MATHEMATICS

F.Sc / ICS – 1st Year

Chapter 1

MCQs

1. The multiplicative inverse of $(1,0)$ is: **(LHR G-I, 2024)**

(A) $(1,0)$ (B) $(0,1)$ (C) $(-1,0)$ (D) $(0,-1)$

2. The value of $(-i)^9$ is: **(LHR G-I, 2024)**

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

3. The multiplicative inverse of $-i$ is: **(LHR G-II, 2024), (FSD G-I, 2024), (SWL G-II, 2024)**

(A) $(1,-1)$ (B) $(0,-1)$ (C) $(0,1)$ (D) $(1,0)$

4. Which of the following set has closure property w.r.t. addition: **(LHR G-II, 2024)**

(A) $\{1\}$ (B) $\{0\}$ (C) $\{0,1\}$ (D) $\{1,-1\}$

5. Multiplicative inverse of $-3i$ is: **(GRW G-I, 2024)**

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

6. $\sqrt{3}$ is: **(GRW G-I, 2024)**

(A) rational number (B) irrational number
(C) even number (D) odd number

7. $(-1)^{-\frac{21}{2}} =$: **(GRW G-II, 2024)**

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

8. Recurring decimal is a _____ number: **(GRW G-II, 2024)**

(A) prime (B) rational (C) irrational (D) integer

9. If n is prime, then $\sqrt{n}$ is: **(FSD G-I, 2024)**

(A) Rational number (B) Whole number
(C) Natural number (D) Irrational number

10. Imaginary part of $\frac{i}{1+i}$ is: **(FSD G-II, 2024)**

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

11. $\sqrt{-5}$ belongs to the set of: **(FSD G-II, 2024)**

(A) Rational number (B) Real numbers
(C) Complex numbers (D) Integers

12. The modulus of Complex number $4+5i$ is: **(SGD G-I, 2024)**

(A) $\sqrt{41}$ (B) $-\sqrt{41}$ (C) $\sqrt{31}$ (D) $-\sqrt{31}$

13. Multiplicative inverse of $(2,0)$ is: **(SGD G-I, 2024)**

(A) $\left(\frac{1}{2},0\right)$ (B) $\left(\frac{1}{2},-2\right)$ (C) $\left(\frac{1}{4},0\right)$ (D) $\left(-\frac{1}{4},0\right)$

14. The reflexive property of equality of real numbers is that $\forall a \in R$: **(SGD G-II, 2024)**

(A) $a=a$ (B) $a\neq a$ (C) $a<a$ (D) $a>a$

15. $|z|^2 =$: **(SGD G-II, 2024)**

(A) z^2 (B) $z\bar{z}$ (C) $\bar{z}^2$ (D) z

16. $\forall z \in C$, which one is true: **(RWP G-I, 2024)**

(A) $z=-z$ (B) $\bar{z}=-z$ (C) $\bar{z}=z$ (D) $\overline{=}z=z$

17. A prime number can be factor of a square only if it occurs in at least: **(RWP G-I, 2024)**

(A) Once (B) Twice (C) Thrice (D) Four times

18. A complex number $1+i$ can also be expressed as: **(RWP G-II, 2024)**

(A) $2(\cos 45°+i\sin 45°)$ (B) $\sqrt{2}(\cos 45°-i\sin 45°)$

(C) $\sqrt{2}(\cos 45°+i\sin 45°)$ (D) $2(\cos 45°-i\sin 45°)$

19. If z is a complex number and $z=\bar{z}$ then z must be: **(RWP G-II, 2024)**

(A) Real (B) Imaginary (C) Rational (D) Irrational

20. $3x+y^2i=1-2i^2$, then vale of x is: **(MTN G-I, 2024)**

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

21. If $z=\sqrt{3}+i$, then $|z|=$: **(MTN G-I, 2024)**

(A) 4 (B) $\sqrt{3}-1$ (C) $-\sqrt{3}+1$ (D) 2

22. Every non-recurring, non-terminating decimal represents ---------- number: **(MTN G-II, 2024), (SWL G-II, 2024)**

(A) Rational number (B) Natural number (C) Irrational number (D) Whole number

23. The multiplicative inverse of complex number $(0,1)$ is: **(MTN G-II, 2024), (DGK G-I, 2024)**

(A) $(0,-1)$ (B) $(0,1)$ (C) $(-1,0)$ (D) $(0,0)$

24. 1 is not −−−−−−− **(DGK G-I, 2024)**

(A) Odd (B) Real (C) Prime (D) Rational

25. If $z=1-i$, then $|z|=$: **(DGK G-II, 2024)**

(A) 2 (B) −2 (C) $\sqrt{-2}$ (D) $\sqrt{2}$

26. $a<b\Rightarrow -a>-b,\ a,b\in R$ property used is: **(DGK G-II, 2024)**

(A) Transitive (B) Additive (C) Multiplicative (D) Trichotomy

27. Modulus of $5-3i$ is: **(BWP G-II, 2024)**

(A) $\sqrt{4}$ (B) $\sqrt{16}$ (C) $\sqrt{25}$ (D) $\sqrt{34}$

28. The property $\forall a\in R,\ a=a$, is called: **(BWP G-II, 2024)**

(A) Symmetric (B) Transitive (C) Reflexive (D) Commutative

Answers

1.	(A)	2.	(D)	3.	(C)	4.	(B)	5.	(B)	6.	(B)	7.	(D)
8.	(B)	9.	(D)	10.	(B)	11.	(C)	12.	(A)	13.	(A)	14.	(A)
15.	(B)	16.	(D)	17.	(B)	18.	(C)	19.	(A)	20.	(B)	21.	(D)
22.	(C)	23.	(A)	24.	(C)	25.	(D)	26.	(C)	27.	(D)	28.	(C)

Solutions

1. (A) Let $z=(1,0)$

$$z^{-1}=\left(\frac{1}{1^2+0^2},-\frac{0}{1^2+0^2}\right)=(1,0) \qquad \because z^{-1}=\left(\frac{a}{a^2+b^2},-\frac{b}{a^2+b^2}\right)$$

2. (D) $(-i)^9=-i^9=-\left(i^2\right)^4.i=-(-1)^4 i=-i$

3. (C) Let $z=-i$

$$z^{-1}=\left(\frac{0}{0^2+(-1)^2},-\frac{(-1)}{0^2+(-1)^2}\right)=(0,1)$$

4. (B) $0+0=0\in\{0\}$, Closure property w.r.t. addition holds.

5. (B) Let $z=-3i$

$$z^{-1}=\left(\frac{0}{0^2+(-3)^2},-\frac{(-3)}{0^2+(-3)^2}\right)=\left(0,\frac{3}{9}\right)=\left(0,\frac{1}{3}\right)=\frac{1}{3}i$$

6. (B) irrational number

7. **(D)** $(-1)^{-\frac{21}{2}} = \left(i^2\right)^{-\frac{21}{2}} = i^{-21} = \frac{1}{i^{21}} = \frac{1}{\left(i^2\right)^{10}.i} = \frac{1}{(-1)^{10}.i} = \frac{1}{i} \times \frac{i}{i} = \frac{i}{i^2} = -i$

8. **(B)** rational

9. **(D)** Irrational number

10. **(B)** $\frac{i}{1+i} = \frac{i}{1+i} \times \frac{1-i}{1-i} = \frac{i-i^2}{1-i^2} = \frac{i+1}{2} = \frac{1}{2} + \frac{i}{2} \Rightarrow$ Imaginary part = $\frac{1}{2}$

11. **(C)** Complex numbers

12. **(A)** $|4+5i| = \sqrt{16+25} = \sqrt{41}$

13. **(A)** Let $z = (2,0)$

$$z^{-1} = \left(\frac{2}{2^2+0^2}, -\frac{0}{2^2+0^2}\right) = \left(\frac{2}{4}, 0\right) = \left(\frac{1}{2}, 0\right)$$

14. **(A)** $a = a$

15. **(B)** $|z|^2 = z\bar{z}$

16. **(D)** $\bar{z} = z$

17. **(B)** Twice

18. **(C)** Let $z = 1+i \Rightarrow |z| = \sqrt{1+1} = \sqrt{2}$

$$\theta = \tan^{-1}\left(\frac{1}{1}\right) = 45^\circ$$

$$1+i = |z|(\cos\theta + i\sin\theta) = \sqrt{2}\left(\cos 45^\circ + i\sin 45^\circ\right)$$

19. **(A)** $z = a+ib \Rightarrow \bar{z} = a-ib$

$z = \bar{z} \Rightarrow a+ib = a-ib \Rightarrow -2ib = 0 \Rightarrow b = 0$

$z = a+ib = a$ (Real)

20. **(B)** $3x + y^2 i = 1 - 2i^2 \Rightarrow 3x + y^2 i = 3 \Rightarrow 3x = 3 \Rightarrow x = 1$

