G-I), (D.G. Khan 24, G-I)**

Exercise 11.2 (Short Questions)

1.	Draw the graph of $y=\sin x$ from 0 to π. **(LHR 24, G-II), (FSD 24, G-II), (GRW 24, G-II), (SGD 24, G-II) (MTN 24, G-II)**
2.	Draw the graph of $y=\sin x$ for $0\le x\le 360^{\circ}$. **(FSD 24, G-I)**
3.	Draw the graph $y=-\sin x,\ x\in[-2\pi,2\pi]$ **(GRW 24, G-I)**
4.	Draw the graph of $y=\sin\frac{x}{2}$ for $0\le x\le 2\pi$ **(D.G. Khan 24, G-I)**
5.	Draw the graph of the function $y=\cos x,\ x\in\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ **(LHR 24, G-I)**
6.	Draw the graph of $y=\cos x$ for $0\le x\le 360^{\circ}$ **(D.G. Khan 24, G-II)**
7.	Draw the graph of $y=2\cos x,\ x\in[0,2\pi]$ **(BWP 24, G-II)**
8.	Draw the graph of $\tan x$ for $x\in[0,\pi]$ **(RWP 24, G-I)**
9.	Draw the graph of $y=\tan x$ for $-\pi\le x\le\pi$. **(MTN 24, G-I)**

Chapter 12 (Applications of Trigonometry)

Exercise 12.2 (Short Questions)

1. Solve the right triangle ABC, in which $\gamma=90^{\circ}$

(i) $a=3.28,\ b=5.74$ **(RWP 24, G-II), (SWL 24, G-II)** **(ii)** $b=68.4,\ c=96.2$

(iii) $\alpha=37°20',\ a=243$ **(GRW 24, G-I), (BWP 24, G-II)**

Exercise 12.3 (Short Questions)

1.	Define the angles of elevation and depression. **(BWP 24, G-II) , (SGD 24, G-II)**
2.	A vertical pole is 8 m high and the length of its shadow is 6 m. What is the angle of elevation of the sun at that moment? **(GRW 24, G-II)**
3.	At the top of a cliff 80 m high, the angle of depression of a boat is 12°. How far is the boat from the cliff? **(SGD 24, G-I), (FSD 24, G-II)**

4.	A ladder leaning against a vertical wall makes an angle of 24° with the wall. Its foot is 5 m from the wall. Find its length.
5.	A kite flying at a height of 67.2 m is attached to a fully stretched string inclined at an angle of 55° to the horizontal. Find the length of the string.
6.	When the angle between the ground and the sun is 30°, flat pole casts a shadow of 40 m long. Find the height of the top of the flag. **(RWP 24, G-I)**

Exercise 12.4 (Short Questions)

1.	What is difference between right angle triangle and oblique triangle. **(D.G. Khan 24, G-II), (SWL 24, G-II), (SGD 24, G-II)**
2.	Solve the triangle ABC, if **(i)** $\beta = 60^\circ, \gamma = 15^\circ, b = \sqrt{6}$ **(GRW 24, G-I), (MTN 24, G-II)** **(ii)** $\alpha = 35^\circ 17', \beta = 45^\circ 13', b = 421$ **(RWP 24, G-I)**

Exercise 12.5 (Short Questions)

1.	State law of cosine. **(FSD 24, G-II)**	**2.**	State law of tangent.
3.	Solve the triangle ABC in which $a = 7,\ b = 3$ and $\gamma = 38^\circ 13'$		
4.	By using Law of cosine find the value of c if $a = \sqrt{3} - 1,\ b = \sqrt{3} + 1,\ \gamma = 60^\circ$ **(BWP 24, G-II)**		
5.	By using law of cosine, find α when $a = 7; b = 3, c = 5$ **(SGD 24, G-II)**		
6.	Measure of two sides of a triangle are in the ratio $3:2$ and angle including these sides is 57°. Find the remaining two angles. **(LHR 24, G-I)**		

Long Questions

1.	With usual notations, prove that $a^2 = b^2 + c^2 - 2bc\cos\alpha$ **(GRW 24, G-I)**
2.	Solve the triangle ABC using first law of tangent and then law of sines $a = 36.21,\ b = 42.09$ and $\gamma = 44^\circ 29'$
3.	Solve the triangle ABC in which $a = 36.21, c = 30.14$ and $\beta = 78^\circ 10'$. **(MTN 24, G-I)**

