

RMS CET EXAM SERIES

MATHEMATICS

Complete Study Guide

Rashtriya Military School

Common Entrance Test | Class 9

Number Systems | Polynomials | Coordinate Geometry
Lines & Angles | Triangles | Quadrilaterals
Circles | Mensuration | Statistics & Probability

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Aligned to NCERT / CBSE Syllabus | 100+ MCQs with Answers

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CHAPTER 1

Number Systems

1.1 Types of Numbers

Numbers are classified into different types. Understanding their hierarchy is fundamental for RMS CET.

| | | |
|--------------------|----|--|
| Natural Numbers | N | 1, 2, 3, 4, ... |
| Whole Numbers | W | 0, 1, 2, 3, ... |
| Integers | Z | ..., -2, -1, 0, 1, 2, ... |
| Rational Numbers | Q | $\frac{1}{2}$, $-\frac{3}{4}$, 5, 0.75 |
| Irrational Numbers | Q' | $\sqrt{2}$, $\sqrt{3}$, π , e |
| Real Numbers | R | All rational + irrational |

1.2 Irrational Numbers

A number that **cannot** be expressed as $\frac{p}{q}$ (where p, q are integers, q is not 0) is called **irrational**. Its decimal expansion is non-terminating and non-repeating.

$$\sqrt{2} = 1.41421356... \quad \sqrt{3} = 1.73205... \quad \pi = 3.14159...$$

If n is NOT a perfect square, then \sqrt{n} is irrational.

Sum / difference of rational and irrational = always irrational

Note: Example: $2 + \sqrt{3}$ is irrational. $5 \times \sqrt{2}$ is irrational.

1.3 Laws of Exponents

$$a^m \times a^n = a^{(m+n)}$$

$$a^m / a^n = a^{(m-n)}$$

$$(a^m)^n = a^{(mn)}$$

$$a^0 = 1 \quad (a \text{ not equal } 0) \quad a^{(-n)} = 1 / a^n$$

$$a^{(1/n)} = \text{nth-root}(a) \quad a^{(m/n)} = (\text{nth-root}(a))^m$$

1.4 MCQ Practice — Number Systems

Q1. Which of the following is an irrational number?

- (a) $\sqrt{16}$
- (b) $\sqrt{9/4}$

- (c) $\sqrt{7}$
- (d) $\sqrt{25/49}$

Answer: (c)

Q2. The value of $(2^3)^2$ is:

- (a) 12
- (b) 32
- (c) 64
- (d) 128

Answer: (c)

Q3. Every rational number is a:

- (a) Natural number
- (b) Integer
- (c) Real number
- (d) Whole number

Answer: (c)

Q4. $\sqrt{2} \times \sqrt{8}$ equals:

- (a) $\sqrt{10}$
- (b) 4
- (c) $\sqrt{16}$
- (d) $2\sqrt{2}$

Answer: (b)

Q5. The decimal expansion of $22/7$ is:

- (a) Terminating
- (b) Non-terminating repeating
- (c) Non-terminating non-repeating
- (d) None of these

Answer: (b)

Q6. Which of the following is NOT irrational?

- (a) π
- (b) $\sqrt{5}$
- (c) $\sqrt{4/9}$
- (d) $\sqrt{3}$

Answer: (c)

Q7. $(81)^{1/4}$ equals:

- (a) 3
- (b) 9
- (c) 27
- (d) 4

Answer: (a)

Q8. Between any two distinct real numbers there exist:

- (a) 0 real numbers
- (b) 1 real number

- (c) Finitely many
- (d) Infinitely many

Answer: (d)

Q9. Simplify: $5^0 + 3^0 + 7^0$

- (a) 0
- (b) 1
- (c) 3
- (d) 15

Answer: (c)

Q10. a^{-2} equals:

- (a) a^2
- (b) $-a^2$
- (c) $1/a^2$
- (d) $-1/a^2$

Answer: (c)

CHAPTER 2

Polynomials

2.1 Key Definitions & Degree

A **polynomial** in variable x is $p(x) = a_n x^n + \dots + a_1 x + a_0$, where a_n is not 0 and n is a non-negative integer. The highest power is its **degree**.