21. **(D)** $z = \sqrt{3}+i \Rightarrow |z| = \sqrt{3+1} = 2$

22. **(C)** Irrational number

23. **(A)** Let $z = (0,1)$

$$z^{-1} = \left(\frac{0}{0^2+1^2}, -\frac{1}{0^2+1^2}\right) = (0,-1)$$

24. **(C)** Prime

25. **(D)** $z = 1-i \Rightarrow |z| = \sqrt{1+1} = \sqrt{2}$

26. **(C)** Multiplicative

27. **(D)** $|5-3i| = \sqrt{(5)^2+(-3)^2} = \sqrt{25+9} = \sqrt{34}$

28. **(C)** Reflexive

Chapter 2

MCQs

1. The number of elements of the power set of $A = \{a, \{b,c\}\}$ are: **(LHR G-I, 2024)**

(A) 2 (B) 4 (C) 6 (D) 8

2. If $A \subseteq B$, then: **(LHR G-I, 2024)**

(A) $A \cup B = A$ (B) $A \cap B = B$ (C) $B \cup A = A$ (D) $A \cup B = B$

3. The converse of $\sim p \to q$ is: **(LHR G-I, 2024), (RWP G-I, 2024)**

(A) $p \to q$ (B) $p \to \sim q$ (C) $\sim p \to q$ (D) $q \to \sim p$

4. If $A = \{\ \}$, then the power set of A is: **(LHR G-II, 2024)**

(A) ϕ (B) $\{0\}$ (C) $\{\ \}$ (D) $\{\phi\}$

5. The converse of $p \to q$ is: **(LHR G-II, 2024), (GRW G-I, 2024)**

(A) $\sim p \to \sim q$ (B) $\sim q \to p$ (C) $q \to p$ (D) $p \to \sim p$

6. If $A \cap B = A$, then: **(LHR G-II, 2024)**

(A) $B \subseteq A$ (B) $A \subseteq B$ (C) $A \cup B = A$ (D) $B \cup A = A$

7. $A' \cap B' =$: **(GRW G-I, 2024)**

(A) $A' - B'$ (B) $A' \cup B'$ (C) $(A \cap B)'$ (D) $(A \cup B)'$

8. Let $A = \{1,2,3\}$, then the number of its subsets is: **(GRW G-I, 2024)**

(A) 2 (B) 3 (C) 7 (D) 8

9. If A = {1,2,3} and B = {4,5}, which is not element of $A \times B$: **(GRW G-II, 2024)**

(A) $(1,4)$ (B) $(2,4)$ (C) $(3,4)$ (D) $(4,3)$

10. Preposition _____ is called biconditional: **(GRW G-II, 2024)**

(A) $p \to q$ (B) $p \leftrightarrow q$ (C) $p \wedge q$ (D) $p \vee q$

11. Set having no proper subset: **(GRW G-II, 2024)**

(A) $\{\ \}$ (B) $\{1\}$ (C) $\{1,2\}$ (D) $\{1,2,3\}$

12. Which symbol is used for membership of a set? **(FSD G-I, 2024)**

(A) $\wedge$ (B) $\vee$ (C) $\in$ (D) $\sim$

13. Set of integers is a group with respect to: **(FSD G-I, 2024)**

(A) $+$ (B) $\div$ (C) $\times$ (D) $-$

14. A function $f : A \to B$ is surjective if: **(FSD G-I, 2024)**

(A) Range $f = A$ (B) Range $f = B$ (C) Range $f \neq A$ (D) Range $f \neq B$

15. The domain of $f = \{(a,1),(b,1),(c,1)\}$ is: **(FSD G-II, 2024)**

(A) $\{a,b,c\}$ (B) $\{1\}$ (C) $\{b,c\}$ (D) $\{a,b,c,1\}$

16. A function which is $1-1$ and onto is called: **(FSD G-II, 2024)**

(A) Injective (B) Surjective (C) Objective (D) Bijective

17. The set $\{(a,b)\}$ is called: **(FSD G-II, 2024), (RWP G-II, 2024)**

(A) Infinite set (B) Set with two elements

(C) Singelton set (D) Empty set

18. If $A \subseteq B$, then $A \cap B$ equals: **(SGD G-I, 2024)**

(A) B (B) A (C) A' (D) B'

19. Disjunction of two Logical statements p and q is: **(SGD G-I, 2024), (DGK G-I, 2024)**

(A) $p \cup q$ (B) $p \wedge q$ (C) $p \vee q$ (D) $p \cap q$

20. The solution of linear equation $ax = b$ where $a, b \in G$ is: **(SGD G-I, 2024)**

(A) $x = ab$ (B) $x = ab^{-1}$ (C) $x = a^{-1}b^{-1}$ (D) $x = a^{-1}b$

21. $\{x \mid x \in N, x \geq 10\}$ is the: **(SGD G-II, 2024)**

(A) Descriptive method (B) Tabular method

(C) Set builder method (D) Non-descriptive method

22. $p : 4 < 7$, $q : 6 > 11$, the disjunction $p \vee q$ is : **(SGD G-II, 2024)**

(A) False (B) True (C) Not valid (D) Unknown

23. The identity element of a set X with respect to intersection in $P(X)$ is: **(SGD G-II, 2024)**

(A) 0 (B) ϕ (C) Does not exist (D) X

24. If A and B are disjoint sets, then $A - B$=: **(RWP G-I, 2024)**

(A) B (B) A (C) $B - A$ (D) ϕ

25. $p \wedge q$ is called: **(RWP G-I, 2024)**

(A) Conjunction (B) Disjunction (C) Conditional (D) Equivalence

26. Drawing conclusion from premises believed to be true is called: **(RWP G-II, 2024)**

(A) Proposition (B) Contradiction (C) Induction (D) Deduction

27. If p is a logical statement $p \wedge \sim p$ is always: **(RWP G-II, 2024), (BWP G-II, 2024)**

(A) Absurdity (B) Contingency (C) Tautology (D) Conditional

28. Inverse of $p \to q$ is: **(MTN G-I, 2024)**

(A) $\sim p \to \sim q$ (B) $\sim q \to \sim p$ (C) $\sim q \to p$ (D) $q \to \sim p$

29. Set A contains 4 elements, then number of elements in its power set $P(A)$: **(MTN G-I, 2024), (BWP G-II, 2024)**

(A) 8 (B) 12 (C) 16 (D) 4

30. $\{1,-1\}$ is a group with respect to: **(MTN G-I, 2024)**

(A) Addition (B) Subtraction (C) Square root (D) Multiplication

31. How many inverse elements correspond to each element of group? **(MTN G-II, 2024)**

(A) At least two (B) Two (C) At least one (D) Only one

32. Set containing elements A or B is denoted by: **(MTN G-II, 2024), (BWP G-II, 2024)**

(A) $A \cap B$ (B) $A \cup B$ (C) $A \subseteq B$ (D) $B \subseteq A$

33. $p \to q$ is called converse of: **(MTN G-II, 2024)**

(A) $\sim p \to q$ (B) $p \to q$ (C) $q \to p$ (D) $\sim q \to p$

34. Set G is closed and associative with respect to binary operation, then set G is called: **(DGK G-I, 2024)**

(A) Groupoid (B) Semi-Group (C) Monoid (D) Group

35. Tabular form of $\{x \mid x \in N \wedge x+4=0\}$ is: **(DGK G-I, 2024)**

(A) $\{\ \}$ (B) $\{0\}$ (C) $\{-4\}$ (D) $\{0,4\}$

36. The set A has m elements, number of elements in power set of A: **(DGK G-II, 2024)**

(A) 2^{m-1} (B) 2^m (C) 2^{m+1} (D) $2^{m/2}$

37. A and B are disjoint sets then: **(DGK G-II, 2024)**

(A) $A \cap B = \phi$ (B) $A \cup B = \phi$ (C) $A - B = \phi$ (D) $B - A = \phi$

38. Tabular form of $\{x \mid x \in E \wedge 2 < x \leq 4\}$: **(DGK G-II, 2024)**

(A) $\{2,3,4\}$ (B) $\{2,4\}$ (C) $\{4\}$ (D) $\{\phi\}$

39. $(A \cup B)^c =$: **(SWL G-II, 2024)**

(A) $A \cup B$ (B) $A \cap B$ (C) $A^c \cup B^c$ (D) $A^c \cap B^c$

40. $(Z, +)$ has identity element: **(SWL G-II, 2024)**

(A) 0 (B) i (C) 1 (D) -1

41. $A \subseteq B$ then complement of A in B (B-Universal): **(SWL G-II, 2024)**

(A) $A - B$ (B) $B - A$ (C) $A \cap B$ (D) $A \cup B$

42. If $A \subseteq B$ and $A - B = \phi$, then $n(A - B) =$: **(BWP G-II, 2024)**

(A) 0 (B) $n(A)$ (C) $n(B)$ (D) $n(A) - n(B)$

Answers

1.	(B)	2.	(D)	3.	(D)	4.	(D)	5.	(C)	6.	(B)	7.	(D)	8.	(D)
9.	(D)	10.	(B)	11.	(A)	12.	(C)	13.	(A)	14.	(B)	15.	(A)	16.	(D)
17.	(C)	18.	(B)	19.	(C)	20.	(D)	21.	(C)	22.	(B)	23.	(D)	24.	(B)
25.	(A)	26.	(D)	27.	(A)	28.	(A)	29.	(C)	30.	(D)	31.	(D)	32.	(B)
33.	(C)	34.	(B)	35.	(A)	36.	(B)	37.	(A)	38.	(C)	39.	(D)	40.	(A)
41.	(B)	42.	(A)												

Solutions

1. **(B)** $2^2 = 4$

2. **(D)** If $A \subseteq B$, then $A \cup B = B$

3. **(D)** The converse of $\sim p \to q$ is $q \to \sim p$

4. **(D)** $\{\phi\}$

5. **(C)** The converse of $p \to q$ is $q \to p$

6. **(B)** If $A \cap B = A$, then $A \subseteq B$

7. **(D)** $A' \cap B' = (A \cup B)'$

8. **(D)** $2^3 = 8$

9. **(D)** $(4,3)$

10. **(B)** $p \leftrightarrow q$

11. **(A)** $\{\}$

12. **(C)** $\in$

13. **(A)** $+$

14. **(B)** Range $f = B$

15. **(A)** The domain of $f = \{(a,1),(b,1),(c,1)\}$ is $\{a,b,c\}$

16. **(D)** Bijective

17. **(C)** Singleton set

18. **(B)** If $A \subseteq B$, then $A \cap B$ equals A

19. **(C)** $p \vee q$

20. **(D)** $ax = b$ where $a,b \in G$

$a^{-1}(ax) = a^{-1}b \Rightarrow \left(a^{-1}a\right)x = a^{-1}b \Rightarrow ex = a^{-1}b \Rightarrow x = a^{-1}b$

21. **(C)** Set builder method

22. **(B)** $p : 4 < 7$, $q : 6 > 11$:

p is true, q is false, then $p \vee q$ is true.