Exercise 12.6 (Short Questions)

1.	Write half angle formulas of $\sin\left(\frac{\gamma}{2}\right), \cos\left(\frac{\gamma}{2}\right)$ and $\cos\left(\frac{\alpha}{2}\right)$. **(LHR 24, G-I), (SWL 24, G-II), (RWP 24, G-I)**
2.	Solve the triangle ABC in which $a = 7,\ b = 7,\ c = 9$
3.	Find the smallest angle of the triangle ABC, when a = 37.34, b = 3.24, c = 35.06. **(D.G.Khan 24, G-I)**
4.	Find the measure of the greatest angle, if sides of the triangle are 16, 20, 33. **(LHR 24, G-II), (FSD 24, G-I)**

Long Questions

1.	The sides of a triangle are $x^2 + x + 1,\ 2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120°. **(BWP 24, G-II), (D.G.Khan 24, G-II)**
2.	The measures of side of a triangular plot and 413, 214 and 375 meters. Find the measures of the corner angles of the plot.

Exercise 12.7 (Short Questions)

1.	Find the area of triangle ABC, in which **(i)** $a = 200,\ b = 120,\ \gamma = 150^\circ$ **(D.G.Khan 24, G-II)** **(ii)** $b = 37,\ c = 45,\ \alpha = 30^\circ 50'$ **(FSD 24, G-I)**
2.	Find the area of triangle ABC, in which **(i)** $b = 25.4,\ \gamma = 36^\circ 41',\ \alpha = 45^\circ 17'$ **(MTN 24, G-II)** **(ii)** $c = 32,\ \alpha = 47^\circ 24',\ \beta = 70^\circ 16'$
3.	Find the area of triangle ABC, in which **(i)** $a = 18,\ b = 24,\ c = 30$ **(SGD 24, G-I) (D.G.Khan 24, G-I)** **(ii)** $a = 524,\ b = 276,\ c = 315$
4.	The area of triangle is 2437. If $a = 79$ and $c = 97$, then find angle β.

Exercise 12.8 (Short Questions)

1.	Prove that: $R = \frac{abc}{4\Delta}$	**2.**	Show that: $r = (s-a)\tan\frac{\alpha}{2}$
3.	Show that: **(i)** $r_1 = s\tan\frac{\alpha}{2}$ **(LHR 24, G-II)** **(ii)** $r_2 = s\tan\frac{\beta}{2}$ **(SGD 24, G-I)** **(iii)** $r_3 = s\tan\frac{\gamma}{2}$		

4. Prove that: **(i)** $r r_1 r_2 r_3 = \Delta^2$ **(D.G.Khan 24, G-I)** **(ii)** $r_1 r_2 r_3 = rs^2$ **(FSD 24, G-I)**

5. Find R, r, r_1, r_2 and r_3 if measures of the sides of triangle ABC are $a = 13,\ b = 14,\ c = 15$ **(MTN 24, G-I), (D.G.Khan 24, G-II)**

6. Show that: **(i)** $\dfrac{1}{2rR} = \dfrac{1}{ab} + \dfrac{1}{bc} + \dfrac{1}{ca}$ **(MTN 24, G-I)** **(ii)** $\dfrac{1}{r} = \dfrac{1}{r_1} + \dfrac{1}{r_2} + \dfrac{1}{r_3}$

Long Questions

1. Prove that: $r = \dfrac{\Delta}{s}$ with usual notations.

2. Prove that: $\dfrac{1}{r^2} + \dfrac{1}{r_1^2} + \dfrac{1}{r_2^2} + \dfrac{1}{r_3^2} = \dfrac{a^2 + b^2 + c^2}{\Delta^2}$

3. Show that: $r = a \sin\dfrac{\beta}{2} \sin\dfrac{\gamma}{2} \sec\dfrac{\alpha}{2}$

4. Show that: **(i)** $r_1 = 4R \sin\dfrac{\alpha}{2} \cos\dfrac{\beta}{2} \cos\dfrac{\gamma}{2}$ **(ii)** $r_2 = 4R \cos\dfrac{\alpha}{2} \sin\dfrac{\beta}{2} \cos\dfrac{\gamma}{2}$ **(GRW 24, G-II)**