| | | |
|---|-------------|----------------|
| 0 | Constant | 7 |
| 1 | Linear | $3x + 2$ |
| 2 | Quadratic | $x^2 - 5x + 6$ |
| 3 | Cubic | $2x^3 - x + 4$ |
| 4 | Biquadratic | $x^4 - 1$ |

2.2 Remainder & Factor Theorem

Remainder Theorem: When $p(x)$ is divided by $(x - a)$, $\text{Remainder} = p(a)$

Factor Theorem: $(x - a)$ is a factor of $p(x) \iff p(a) = 0$

Example: $p(x) = x^3 - 6x^2 + 11x - 6$, $p(2) = 8 - 24 + 22 - 6 = 0$

Therefore $(x - 2)$ is a factor of $p(x)$

2.3 Algebraic Identities

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$a^2 - b^2 = (a + b)(a - b)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

$$(a + b)^3 = a^3 + 3a^2 b + 3ab^2 + b^3$$

$$(a - b)^3 = a^3 - 3a^2 b + 3ab^2 - b^3$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

$$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

2.4 MCQ Practice — Polynomials**Q1. The degree of $7x^3 - 4x^2 + x - 9$ is:**

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Answer: (c)**Q2. If $p(x) = x^2 - 3x + 2$, then $p(1) =$**

- (a) 0
- (b) 1
- (c) 2
- (d) 3

Answer: (a)**Q3. A factor of $2x^2 + 7x + 3$ is:**

- (a) $(x+3)$
- (b) $(2x-1)$
- (c) $(2x+1)$
- (d) $(x-3)$

Answer: (c)**Q4. Zero of $p(x) = 3x - 6$ is:**

- (a) 2
- (b) 3
- (c) 6
- (d) -2

Answer: (a)**Q5. $(x + 3)(x - 3)$ expands to:**

- (a) $x^2 - 9$
- (b) $x^2 + 9$
- (c) $x^2 - 6x + 9$
- (d) $x^2 - 6$

Answer: (a)**Q6. Which is a factor of $x^3 - 8$?**

- (a) $(x - 2)$
- (b) $(x + 2)$
- (c) $(x - 4)$
- (d) $(x + 8)$

Answer: (a)**Q7. Maximum zeros of a cubic polynomial:**

- (a) Exactly 3
- (b) At most 3
- (c) At most 2
- (d) Exactly 2

Answer: (b)

Q8. Remainder when $x^3 + 3x^2 - x + 2$ divided by $(x - 1)$:

- (a) 3
- (b) 4
- (c) 5
- (d) 6

Answer: (c)

Q9. $(2x + 3y)^2$ expands to:

- (a) $4x^2 + 9y^2$
- (b) $4x^2 + 12xy + 9y^2$
- (c) $4x^2 + 6xy + 9y^2$
- (d) $2x^2 + 12xy + 3y^2$

Answer: (b)

Q10. If $(x - a)$ is a factor of $p(x)$, then:

- (a) $p(0)=0$
- (b) $p(a)=0$
- (c) $p(-a)=0$
- (d) $p(1)=0$

Answer: (b)

CHAPTER 3

Coordinate Geometry

3.1 Cartesian Coordinate System

The Cartesian plane is formed by two perpendicular number lines — the horizontal **x-axis** and the vertical **y-axis** — intersecting at the **origin O(0, 0)**. Every point P in the plane is written as an ordered pair **(x, y)**.

| | | | |
|-----|---|---|----------|
| I | + | + | (3, 4) |
| II | - | + | (-2, 5) |
| III | - | - | (-3, -1) |
| IV | + | - | (4, -6) |

3.2 Key Formulas

$$\text{Distance Formula: } d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\text{Mid-Point Formula: } M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{Distance from origin: } d = \sqrt{x^2 + y^2}$$

$$\text{Point on x-axis: } (x, 0) \quad \text{Point on y-axis: } (0, y)$$

Note: A point lies on x-axis when $y = 0$; on y-axis when $x = 0$; at origin when both $= 0$.