23. **(D)** X

24. **(B)** If A and B are disjoint sets, then $A - B = A$

25. **(A)** $p \wedge q$ is called conjunction.

26. **(D)** Deduction

27. **(A)**

p	$\sim p$	$p \wedge \sim p$
T	F	F
F	T	F

$p \wedge \sim p$ is an absurdity

28. **(A)** Inverse of $p \to q$ is $\sim p \to \sim q$

29. **(C)** $2^4 = 16$

30. **(D)** Let $G = \{1,-1\}$

$\times$	1	-1
1	1	-1
-1	-1	1

From table we see that closure and associative properties holds in G w.r.t. multiplication.

1 is the identity element in G w.r.t. multiplication.

From table we see that 1 and -1 has inverses 1 and -1 w.r.t. multiplication.

$G = \{1,-1\}$ is a group w.r.t. multiplication.

31. **(D)** Only one

32. **(B)** $A \bigcup B$

33. **(C)** $p \to q$ is called converse of $q \to p$

34. **(B)** Semi-Group

35. **(A)** $\{x \mid x \in N \wedge x + 4 = 0\} \Rightarrow x = -4 \notin N$

Tabular form = $\{\ \}$

36. **(B)** Number of elements in power set of $A = 2^m$

37. **(A)** $A \cap B = \phi$

38. **(C)** $\{x \mid x \in E \wedge 2 < x \leq 4\}$

Tabular form $= \{4\}$

39. **(D)** $(A \cup B)^c = A^c \cap B^c$

40. **(A)** 0

41. **(B)** $B - A$

42. **(A)** 0

Chapter 3

MCQs

1. If A is a square matrix of order 3 and $|A|=2$, then $|2A|=$: **(LHR G-I, 2024)**

(A) 16 (B) 8 (C) 6 (D) 8

2. Rank of the matrix $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ is: **(LHR G-I, 2024)**

(A) 0 (B) 1 (C) 2 (D) 3

3. If A is a matrix of order 2×3, then order of A^tA is: **(LHR G-II, 2024)**

(A) 3×3 (B) 2×3 (C) 3×2 (D) 2×2

4. If $|A|=9$, then $|A^t|$ is: **(LHR G-II, 2024)**

(A) 81 (B) $\frac{1}{9}$ (C) -9 (D) 9

5. A square matrix A is symmetric if $A^t=$: **(GRW G-I, 2024), (SGD G-I, 2024), (DGK G-I, 2024)**

(A) $-A$ (B) A (C) $\overline{A}$ (D) $-\overline{A}$

6. The value of the determinant $\begin{vmatrix} 1 & 12 & 25 \\ 0 & 3 & 15 \\ 0 & 0 & 8 \end{vmatrix}$ is: **(GRW G-I, 2024)**

(A) 0 (B) 1 (C) 8 (D) 24

7. The matrix [1 2 3] is _____ matrix: **(GRW G-II, 2024)**

(A) square (B) unit (C) null (D) row

8. If $\begin{bmatrix} x & 1 \\ 3 & 1 \end{bmatrix}$ is singular, then $x=$: **(GRW G-II, 2024)**

(A) -3 (B) 3 (C) 1 (D) -1

9. For any non-singular matrix A, A^{-1} is: **(FSD G-I, 2024)**

(A) $|A|\,adj(A)$ (B) $\frac{1}{|A|\,adj(A)}$ (C) $\frac{adj(A)}{|A|}$ (D) $\frac{|A|}{adj(A)}$

10. Transpose of diagonal matrix is: **(FSD G-I, 2024)**

(A) Scalar matrix (B) Row matrix (C) Null matrix (D) Diagonal matrix

11. The additive inverse of matrix A is: **(FSD G-II, 2024)**

(A) A (B) $-A$ (C) A^2 (D) 1

12. The trivial solution of homogenous linear equations is: **(FSD G-II, 2024)**

(A) $(1,0,0)$ (B) $(0,1,0)$ (C) $(0,0,1)$ (D) $(0,0,0)$

13. If $A=\begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, then A_{23} will be: **(SGD G-I, 2024)**

(A) 1 (B) 3 (C) -2 (D) 2

14. If $A=\begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ and $\frac{1}{|A|}=7$, then $x=$: **(SGD G-II, 2024)**

(A) $\frac{8}{7}$ (B) $\frac{7}{8}$ (C) $\frac{9}{7}$ (D) 7

15. The transpose of a rectangular matrix is a: **(SGD G-II, 2024)**

(A) Square matrix (B) Diagonal matrix
(C) Rectangular matrix (D) Scalar matrix

16. $(AB)^t=$: **(RWP G-I, 2024)**

(A) A^tB^t (B) A^tB (C) AB (D) B^tA^t

17. A square matrix A is anti-symmetric if: **(RWP G-I, 2024)**

(A) $A^t = -A$ (B) $A^t = A$ (C) $\overline{A} = A$ (D) $\overline{A} = -A$

18. If $A = [a \quad b \quad c]$, then order of A^t is: **(RWP G-II, 2024)**

(A) 1×3 (B) 3×1 (C) 3×3 (D) 1×1

19. If the matrix $\begin{bmatrix} \lambda & 1 \\ -2 & 1 \end{bmatrix}$ is singular then $\lambda =$: **(RWP G-II, 2024)**

(A) 2 (B) 1 (C) -1 (D) -2

20. Inverse of square matrix exists if it is: **(MTN G-I, 2024), (MTN G-II, 2024)**

(A) Singular (B) Non-singular (C) Null (D) Symmetric

21. If A is skew symmetric, then A^2 will be: **(MTN G-I, 2024)**

(A) Symmetric (B) Skew symmetric

(C) Hermitian (D) Skew Hermitian

22. If A is a square matrix of order 2×2 then $|KA|$ equals: **(MTN G-II, 2024)**

(A) $K|A|$ (B) $\frac{1}{K}|A|$ (C) $K^2|A|$ (D) $2K|A|$

23. If order of matrix A is 2×5 and order of B is 5×7, then order of AB is $--------$ **(DGK G-I, 2024)**

(A) 5×2 (B) 7×5 (C) 7×2 (D) 2×7

24. Rank of $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ is: **(DGK G-II, 2024)**

(A) Zero (B) 1 (C) −1 (D) 2

25. Determinant of $[-5]$ is: **(DGK G-II, 2024)**

(A) Zero (B) Not possible (C) −5 (D) 5

26. Rank of the matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is: **(SWL G-II, 2024)**

(A) 2 (B) -1 (C) 0 (D) $\sqrt{-1}$

27. If $\begin{vmatrix} k & 4 \\ 4 & k \end{vmatrix} = 20$ then $k =$: **(SWL G-II, 2024)**

(A) ±36 (B) ±24 (C) ±16 (D) ±6

28. A matrix of order m × 1 is called: **(BWP G-II, 2024)**

(A) Row Matrix (B) Column Matrix

(C) Diagonal Matrix (D) Null Matrix

29. If $A = \begin{bmatrix} 1 & 1 \\ 1 & x \end{bmatrix}$ and $|A| = 4$, then $x =$: **(BWP G-II, 2024)**

(A) 2 (B) 3 (C) 4 (D) 5

Answers

1.	(A)	2.	(B)	3.	(A)	4.	(D)	5.	(B)	6.	(D)	7.	(D)	8.	(B)
9.	(C)	10.	(D)	11.	(B)	12.	(D)	13.	(C)	14.	(A)	15.	(C)	16.	(D)
17.	(A)	18.	(B)	19.	(D)	20.	(B)	21.	(A)	22.	(C)	23.	(D)	24.	(B)
25.	(C)	26.	(A)	27.	(D)	28.	(B)	29.	(D)						

Solutions

1. **(A)** $|A| = 2$, then $|2A| = 2^3|A| = 8(2) = 16$

2. **(B)** $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ by $R_3 + R_1$ then $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, there is one non-zero row, so rank is 1.

3. **(A)** Order of matrix $A = 2 \times 3$, Order of matrix $A^t = 3 \times 2$, then order of $A^t A = 3 \times 3$

4. **(D)** $|A^t| = |A| = 9$

5. **(B)** $A^t = A$ (Definition of symmetric matrix)

6. **(D)** $\begin{vmatrix} 1 & 12 & 25 \\ 0 & 3 & 15 \\ 0 & 0 & 8 \end{vmatrix} = 1 \times 3 \times 8 = 24$ (If a matrix is in triangular form, then the value of its determinant is the product of entries on its main diagonal.)