(iii) $r_3 = 4R \cos\dfrac{\alpha}{2} \cos\dfrac{\beta}{2} \sin\dfrac{\gamma}{2}$ **(LHR 24, G-II)**

5. Prove that: $r_1 r_2 + r_2 r_3 + r_3 r_1 = s^2$ **(FSD 24, G-I)**

6. Prove that: $\Delta = 4Rr \cos\dfrac{\alpha}{2} \cos\dfrac{\beta}{2} \cos\dfrac{\gamma}{2}$

7. Prove that: $abc(\sin\alpha + \sin\beta + \sin\gamma) = 4\Delta s$

8. Prove that: $(r_1 + r_2)\tan\dfrac{\gamma}{2} = c$

9. Prove that $r_1 + r_2 + r_3 - r = 4R.$ **(SWL 24, G-II), (SGD 24, G-I)**

10. Prove that in an equilateral triangle:

(i) $r : R : r_1 = 1 : 2 : 3$ **(FSD 24, G-II)** **(ii)** $r : R : r_1 : r_2 : r_3 = 1 : 2 : 3 : 3 : 3$

11. Prove that $\Delta = r^2 \cot\dfrac{\alpha}{2} \cot\dfrac{\beta}{2} \cot\dfrac{\gamma}{2}$ **(LHR 24, G-I)**

Chapter 13 (Inverse Trigonometric Functions)

Exercise 13.1 (Short Questions)

1. Define principal sine function.

2. Define principal tangent function.

3. Evaluate without using tables / calculator

(i) $\cos^{-1}\dfrac{1}{2}$ **(GRW 24, G-I)** **(ii)** $\tan^{-1}\left(-\sqrt{3}\right)$ **(iii)** $\tan^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$

(iv) $\operatorname{cosec}^{-1}\left(\dfrac{-2}{\sqrt{3}}\right)$ **(v)** $\sin^{-1}\left(-\dfrac{1}{\sqrt{2}}\right)$

4. Without using table / calculator show that:

(i) $2\cos^{-1}\dfrac{4}{5} = \sin^{-1}\dfrac{24}{25}$ **(LHR 24, G-I), (D.G. Khan 24, G-I)** **(ii)** $\cos^{-1}\dfrac{4}{5} = \cot^{-1}\dfrac{4}{3}$ **(MTN 24, G-I)**

5. Find the value of each expression:

(i) $\sin\left(\cos^{-1}\dfrac{\sqrt{3}}{2}\right)$ **(SWL 24, G-II), (FSD 24, G-II)** **(ii)** $\cos\left(\sin^{-1}\dfrac{1}{\sqrt{2}}\right)$ **(LHR 24, G-II), (BWP 24, G-II)**

(iii) $\tan\left(\cos^{-1}\dfrac{\sqrt{3}}{2}\right)$ **(iv)** $\csc\left(\tan^{-1}(-1)\right)$ **(v)** $\tan\left(\sin^{-1}\left(-\dfrac{1}{2}\right)\right)$

(vi) $\sec\left(\sin^{-1}\left(-\dfrac{1}{2}\right)\right)$ **(MTN 24, G-II)** **(vii)** $\sin\left(\tan^{-1}(-1)\right)$ **(RWP 24, G-II)**

Exercise 13.2 (Short Questions)

1. Prove that: $\sin^{-1} x = \dfrac{\pi}{2} - \cos^{-1} x$ **(SGD 24, G-II)**

2. Prove that $2\tan^{-1} A = \tan^{-1}\dfrac{2A}{1 - A^2}$ **(FSD 24, G-I)**

3.	Prove that: $\tan^{-1}\frac{1}{4}+\tan^{-1}\frac{1}{5}=\tan^{-1}\frac{9}{19}$ **(RWP 24, G-I)**	**4.**	Show that: $\cos\left(\sin^{-1}x\right)=\sqrt{1-x^2}$ **(SGD 24, G-I), (RWP 24, G-I)**
5.	Show that: $\sin\left(2\cos^{-1}x\right)=2x\sqrt{1-x^2}$	**6.**	Show that: $\cos\left(2\sin^{-1}x\right)=1-2x^2$
7.	Show that: $\cos^{-1}(-x)=\pi-\cos^{-1}x$	**8.**	Show that $\tan(\sin^{-1}x)=\frac{x}{\sqrt{1-x^2}}$ **(GRW 24, G-II), (LHR 24, G-II)**