3.3 MCQ Practice — Coordinate Geometry

Q1. The point **(-4, 7)** lies in quadrant:

- (a) I
- (b) II
- (c) III
- (d) IV

Answer: (b)

Q2. Distance between **(0,0)** and **(3,4)** is:

- (a) 3
- (b) 4
- (c) 5
- (d) 7

Answer: (c)

Q3. Mid-point of **(2,4)** and **(6,8)** is:

- (a) (4,6)
- (b) (8,12)

(c) (3,5)

(d) (4,4)

Answer: (a)

Q4. A point on y-axis at distance 5 from origin:

(a) (5,0)

(b) (0,5)

(c) (5,5)

(d) (-5,-5)

Answer: (b)

Q5. Abscissa of a point is its:

(a) y-coordinate

(b) x-coordinate

(c) Distance from origin

(d) Ordinate

Answer: (b)

Q6. In which quadrant does (-3, -5) lie?

(a) I

(b) II

(c) III

(d) IV

Answer: (c)

Q7. Distance between (1,1) and (4,5) is:

(a) 3

(b) 4

(c) 5

(d) 6

Answer: (c)

Q8. x-coordinate of any point on y-axis is:

(a) 1

(b) 0

(c) -1

(d) Any number

Answer: (b)

Q9. Mid-point of (-2,3) and (4,-1) is:

(a) (1,1)

(b) (2,2)

(c) (0,2)

(d) (1,2)

Answer: (a)

Q10. Which point is equidistant from (2,0) and (-2,0)?

(a) (0,0)

(b) (2,2)

(c) (1,1)

(d) (0,3)

Answer: (a)

CHAPTER 4

Linear Equations in Two Variables

4.1 Standard Form & Solutions

Standard form: $ax + by + c = 0$, where a, b, c are real numbers and $a^2 + b^2$ is not 0. A linear equation in two variables has **infinitely many solutions** — each forming a point on a straight line.

General form: $ax + by + c = 0$

x-intercept: substitute $y = 0$ and solve for x

y-intercept: substitute $x = 0$ and solve for y

Example: $2x + 3y = 12 \Rightarrow (0, 4)$ and $(6, 0)$ are two solutions

4.2 MCQ Practice — Linear Equations

Q1. $x = 5$ in two variables represents:

- (a) A point
- (b) Line parallel to y-axis
- (c) Line parallel to x-axis
- (d) The y-axis

Answer: (b)

Q2. How many solutions does $3x + 2y = 6$ have?

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

Answer: (d)

Q3. Which is a solution of $x + 2y = 6$?

- (a) (2,2)
- (b) (1,3)
- (c) (0,2)
- (d) (4,1)

Answer: (a)

Q4. Graph of $y = 3$ is a line:

- (a) Parallel to x-axis
- (b) Parallel to y-axis
- (c) Through origin
- (d) Perpendicular to x-axis

Answer: (a)

Q5. y-intercept of $2x - y = 4$ is:

- (a) (0,4)

- (b) (0,-4)
- (c) (2,0)
- (d) (4,0)

Answer: (b)

Q6. Equation of x-axis is:

- (a) $x=0$
- (b) $y=0$
- (c) $x=y$
- (d) $x+y=0$

Answer: (b)

Q7. If (2, k) satisfies $3x + 2y = 12$, then k =

- (a) 2
- (b) 3
- (c) 4
- (d) 6

Answer: (b)

Q8. Standard form $ax + by + c = 0$ requires:

- (a) a not 0
- (b) b not 0
- (c) a^2+b^2 not 0
- (d) c not 0

Answer: (c)

Q9. x-intercept of $4x + 3y = 12$ is:

- (a) (3,0)
- (b) (0,4)
- (c) (4,0)
- (d) (0,3)

Answer: (a)

Q10. Which equation represents a line through origin?

- (a) $2x+3y=6$
- (b) $x-y=1$
- (c) $3x=2y$
- (d) $x+y=5$

Answer: (c)

CHAPTER 5

Lines & Angles

5.1 Pairs of Angles

| | | |
|---------------------|----------------------------------|----------------------|
| Complementary | Sum = 90 degrees | $x + y = 90$ |
| Supplementary | Sum = 180 degrees | $x + y = 180$ |
| Linear Pair | Adjacent on straight line | Always supplementary |
| Vertically Opposite | Formed by two intersecting lines | Always equal |

5.2 Parallel Lines & Transversal

Corresponding Angles: Equal (F-pattern)

Alternate Interior Angles: Equal (Z-pattern)

Co-interior (Same-side interior) Angles: Sum = 180 degrees (C-pattern)

Vertically Opposite Angles: Always equal

If lines are parallel, all the above hold. Converse is also true.