7. **(D)** row

8. **(B)** $\begin{vmatrix} x & 1 \\ 3 & 1 \end{vmatrix} = 0 \Rightarrow x - 3 = 0 \Rightarrow x = 3$

9. **(C)** $A^{-1} = \dfrac{adj(A)}{|A|}$

10. **(D)** Diagonal matrix

11. **(B)** $-A$

12. **(D)** $(0,0,0)$

13. **(C)** $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix} \Rightarrow A_{23} = (-1)^{2+3} \begin{vmatrix} 1 & 2 \\ -2 & -2 \end{vmatrix} = -(-2+4) = -2$

14. **(A)** $|A| = \begin{vmatrix} x & 1 \\ 1 & 1 \end{vmatrix} = x - 1$

$$\frac{1}{|A|} = 7 \Rightarrow \frac{1}{x-1} = 7 \Rightarrow 1 = 7x - 7 \Rightarrow 7x = 8 \Rightarrow x = \frac{8}{7}$$

15. **(C)** Rectangular matrix

16. **(D)** $(AB)^t = B^t A^t$

17. **(A)** $A^t = -A$

18. **(B)** $A = [a \quad b \quad c]$

Order of $A = 1 \times 3 \Rightarrow$ Order of $A^t = 3 \times 1$

19. **(D)** $\begin{vmatrix} \lambda & 1 \\ -2 & 1 \end{vmatrix} = 0 \Rightarrow \lambda + 2 = 0 \Rightarrow \lambda = -2$

20. **(B)** Inverse of square matrix exists if it is Non-singular

21. **(A)** If A is skew symmetric matrix then $A^t = -A$

$\left(A^2\right)^t = \left(A^t\right)^2 = (-A)^2 = A^2 \Rightarrow$ A^2 is symmetric.

22. **(C)** $|KA| = K^2 |A|$

23. **(D)** Order of matrix A is 2×5 and order of B is 5×7, then order of AB is 2×7.

24. **(B)** $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ by $R_2 - R_1$ then $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$, there is one non-zero row, so rank is 1.

25. **(C)** $|-5| = -5$

26. **(A)** $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, there are two non-zero rows, so rank is 2.

27. **(D)** $\begin{vmatrix} k & 4 \\ 4 & k \end{vmatrix} = 20 \Rightarrow k^2 - 16 = 20 \Rightarrow k^2 = 36 \Rightarrow k = \pm 6$

28. **(B)** A matrix of order m × 1 is called column matrix.

29. **(D)** $A=\begin{bmatrix}1 & 1\\ 1 & x\end{bmatrix}$ and $|A|=4 \Rightarrow \begin{vmatrix}1 & 1\\ 1 & x\end{vmatrix}=4 \Rightarrow x-1=4 \Rightarrow x=5$

Chapter 4

MCQs

1. The roots of $2x^2-7x+3=0,$ are: **(LHR G-I, 2024)**

(A) Equal (B) Complex (C) Irrational (D) Rational

2. If ω is a cube root of unity, then value of $\left(1+\omega-\omega^2\right)^3$ is: **(LHR G-I, 2024)**

(A) 8ω (B) $8\omega^2$ (C) -8 (D) 8

3. If $4^{1+x}=2$, then $x=$: **(LHR G-II, 2024)**

(A) 0 (B) -2 (C) $-\frac{1}{2}$ (D) $\frac{1}{2}$

4. If ω is a cube root of unity, then $\left(1+\omega+\omega^2\right)^8=$: **(LHR G-II, 2024)**

(A) 0 (B) 256 (C) 256ω (D) $256\omega^2$

5. When $3x^4+4x^3+x-5$ is divided by $x+1$, then remainder is: **(GRW G-I, 2024)**

(A) -7 (B) -6 (C) 6 (D) 7

6. In a quadratic equation $ax^2+bx+c=0$, if $b^2-4ac>0$, then roots are: **(GRW G-I, 2024)**

(A) real (B) equal (C) rational (D) irrational

7. Sum of roots of equation $x^2-5x+6=0$ is: **(GRW G-II, 2024)**

(A) 6 (B) -6 (C) 5 (D) -5

8. $3^{2x}+4.3^x+4=0$ is _____ equation: **(GRW G-II, 2024)**

(A) cubic (B) Radical (C) reciprocal (D) exponential

9. If ω is complex root of unity then value of $(3+\omega)(3+\omega^2)$ is: **(FSD G-I, 2024)**

(A) 6 (B) 7 (C) 0 (D) 13

10. A quadratic equation $ax^2+bx+c=0$ becomes linear equation if: **(FSD G-I, 2024)**

(A) $a=0$ (B) $b=0$ (C) $c=0$ (D) $a=b$

11. Complex cube roots of -1 are: **(FSD G-II, 2024)**

(A) ω,ω^2 (B) $1,\omega,\omega^2$ (C) $-1,-\omega,-\omega^2$ (D) $-\omega,-\omega^2$

12. Sum of all the three cube roots of unity is: **(FSD G-II, 2024)**

(A) 1 (B) -1 (C) 3 (D) 0

13. The product of four fourth root of unity is: **(SGD G-I, 2024)**

(A) 1 (B) -1 (C) 0 (D) 4

14. If α and β are roots of $7x^2-x-2=0$, then $\alpha+\beta$ will be: **(SGD G-I, 2024)**

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

15. The quadratic equation with roots $3-\sqrt{3}$, $3+\sqrt{3}$ is: **(SGD G-II, 2024)**

(A) $x^2+4x+1=0$ (B) $x^2-4x+1=0$ (C) $x^2-6x+6=0$ (D) $x^2-6x-6=0$

16. $1-\omega+\omega^2=$: **(SGD G-II, 2024)**

(A) -1 (B) 0 (C) $-\omega$ (D) -2ω

17. Four 4th roots of 625 are: **(RWP G-I, 2024)**

(A) $\pm4,\pm4i$ (B) $\pm5,\pm5i$ (C) $\pm16,\pm16i$ (D) $\pm25,\pm25i$

18. $1+\omega+\omega^2=$: **(RWP G-I, 2024)**

(A) 1 (B) ω (C) ω^2 (D) 0

19. If $4^{3x}=\frac{1}{2}$ then x is equal to: **(RWP G-II, 2024)**

(A) $-\frac{1}{6}$ (B) -6 (C) $\frac{1}{6}$ (D) 6

20. If ω is cube root of unity, then $\omega+\omega^2=$: **(RWP G-II, 2024)**

(A) 0 (B) -1 (C) 1 (D) $\frac{1}{\omega}$

21. Product of roots of $x^2-5x+6=0$ is: **(MTN G-I, 2024)**

(A) -6 (B) 6 (C) 5 (D) -5

22. Roots of equation $cx^2+ax+b=0$ are complex if: **(MTN G-I, 2024)**

(A) $b^2-4ac<0$ (B) $c^2-4ab<0$

(C) $a^2-4bc<0$ (D) $a^2-4ac<0$

23. If $4^x=\frac{1}{2}$ then x is equal to: **(MTN G-II, 2024), (SWL G-II, 2024)**

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

24. The roots of the equation $x^2-5x+6=0$ are: **(MTN G-II, 2024), (BWP G-II, 2024)**

(A) $2,-3$ (B) $-2,-3$ (C) $2,3$ (D) $-2,3$

25. α, β are roots of $x^2+2x+1=0$, then $\alpha^2+\beta^2=-----$ **(DGK G-I, 2024)**

(A) 8 (B) 4 (C) −2 (D) 2

26. If ω is cube root of unity, then $\left(1+\omega+\omega^2\right)^2=------$ **(DGK G-I, 2024)**

(A) ω (B) ω^2 (C) 0 (D) 1

27. α, β are roots of $ax^2-bx+c=0$, then $\alpha+\beta=$: **(DGK G-II, 2024)**

(A) $\frac{b}{a}$ (B) $-\frac{b}{a}$ (C) $\frac{c}{a}$ (D) $-\frac{c}{a}$

28. If polynomial x^2-2x+2 is divided by $x-1$, then remainder is: **(DGK G-II, 2024)**

(A) −1 (B) 1 (C) 0 (D) 2

29. The product of the roots of equation $x^2+2x+1=0$ is: **(SWL G-II, 2024)**

(A) 2 (B) 3 (C) 1 (D) -1

30. Degree of constant polynomial is: **(BWP G-II, 2024)**

(A) n (B) 2 (C) 1 (D) 0

Answers

1.	(D)	2.	(C)	3.	(C)	4.	(A)	5.	(A)	6.	(A)	7.	(C)	8.	(D)
9.	(B)	10.	(A)	11.	(D)	12.	(D)	13.	(B)	14.	(B)	15.	(C)	16.	(D)
17.	(B)	18.	(D)	19.	(A)	20.	(B)	21.	(B)	22.	(C)	23.	(A)	24.	(C)
25.	(D)	26.	(C)	27.	(A)	28.	(B)	29.	(C)	30.	(D)				

Solutions

1. (D) $2x^2-7x+3=0$

Disc. $=b^2-4ac=49-24=25$ which is a perfect square, so roots are rational.