Long Questions

1.	Prove that: $\sin^{-1}\frac{5}{13}+\sin^{-1}\frac{7}{25}=\cos^{-1}\frac{253}{325}$	**(LHR 24, G-I)**
2.	Prove that: $2\tan^{-1}\frac{2}{3}=\sin^{-1}\frac{12}{13}$	
3.	Prove that: $\tan^{-1}\frac{120}{119}=2\cos^{-1}\frac{12}{13}$	**(SWL 24, G-II), (FSD 24, G-I)**
4.	Prove that: $\sin^{-1}\frac{1}{\sqrt{5}}+\cot^{-1}3=\frac{\pi}{4}$	**(LHR 24, G-II), (BWP 24, G-II)**
5.	Prove that: $\sin^{-1}\frac{3}{5}+\sin^{-1}\frac{8}{17}=\sin^{-1}\frac{77}{85}$	
6.	Prove that: $\sin^{-1}\frac{77}{85}-\sin^{-1}\frac{3}{5}=\cos^{-1}\frac{15}{17}$	**(SGD 24, G-I)**
7.	Prove that: $\tan^{-1}\frac{3}{4}+\tan^{-1}\frac{3}{5}-\tan^{-1}\frac{8}{19}=\frac{\pi}{4}$	**(GRW 24, G-I)**
8.	Prove that $\sin^{-1}\frac{4}{5}+\sin^{-1}\frac{5}{13}+\sin^{-1}\frac{16}{65}=\frac{\pi}{2}$	**(GRW 24, G-II)**
9.	Prove that: $\tan^{-1}\frac{1}{11}+\tan^{-1}\frac{5}{6}=\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{2}$	**(MTN 24, G-II)**
10.	Prove that: $2\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{7}=\frac{\pi}{4}$	**(SGD 24, G-II), (FSD 24, G-II), (D.G.Khan 24, G-I)**

Chapter 14 (Solutions of Trigonometric Equations)

Exercise 14 (Short Questions)

1.	Define trigonometric equation. Give one example. **(MTN 24, G-II), (FSD 24, G-II)**	**2.**	Solve the equation $\sin x=\frac{1}{2}$
3.	Solve $1+\cos x=0$ **(SGD 24, G-I), (BWP 24, G-II)**	**4.**	Solve the equation $4\cos^2 x-3=0$ **(RWP 24, G-I)**
5.	Solve the equation $\sin x+\cos x=0$ and find its general solution. **(D.G.Khan 24, G-II)**	**6.**	Find the solution set of $\sin x\cos x=\frac{\sqrt{3}}{4}$ **(MTN 24, G-I)**
7.	Solve the equation $\sin^2 x+\cos x=1$ where $x\in[0,2\pi]$ **(GRW 24, G-I)**		
8.	Find the solutions of equations which lies in $[0,2\pi]$ **(i)** $\sin x=-\frac{\sqrt{3}}{2}$ **(SWL 24, G-II), (GRW 24, G-II)** **(ii)** $\cos ec\theta=2$ **(D.G. Khan 24, G-I)** **(iii)** $\sec x=-2$ **(FSD 24, G-I)** **(iv)** $\cot\theta=\frac{1}{\sqrt{3}}$		
9.	Solve the equations which lies in $[0,2\pi]$ **(i)** $\cos ec^2\theta=\frac{4}{3}$ **(LHR 24, G-I)** **(ii)** $\sec^2\theta=\frac{4}{3}$ **(iii)** $\cot^2\theta=\frac{1}{3}$ **(SGD 24, G-II)**		
10.	Solve the equation $2\sin\theta+\cos^2\theta=0$ for $\theta\in[0,\pi]$		
11.	Find the value of θ satisfying the equation $2\sin^2\theta-\sin\theta=0,\ \ \theta\in[0,2\pi]$		