2. (C) $\left(1+\omega-\omega^2\right)^3=\left(-\omega^2-\omega^2\right)^3=\left(-2\omega^2\right)^3=-8\omega^6=-8\left(\omega^3\right)^2=-8$

3. (C) $4^{1+x}=2\Rightarrow\left(2^2\right)^{1+x}=2\Rightarrow 2^{2+2x}=2^1\Rightarrow 2+2x=1\Rightarrow 2x=-1\Rightarrow x=-\frac{1}{2}$

4. (A) $\left(1+\omega+\omega^2\right)^8=(0)^8=0$

5. (A) $f(x)=3x^4+4x^3+x-5$

$x+1=0\Rightarrow x=-1$

Remainder $=f(-1)=3-4-1-5=-7$

6. **(A)** real

7. **(C)** $x^2-5x+6=0$

Sum of roots $=-\dfrac{b}{a}=-\dfrac{(-5)}{1}=5$

8. **(D)** exponential

9. **(B)** $(3+\omega)(3+\omega^2)=9+3\omega^2+3\omega+\omega^3=9+3(\omega^2+\omega)+1=10+3(-1)=10-3=7$

10. **(A)** $a=0$

11. **(D)** $-\omega,-\omega^2$

12. **(D)** $1+\omega+\omega^2=0$

13. **(B)** $(1)(-1)(i)(-i)=i^2=-1$

14. **(B)** $7x^2-x-2=0$, then $\alpha+\beta=-\dfrac{b}{a}=-\dfrac{(-1)}{7}=\dfrac{1}{7}$

15. **(C)** $S=3-\sqrt{3}+3+\sqrt{3}=6,\ P=\left(3-\sqrt{3}\right)\left(3+\sqrt{3}\right)=9-3=6$

Quadratic equation is $x^2-Sx+P=0\Rightarrow x^2-6x+6=0$

16. **(D)** $1-\omega+\omega^2=-\omega-\omega=-2\omega$

17. **(B)** $\pm5,\pm5i$

18. **(D)** $1+\omega+\omega^2=0$

19. **(A)** $4^{3x}=\dfrac{1}{2}\Rightarrow\left(2^2\right)^{3x}=2^{-1}\Rightarrow 2^{6x}=2^{-1}\Rightarrow 6x=-1\Rightarrow x=-\dfrac{1}{6}$

20. **(B)** $\omega+\omega^2=-1$

21. **(B)** $x^2-5x+6=0\Rightarrow$ Product of roots $=P=\dfrac{c}{a}=\dfrac{6}{1}=6$

22. **(C)** $cx^2+ax+b=0\Rightarrow$ Roots are complex if $a^2-4bc<0$

23. **(A)** $4^x=\dfrac{1}{2}\Rightarrow 2^{2x}=2^{-1}\Rightarrow 2x=-1\Rightarrow x=-\dfrac{1}{2}$

24. **(C)** $x^2-5x+6=0\Rightarrow x^2-3x-2x+6=0\Rightarrow x(x-3)-2(x-3)=0\Rightarrow(x-3)(x-2)=0$

$x-3=0$ *or* $x-2=0$

$x=3$ $\qquad$ $x=2$

25. **(D)** $x^2+2x+1=0$

$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=(-2)^2-2(1)=2$

26. **(C)** $\left(1+\omega+\omega^2\right)^2=(0)^2=0$

27. **(A)** $ax^2-bx+c=0,$ then $\alpha+\beta=-\dfrac{(-b)}{a}=\dfrac{b}{a}$

28. **(B)** $f(x)=x^2-2x+2$

$x-1=0\Rightarrow x=1$

Remainder $=f(1)=1-2+2=1$

29. **(C)** $x^2+2x+1=0\Rightarrow$ Product of roots $=P=\dfrac{1}{1}=1$

30. **(D)** 0

Chapter 5

MCQs

1. The fraction $\dfrac{x+1}{x^2+2}$ is: **(LHR G-I, 2024), (FSD G-II, 2024)**

(A) Improper fraction (B) Proper fraction

(C) Identity (D) Mixed

2. The equation $x(x-1)=x^2-x$ is: **(LHR G-II, 2024)**

(A) Conditional (B) Identity (C) Exponential (D) Radical

3. Conditional equation $3x-1=0$ is true only if: **(GRW G-I, 2024)**

(A) $x=3$ (B) $x=-3$ (C) $x=\dfrac{1}{3}$ (D) $x=-\dfrac{1}{3}$

4. In $\frac{p(x)}{q(x)}$, degree of $p(x)$ is less than degree of $q(x)$, then fraction is: **(GRW G-II, 2024)**

(A) proper (B) improper (C) combined (D) partial

5. The improper fraction can be changed into proper fraction by: **(FSD G-I, 2024)**

(A) Addition (B) Subtraction (C) Multiplication (D) Division

6. Rational fraction $\frac{x^2+2x+3}{Q(x)}$ will be improper fraction if degree of $Q(x)$ is: **(SGD G-I, 2024)**

(A) 3 (B) 4 (C) 2 (D) 5

7. $(x-4)^2 = x^2-8x+16$ is: **(SGD G-II, 2024)**

(A) A linear equation (B) Cubic equation
(C) An equation (D) An identity

8. Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ are of the form: **(RWP G-I, 2024)**

(A) $\frac{A}{x+1}+\frac{B}{x-1}$ (B) $\frac{Ax}{x+1}+\frac{B}{x-1}$ (C) $1+\frac{A}{x+1}+\frac{B}{x-1}$ (D) $\frac{Ax+B}{x+1}+\frac{Cx+D}{x-1}$

9. From the identity $5x+4 = A(x-1)+B(x+2)$, value of B is: **(RWP G-II, 2024)**

(A) -3 (B) 3 (C) -2 (D) 2

10. $\frac{1}{x^3+1} = \frac{A}{x+1}+\frac{----}{x^2-x+1}$ (Numerator of x^2-x+1) **(MTN G-I, 2024)**

(A) $Bx+C$ (B) B (C) C (D) $B+C$

11. The fraction $\frac{x-3}{x+1}$ is: **(MTN G-II, 2024)**

(A) Improper (B) Proper (C) Identity (D) Equivalent

12. $\frac{2}{x^2-1} = \frac{1}{x-1}+\frac{B}{x+1}$, then value of B is: **(DGK G-I, 2024)**

(A) 1 (B) −1 (C) 2 (D) −2

13. Partial fraction of $\frac{x}{(x-1)(x+2)} = \frac{1}{3(x-1)}+\frac{B}{x+2}$, then value of B is: **(DGK G-II, 2024)**

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

14. $\frac{A}{x-1}+\frac{B}{x+1}$ is a partial fraction of: **(SWL G-II, 2024)**

(A) $\frac{1}{x^3-1}$ (B) $\frac{1}{x^2-1}$ (C) $\frac{1}{1-x^2}$ (D) $\frac{1}{x^2+1}$

15. $\frac{x}{2x+3}$ is: **(BWP G-II, 2024)**

(A) Proper Fraction (B) Improper Fraction
(C) Identity Fraction (D) Mixed Fraction

Answers

1.	(B)	2.	(B)	3.	(C)	4.	(A)	5.	(D)	6.	(C)	7.	(D)	8.	(C)
9.	(B)	10.	(A)	11.	(A)	12.	(B)	13.	(C)	14.	(B)	15.	(B)		

Solutions

1. **(B)** Proper fraction

2. **(B)** Identity

3. **(C)** $3x-1=0 \Rightarrow x=\frac{1}{3}$

4. **(A)** proper
5. **(D)** Division
6. **(C)** 2
7. **(D)** An identity
8. **(C)** $\frac{x^2+1}{(x+1)(x-1)}=\frac{x^2+1}{x^2-1}$ which is an improper rational fraction

$\frac{x^2+1}{x^2-1}=1+\frac{2}{x^2-1}=1+\frac{2}{(x+1)(x-1)}=1+\frac{A}{x+1}+\frac{B}{x-1}$

9. **(B)** $5x+4=A(x-1)+B(x+2)\Rightarrow 5x+4=(A+B)x+(-A+2B)$

$5=A+B\ \cdots(1),\ 4=-A+2B\cdots(2)$

Adding Eq.(1) and Eq.(2), we get

$9=3B\Rightarrow B=3$

10. **(A)** $Bx+C$
11. **(A)** Improper

12. **(B)** $\frac{2}{x^2-1}=\frac{1}{x-1}+\frac{B}{x+1}\Rightarrow\frac{2}{(x+1)(x-1)}=\frac{1}{x-1}+\frac{B}{x+1}$

$x+1=0\Rightarrow x=-1$

$B=\frac{2}{x-1}=\frac{2}{-1-1}=-1$

13. **(C)** $\frac{x}{(x-1)(x+2)}=\frac{1}{3(x-1)}+\frac{B}{x+2}$

$x+2=0\Rightarrow x=-2$

$B=\frac{x}{x-1}=\frac{-2}{-2-1}=\frac{2}{3}$

14. **(B)** $\frac{1}{x^2-1}$
15. **(B)** Improper Fraction

Chapter 9

MCQS

1. If $\sin\theta<0$ and $\cot\theta>0$, then θ lies in quadrant: **(LHR G-I, 2024)**

(A) IV (B) III (C) II (D) I

2. Which angle is quadrantal angle: **(LHR G-II, 2024)**

(A) $45°$ (B) $60°$ (C) $120°$ (D) $270°$

3. If $\sin\theta>0$ and $\sec\theta>0$, then terminal arm of 0 lies in quadrant: **(GRW G-I, 2024)**

(A) I (B) II (C) III (D) IV

4. Number of radians in semi-circle: **(GRW G-II, 2024)**

(A) $\frac{\pi}{2}$ (B) π (C) 2π (D) $\frac{2\pi}{3}$

5. The 60^{th} part of 1 degree is called one: **(FSD G-I, 2024)**

(A) Second (B) Radian (C) Degree (D) Minute

6. The angle $\frac{\pi}{12}$ in degree measure is: **(FSD G-II, 2024)**

(A) $30°$ (B) $20°$ (C) $45°$ (D) $15°$

7. If $\cot\theta=\frac{5}{2};\ 0<\theta<\frac{\pi}{2}$, then $\operatorname{cosec}^2\theta$ is: **(SGD G-I, 2024)**

(A) $\frac{-29}{4}$ (B) $\frac{4}{29}$ (C) $\frac{29}{4}$ (D) $\frac{-4}{29}$

8. $120°$ = _____ radians: **(SGD G-II, 2024)**

(A) $\frac{3\pi}{2}$ (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{2}$ (D) 180π

9. If $\sin\theta < 0$ and $\cos\theta > 0$, then terminal arm of θ lies in quadrant: **(RWP G-I, 2024)**

(A) I (B) II (C) III (D) IV

10. Which of the following is not a quadrantal angle? **(RWP G-II, 2024)**

(A) $\frac{9}{2}\pi$ (B) 13π (C) $\frac{4}{3}\pi$ (D) $\frac{\pi}{2}$

11. -1035° is coterminal with _____ **(MTN G-I, 2024)**

(A) 60° (B) 30° (C) 45° (D) 35°

12. Trigonometric ratio of $-330°$ is same as: **(MTN G-II, 2024)**

(A) $60°$ (B) $30°$ (C) $45°$ (D) $90°$

13. Value of $\sin^2\frac{\pi}{4}+\cos^2\frac{\pi}{4} = -----$ **(DGK G-I, 2024)**

(A) 0 (B) -1 (C) 1 (D) $\frac{1}{\sqrt{2}}$

14. One degree is equal to ..... radian **(DGK G-II, 2024)**

(A) $\frac{180}{\pi}$ (B) $\frac{\pi}{180}$ (C) $\frac{\pi}{90}$ (D) π

15. $2\sin 45° + \frac{1}{2}\cos ec 45° =:$ **(SWL G-II, 2024)**

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

Answers

1.	(B)	2.	(D)	3.	(A)	4.	(B)	5.	(D)	6.	(D)	7.	(C)	8.	(B)
9.	(D)	10.	(C)	11.	(C)	12.	(B)	13.	(C)	14.	(B)	15.	(C)		

Solutions

1. **(B)** III

2. **(D)** $270°$

3. **(A)** I

4. **(B)** π

5. **(D)** Minute

6. **(D)** $\frac{\pi}{12}\times\frac{180}{\pi} = 15^\circ$

7. **(C)** $\cot\theta = \frac{5}{2};\ 0 < \theta < \frac{\pi}{2}$

$\cos ec^2\theta = 1+\cot^2\theta = 1+\frac{25}{4} = \frac{29}{4}$

8. **(B)** $120^\circ = 120\times\frac{\pi}{180} = \frac{2\pi}{3}$

9. **(D)** IV

10. **(C)** $\frac{4}{3}\pi$

11. **(C)** $-1035^\circ = 45^\circ + (-3)360^\circ = 45^\circ$

12. **(B)** $-330^\circ = 30^\circ + (-1)360^\circ = 30^\circ$

13. **(C)** $\sin^2\frac{\pi}{4}+\cos^2\frac{\pi}{4} = 1$

14. **(B)** $\frac{\pi}{180}$

15. **(C)** $2\sin 45° + \frac{1}{2}\cos ec45° = \frac{2}{\sqrt{2}} + \frac{\sqrt{2}}{2} = \frac{4+2}{2\sqrt{2}} = \frac{6}{2\sqrt{2}} = \frac{3}{\sqrt{2}}$

Chapter 10

MCQs

1. $\cos 2\theta =:$ **(LHR G-I, 2024)**

(A) $1-\sin^2\theta$ (B) $1-2\sin\theta$ (C) $1-2\sin^2\theta$ (D) $2\sin^2\theta-1$

2. $\sin(270°+\theta) =:$ **(LHR G-II, 2024), (SGD G-I, 2024)**

(A) $\sin\theta$ (B) $\cos\theta$ (C) $-\cos\theta$ (D) $-\sin\theta$

3. $\sin(\pi-\theta) =:$ **(GRW G-I, 2024)**

(A) $\sin\theta$ (B) $-\sin\theta$ (C) $\cos\theta$ (D) $-\cos\theta$

4. Co-ratio of cosine is: **(GRW G-II, 2024)**

(A) sine (B) cosine (C) tangent (D) secant

5. $\cot(\pi-\alpha) =:$ **(FSD G-I, 2024)**

(A) $\sin\alpha$ (B) $\cot\alpha$ (C) $-\cot\alpha$ (D) $\tan\alpha$

6. $\cos(\theta-90°)-\cos(\theta+90°)$ equal to: **(FSD G-II, 2024)**

(A) $-2\cos\theta$ (B) $2\cos\theta$ (C) $-2\sin\theta$ (D) $2\sin\theta$

7. $2\sin^2\left(\frac{\alpha}{2}\right) =:$ **(SGD G-II, 2024)**

(A) $1+\sin\alpha$ (B) $1-\sin\alpha$ (C) $1+\cos\alpha$ (D) $1-\cos\alpha$

8. $\frac{1-\cos\theta}{2} =:$ **(RWP G-I, 2024)**

(A) $\sin\theta$ (B) $\sin^2\frac{\theta}{2}$ (C) $\cos\theta$ (D) $\cos^2\frac{\theta}{2}$

9. The angle $\frac{3\pi}{2}-\theta$ lies in quadrant: **(RWP G-II, 2024)**

(A) I (B) II (C) III (D) IV

10. $\cos(\alpha+\beta)-\cos(\alpha-\beta) =:$ **(MTN G-I, 2024)**

(A) $-2\cos\alpha\cos\beta$ (B) $2\cos\alpha\cos\beta$

(C) $2\sin\alpha\sin\beta$ (D) $-2\sin\alpha\sin\beta$

11. $\frac{3\pi}{2}+\theta$ lies in quadrant: **(MTN G-II, 2024)**

(A) 1st (B) 2nd (C) 3rd (D) 4th

12. $\sec\left(\frac{\pi}{2}-\theta\right) =:$ **(DGK G-I, 2024)**

(A) $-\sec\theta$ (B) $-\cos ec\theta$ (C) $\sec\theta$ (D) $\cos ec\theta$

13. $\cot(90-\alpha) =:$ **(DGK G-II, 2024)**

(A) $\tan\alpha$ (B) $-\tan\alpha$ (C) $\cot\alpha$ (D) $-\cot\alpha$

14. $\sin(-300°) =:$ **(SWL G-II, 2024)**

(A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{2}{\sqrt{3}}$ (D) 0

15. $\tan(\alpha-90°) =:$ **(BWP G-II, 2024)**

(A) $\cot\alpha$ (B) $-\cot\alpha$ (C) $\tan\alpha$ (D) $-\tan\alpha$

Answers

1.	(C)	2.	(C)	3.	(A)	4.	(A)	5.	(C)	6.	(D)	7.	(D)	8.	(B)
9.	(C)	10.	(D)	11.	(D)	12.	(D)	13.	(A)	14.	(B)	15.	(B)		

Solutions

1. **(C)** $\cos 2\theta = 1 - 2\sin^2\theta$

2. **(C)** $-\cos\theta$

3. **(A)** $\sin\theta$

4. **(A)** sine

5. **(C)** $-\cot\alpha$

6. **(D)** $\cos(\theta - 90°) - \cos(\theta + 90°) = \cos(90° - \theta) - \cos(90° + \theta) = \sin\theta + \sin\theta = 2\sin\theta$

7. **(D)** $\sin\left(\frac{\alpha}{2}\right) = \pm\sqrt{\frac{1-\cos\alpha}{2}} \Rightarrow \sin^2\left(\frac{\alpha}{2}\right) = \frac{1-\cos\alpha}{2} \Rightarrow 2\sin^2\left(\frac{\alpha}{2}\right) = 1 - \cos\alpha$

8. **(B)** $\sin\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1-\cos\theta}{2}} \Rightarrow \sin^2\left(\frac{\theta}{2}\right) = \frac{1-\cos\theta}{2}$

9. **(C)** *III*

10. **(D)** $\cos(\alpha+\beta) - \cos(\alpha-\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta - (\cos\alpha\cos\beta + \sin\alpha\sin\beta)$
$= -2\sin\alpha\sin\beta$

11. **(D)** 4^{th}

12. **(D)** $\cos ec\theta$

13. **(A)** $\tan\alpha$

14. **(B)** $\sin(-300°) = -\sin 300° = -\sin(270° + 30°) = \cos 30° = \frac{\sqrt{3}}{2}$

15. **(B)** $\tan(\alpha - 90°) = \tan\left(-(90° - \alpha)\right) = -\tan(90° - \alpha) = -\cot\alpha$

Chapter 11
MCQs

1. The period of $\cos\frac{x}{6}$ is: **(LHR G-I, 2024)**

(A) 2π (B) 3π (C) 6π (D) 12π

2. The period of $\cos 2x$ is: **(LHR G-II, 2024)**

(A) π (B) 2π (C) 4π (D) $\frac{\pi}{2}$

3. $\tan\theta$ is a periodic function of period: **(GRW G-I, 2024), (GRW G-II, 2024)**

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{3\pi}{2}$ (D) 2π

4. The domain of $\cos x$ is: **(FSD G-I, 2024)**

(A) $[-1,1]$ (B) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (C) R (D) Q

5. Period of is $\cos\theta$: **(FSD G-II, 2024)**

(A) 2π (B) $\frac{3\pi}{2}$ (C) π (D) $\frac{\pi}{2}$

6. Period of $\sin\frac{x}{3}$ is: **(SGD G-I, 2024), (DGK G-II, 2024)**

(A) 6π (B) 3π (C) -6π (D) -3π

7. The range of $\sin x$ is: **(SGD G-II, 2024), (RWP G-II, 2024), (MTN G-II, 2024)**

(A) $[-1,1]$ (B) $]-1,1[$ (C) R (D) $]-1,1]$

8. Range of $y = \tan x$ is: **(RWP G-I, 2024)**

(A) $\frac{-\pi}{2} \geq y \leq \frac{\pi}{2}$ (B) $-\infty < y < \infty$ (C) $\frac{-\pi}{2} \geq x \leq \frac{\pi}{2}$ (D) $-\infty < x < \infty$

9. Period of $\sec x$ is: **(MTN G-I, 2024)**

(A) π (B) 2π (C) 3π (D) $\frac{\pi}{2}$

10. Period of $\operatorname{cosec} x$ is: **(DGK G-I, 2024)**

(A) 2π (B) π (C) 3π (D) $\pi/2$

11. Range of $\sin\left(\frac{x}{2}\right)$ is: **(SWL G-II, 2024)**

(A) $\left[\frac{1}{2},-\frac{1}{2}\right]$ (B) $[-2,2]$ (C) $[2,-2]$ (D) $[-1,1]$

12. Period of $\cot 3x$ is: **(BWP G-II, 2024)**

(A) π (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{3}$

Answers

1.	(D)	2.	(A)	3.	(A)	4.	(C)	5.	(A)	6.	(A)	7.	(A)	8.	(B)
9.	(B)	10.	(A)	11.	(D)	12.	(D)								

Solutions

1. **(D)** Period of $\cos\frac{x}{6}$ is $\frac{2\pi}{\frac{1}{6}}=12\pi$

2. **(A)** Period of $\cos 2x$ is $\frac{2\pi}{2}=\pi$

3. **(A)** π

4. **(C)** R

5. **(A)** 2π

6. **(A)** Period of $\sin\frac{x}{3}$ is $\frac{2\pi}{\frac{1}{3}}=6\pi$

7. **(A)** $[-1,1]$

8. **(B)** $-\infty<y<\infty$

9. **(B)** 2π

10. **(A)** 2π

11. **(D)** $[-1,1]$

12. **(D)** Period of $\cot 3x$ is $\frac{\pi}{3}$

Chapter 12
MCQs

1. $\sqrt{\frac{s(s-c)}{ab}}=:$ **(LHR G-I, 2024)**

(A) $\cos\frac{\alpha}{2}$ (B) $\sin\frac{\alpha}{2}$ (C) $\cos\frac{\gamma}{2}$ (D) $\sin\frac{\gamma}{2}$

2. With usual notation, $\frac{abc}{4R}=:$ **(LHR G-II, 2024)**

(A) r (B) r_1 (C) Δ (D) r_2

3. $r_2 =:$ **(GRW G-I, 2024)**

(A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ (C) $\frac{\Delta}{s-b}$ (D) $\frac{\Delta}{s-c}$

4. Sum of opposite angles of cyclic quadrilateral is: **(GRW G-II, 2024)**

(A) 90 (B) 120 (C) 180 (D) 270

5. A circle passing through the three vertices of a triangle is called: **(FSD G-I, 2024)**

(A) Circumcircle (B) In-circle (C) Escribed circle (D) Both A and B

6. Angle below the horizontal line is called: **(FSD G-II, 2024)**

(A) Right angle (B) Oblique angle

(C) Angle of depression (D) Angle of elevation

7. $\frac{4\Delta}{abc} =:$ **(SGD G-I, 2024)**

(A) $\frac{1}{R}$ (B) $\frac{1}{r}$ (C) R (D) r

8. $r_1 r_2 r_3 =:$ **(SGD G-II, 2024)**

(A) Rr^2 (B) rR^2 (C) RS^2 (D) rs^2

9. $2R\sin\alpha =:$ **(RWP G-I, 2024)**

(A) r (B) s (C) Δ (D) a

10. The radius of inscribed circle is: **(RWP G-II, 2024)**

(A) $\frac{abc}{4\Delta}$ (B) $\frac{s}{\Delta}$ (C) $\frac{\Delta}{s-a}$ (D) $\frac{\Delta}{s}$

11. $\sqrt{\frac{s(s-a)}{bc}} =:$ **(MTN G-I, 2024)**

(A) $\cos\frac{\alpha}{2}$ (B) $\sin\frac{\alpha}{2}$ (C) $\tan\frac{\alpha}{2}$ (D) $\cot\frac{\alpha}{2}$

12. In right triangle, no angle is greater than: **(MTN G-II, 2024)**

(A) 45° (B) 80° (C) 60° (D) 90°

13. Radius of escribed circle opposite to vertex A of triangle is: **(DGK G-I, 2024)**

(A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ (C) $\frac{\Delta}{s-b}$ (D) $\frac{\Delta}{s-c}$

14. $\cos\frac{\alpha}{2} =:$ **(DGK G-II, 2024)**

(A) $\frac{s(s-a)}{bc}$ (B) $\frac{s(s-b)}{ac}$ (C) $\sqrt{\frac{s(s-a)}{bc}}$ (D) $\sqrt{\frac{s(s-b)}{ac}}$

15. In any triangle ABC, $\frac{c^2+a^2-b^2}{2ac} =:$ **(SWL G-II, 2024)**

(A) $\cos\alpha$ (B) $\cos\beta$ (C) $\cos\gamma$ (D) $\cos(\beta+\alpha)$

16. $\sec\left(\frac{\alpha}{2}\right) =:$ **(BWP G-II, 2024)**

(A) $\sqrt{\frac{s(s-a)}{bc}}$ (B) $\sqrt{\frac{bc}{s(s-a)}}$ (C) $\frac{s}{\Delta}$ (D) $\frac{\Delta}{s-b}$

Answers

1.	(C)	2.	(C)	3.	(C)	4.	(C)	5.	(A)	6.	(C)	7.	(A)	8.	(D)
9.	(D)	10.	(D)	11.	(A)	12.	(D)	13.	(B)	14.	(C)	15.	(B)	16.	(B)

Solutions

1. **(C)** $\cos\frac{\gamma}{2}$

2. **(C)** $\frac{abc}{4R}=\frac{abc}{4\times\frac{abc}{4\Delta}}=\Delta$

3. **(C)** $r_2=\frac{\Delta}{s-b}$

4. **(C)** 180

5. **(A)** Circumcircle

6. **(C)** Angle of depression

7. **(A)** $\frac{4\Delta}{abc}=\frac{1}{\frac{abc}{4\Delta}}=\frac{1}{R}$

8. **(D)** $r_1r_2r_3=\frac{\Delta}{s-a}\times\frac{\Delta}{s-b}\times\frac{\Delta}{s-c}=\frac{\Delta^3}{(s-a)(s-b)(s-c)}=\frac{s\Delta^3}{s(s-a)(s-b)(s-c)}=\frac{s\Delta^3}{\Delta^2}=s\Delta$

$=s\times s\times\frac{\Delta}{s}=rs^2$

9. **(D)** $2R\sin\alpha=2\times\frac{a}{2\sin\alpha}\times\sin\alpha=a$

10. **(D)** $\frac{\Delta}{s}$

11. **(A)** $\cos\frac{\alpha}{2}$

12. **(D)** $90°$

13. **(B)** $\frac{\Delta}{s-a}$

14. **(C)** $\sqrt{\frac{s(s-a)}{bc}}$

15. **(B)** $b^2=a^2+c^2-2ac\cos\beta\Rightarrow 2ac\cos\beta=c^2+a^2-b^2\Rightarrow\frac{c^2+a^2-b^2}{2ac}=\cos\beta$

16. **(B)** $\sqrt{\frac{bc}{s(s-a)}}$

Chapter 13
MCQs

1. The value of $\sin^{-1}\left(\cos\frac{\pi}{6}\right)$ is equal to: **(LHR G-I, 2024), (BWP G-II, 2024)**

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{2}$

2. $\sin^{-1}(0)+\cos^{-1}(0)=:$ **(LHR G-II, 2024)**

(A) 0 (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

3. $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right)=:$ **(GRW G-I, 2024), (RWP G-II, 2024)**

(A) $\frac{1}{\sqrt{2}}$ (B) 1 (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

4. $\cos(\tan^{-1} 0) =:$ **(GRW G-II, 2024)**

(A) 0 (B) 1 (C) -1 (D) ∞

5. $\sin^{-1}\left(-\frac{1}{2}\right) = :$ **(FSD G-I, 2024)**

(A) $\frac{\pi}{3}$ (B) $-\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $-\frac{\pi}{3}$

6. Domain of $y = \tan^{-1} x$ is: **(FSD G-II, 2024)**

(A) R (B) Q (C) N (D) Z

7. $\cos(2\sin^{-1} x)$ will be equal to: **(SGD G-I, 2024)**

(A) $2x^2 - 1$ (B) $1 + 2x^2$ (C) $2x + 1$ (D) $1 - 2x^2$

8. $2\cos^{-1} A =:$ **(SGD G-II, 2024)**

(A) $\sin^{-1}\{2A^2 - 1\}$ (B) $\sin^{-1}\{A^2 - 2\}$ (C) $\cos^{-1}\{2A^2 - 1\}$ (D) $\cos^{-1}\{A^2 - 2\}$

9. $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right) =:$ **(RWP G-I, 2024), (DGK G-I, 2024)**

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

10. $\tan\left[\tan^{-1}(-1)\right] =:$ **(MTN G-I, 2024)**

(A) 1 (B) -1 (C) $\frac{\pi}{4}$ (D) $-\frac{\pi}{4}$

11. Domain of $y = \sin^{-1}(x)$ is: **(MTN G-II, 2024)**

(A) $-1 \le x \le 1$ (B) $-1 \ge x \ge 1$ (C) $-1 < x < 1$ (D) $0 \le x \le 1$

12. $\sec\left(\cos^{-1}\frac{1}{2}\right) =:$ **(DGK G-II, 2024)**

(A) $\frac{1}{2}$ (B) 2 (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{6}$

13. The value of $\sec\left(\sin^{-1}\frac{\sqrt{3}}{2}\right) =:$ **(SWL G-II, 2024)**

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

Answers

1.	(A)	2.	(B)	3.	(A)	4.	(B)	5.	(B)	6.	(A)	7.	(D)
8.	(C)	9.	(A)	10.	(B)	11.	(A)	12.	(B)	13.	(C)		

Solutions

1. **(A)** $\sin^{-1}\left(\cos\frac{\pi}{6}\right) = \sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{3}$

2. **(B)** $\sin^{-1}(0) + \cos^{-1}(0) = 0 + \frac{\pi}{2} = \frac{\pi}{2}$

3. **(A)** $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right) = \cos\frac{\pi}{4} = \frac{1}{\sqrt{2}}$

4. **(B)** $\cos(\tan^{-1} 0) = \cos(0) = 1$

5. **(B)** $\sin^{-1}\left(-\frac{1}{2}\right)=-\sin^{-1}\left(\frac{1}{2}\right)=-\frac{\pi}{6}$

6. **(A)** R

7. **(D)** $\cos(2\sin^{-1}x)$

Let $\sin^{-1}x=t\Rightarrow x=\sin t$

$\cos(2\sin^{-1}x)=\cos 2t=1-2\sin^2 t=1-2x^2$

8. **(C)** $2\cos^{-1}A=\cos^{-1}A+\cos^{-1}A=\cos^{-1}\left[A.A-\sqrt{1-A^2}\sqrt{1-A^2}\right]=\cos^{-1}\left[A^2-\left\{1-A^2\right\}\right]$

$=\cos^{-1}\left\{A^2-1+A^2\right\}=\cos^{-1}\left\{2A^2-1\right\}$

9. **(A)** $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)=\sin\frac{\pi}{6}=\frac{1}{2}$

10. **(B)** $\tan\left[\tan^{-1}(-1)\right]=\tan\left(-\frac{\pi}{4}\right)=-1$

11. **(A)** $-1\le x\le 1$

12. **(B)** $\sec\left(\cos^{-1}\frac{1}{2}\right)=\sec\frac{\pi}{3}=\frac{1}{\cos\frac{\pi}{3}}=\frac{1}{\frac{1}{2}}=2$

13. **(C)** $\sec\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)=\sec\frac{\pi}{3}=\frac{1}{\cos\frac{\pi}{3}}=\frac{1}{\frac{1}{2}}=2$

Chapter 14
MCQs

1. If $\cos x=\frac{\sqrt{3}}{2}$, then the reference angle is: **(LHR G-I, 2024)**

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $-\frac{\pi}{3}$ (D) $-\frac{\pi}{6}$

2. If $\sin x=-\frac{\sqrt{3}}{2}$, then the reference angle is: **(LHR G-II, 2024)**

(A) $-\frac{\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $-\frac{\pi}{3}$ (D) $\frac{\pi}{3}$

3. Reference angle always lies in quadrant: **(GRW G-I, 2024), (SGD G-I, 2024)**

(A) I (B) II (C) III (D) IV

4. $\sin x=\frac{1}{2}$, then $x=$: **(GRW G-II, 2024)**

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

5. If $\sin x=\cos x$, then x = : **(FSD G-I, 2024)**

(A) $45°$ (B) $30°$ (C) $0°$ (D) $60°$

6. If $\sin x=\frac{1}{2}$, then $x=$: **(FSD G-II, 2024)**

(A) $\frac{\pi}{6},\frac{5\pi}{6}$ (B) $-\frac{\pi}{6},\frac{5\pi}{6}$ (C) $-\frac{\pi}{6},-\frac{5\pi}{6}$ (D) $\frac{\pi}{3},\frac{2\pi}{3}$

7. $\cos x = -\frac{1}{\sqrt{2}}$ and $x \in [0, \pi]$ then $x =$: **(SGD G-II, 2024)**

(A) $\frac{3\pi}{4}$ (B) $\frac{5\pi}{4}$ (C) $\frac{\pi}{4}$ (D) $\frac{-\pi}{4}$

8. Reference angle for $1 - 2\sin x = 0$ is: **(RWP G-I, 2024), (RWP G-II, 2024)**

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

9. $\sin x \cos x = \frac{\sqrt{3}}{4}$, then $x =$: **(MTN G-I, 2024)**

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $-\frac{\pi}{6}$ (D) $\frac{\pi}{4}$

10. If $\cos x = \frac{1}{\sqrt{2}}$, then reference angle is: **(MTN G-II, 2024), (SWL G-II, 2024)**

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

11. $\cos x = \frac{1}{2}$, then $x =$: **(DGK G-I, 2024)**

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

12. If $\cos x = -\frac{\sqrt{3}}{2}$, then value of x is: **(DGK G-II, 2024)**

(A) $\frac{5\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $-\frac{\pi}{3}$

13. If $\sin x = \frac{\sqrt{3}}{2}$ and $x \in [0, 2\pi]$, then x is: **(BWP G-II, 2024)**

(A) $\frac{5\pi}{3}, \frac{4\pi}{3}$ (B) $\frac{\pi}{4}, \frac{3\pi}{4}$ (C) $\frac{\pi}{3}, \frac{2\pi}{3}$ (D) $\frac{\pi}{6}, \frac{5\pi}{6}$

14. Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in quad III is: **(BWP G-II, 2024)**

(A) $\frac{5\pi}{3}$ (B) $\frac{7\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\frac{7\pi}{3}$

Answers

1.	(B)	2.	(D)	3.	(A)	4.	(A)	5.	(A)	6.	(A)	7.	(A)
8.	(A)	9.	(B)	10.	(B)	11.	(C)	12.	(A)	13.	(C)	14.	(C)

Solutions

1. **(B)** $\frac{\pi}{6}$

2. **(D)** $\frac{\pi}{3}$

3. **(A)** I

4. **(A)** $\sin x = \frac{1}{2}$

Since $\sin x$ is positive in 1st and 2nd quadrant with reference angle $\frac{\pi}{6}$

In 1st quadrant: $x = \frac{\pi}{6}$

5. **(A)** $\sin x = \cos x \Rightarrow \tan x = 1 \Rightarrow x = 45^{o}$

6. **(A)** $\sin x = \frac{1}{2}$

Since $\sin x$ is positive in 1st and 2nd quadrant with reference angle $\frac{\pi}{6}$

In 1st quadrant: $x = \frac{\pi}{6}$

In 2nd quadrant: $x = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$

7. **(A)** $\cos x = -\frac{1}{\sqrt{2}}$ and $x \in [0, \pi]$

Since $\cos x$ is negative in 2nd and 3rd quadrant with reference angle $\frac{\pi}{4}$

In 2nd quadrant: $x = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$

8. **(A)** $1 - 2\sin x = 0 \Rightarrow -2\sin x = -1 \Rightarrow \sin x = \frac{1}{2}$

Reference angle $= \frac{\pi}{6}$

9. **(B)** $x = \frac{\pi}{3}$ satisfies $\sin x \cos x = \frac{\sqrt{3}}{4}$

10. **(B)** $\frac{\pi}{4}$

11. **(C)** $\cos x = \frac{1}{2}$

Since $\cos x$ is positive in 1st and 4th quadrant with reference angle $\frac{\pi}{3}$

In 1st quadrant: $x = \frac{\pi}{3}$

12. **(A)** $\cos x = -\frac{\sqrt{3}}{2}$

Since $\cos x$ is negative in 2nd and 3rd quadrant with reference angle $\frac{\pi}{6}$

In 2nd quadrant: $x = \pi - \frac{\pi}{6} = \frac{5\pi}{6}$

13. **(C)** $\sin x = \frac{\sqrt{3}}{2}$ and $x \in [0, 2\pi]$

Since $\sin x$ is positive in 1st and 2nd quadrant with reference angle $\frac{\pi}{3}$

In 1st quadrant: $x = \frac{\pi}{3}$

In 2nd quadrant: $x = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$

14. **(C)** $\cot\theta = \frac{1}{\sqrt{3}} \Rightarrow \tan\theta = \sqrt{3}$

Reference angle $= \frac{\pi}{3}$

In 3rd quadrant: $x = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$