Note: Angle sum of a triangle = 180 degrees. Exterior angle = sum of two opposite interior angles.

5.3 MCQ Practice — Lines & Angles

Q1. Complement of 35 degrees is:

- (a) 55 deg
- (b) 45 deg
- (c) 65 deg
- (d) 145 deg

Answer: (a)

Q2. Vertically opposite angles are always:

- (a) Supplementary
- (b) Complementary
- (c) Equal
- (d) Adjacent

Answer: (c)

Q3. Co-interior angles with parallel lines are:

- (a) Equal
- (b) Complementary

- (c) Supplementary
- (d) Vertically opposite

Answer: (c)

Q4. Supplement of 110 degrees is:

- (a) 80 deg
- (b) 70 deg
- (c) 90 deg
- (d) 60 deg

Answer: (b)

Q5. Angles in a linear pair sum to:

- (a) 90 deg
- (b) 180 deg
- (c) 270 deg
- (d) 360 deg

Answer: (b)

Q6. If vertically opposite angle = 65 deg, other angle =

- (a) 25 deg
- (b) 115 deg
- (c) 65 deg
- (d) 90 deg

Answer: (c)

Q7. Alternate interior angles exist when:

- (a) Lines are perpendicular
- (b) Lines are parallel with a transversal
- (c) Two lines meet
- (d) None

Answer: (b)

Q8. An angle equal to its supplement is:

- (a) 45 deg
- (b) 60 deg
- (c) 90 deg
- (d) 180 deg

Answer: (c)

Q9. Equal corresponding angles imply lines are:

- (a) Intersecting
- (b) Perpendicular
- (c) Parallel
- (d) Coincident

Answer: (c)

Q10. Angle between a line and its perpendicular is:

- (a) 45 deg
- (b) 60 deg

(c) 90 deg

(d) 180 deg

Answer: (c)

CHAPTER 6

Triangles

6.1 Congruence Rules

| | | |
|-----|-----------------------|--|
| SSS | Side-Side-Side | All three corresponding sides equal |
| SAS | Side-Angle-Side | Two sides and the included angle equal |
| ASA | Angle-Side-Angle | Two angles and the included side equal |
| AAS | Angle-Angle-Side | Two angles and a non-included side equal |
| RHS | Right-Hypotenuse-Side | Right angle, hypotenuse and one side equal |

6.2 Key Theorems

Angle Sum Property: Angle A + Angle B + Angle C = 180 degrees

Exterior angle = sum of two non-adjacent interior angles

Angles opposite equal sides are equal (Isosceles Triangle Property)

Triangle Inequality: Sum of any two sides > third side

Pythagoras Theorem: $c^2 = a^2 + b^2$ (c = hypotenuse)

6.3 MCQ Practice — Triangles

Q1. Two sides of a triangle are 5 and 8. Third side must be:

- (a) Less than 3
- (b) Greater than 13
- (c) Between 3 and 13
- (d) Exactly 4

Answer: (c)

Q2. Right triangles with equal hypotenuse and one equal leg use rule:

- (a) SSS
- (b) SAS
- (c) RHS
- (d) ASA

Answer: (c)

Q3. Exterior angle at C when angle A=50, angle B=60 is:

- (a) 110 deg
- (b) 120 deg
- (c) 70 deg

(d) 130 deg

Answer: (a)

Q4. In isosceles triangle, angles opposite equal sides are:

- (a) Different
- (b) Equal
- (c) Supplementary
- (d) Right angles

Answer: (b)

Q5. If angle A=40 deg and angle B=75 deg, angle C =

- (a) 60 deg
- (b) 65 deg
- (c) 75 deg
- (d) 80 deg

Answer: (b)

Q6. Hypotenuse of right triangle with legs 6 and 8 cm:

- (a) 10 cm
- (b) 12 cm
- (c) 14 cm
- (d) 8 cm

Answer: (a)

Q7. Congruent triangles have corresponding parts that are:

- (a) Proportional
- (b) Equal
- (c) Supplementary
- (d) Complementary

Answer: (b)

Q8. In triangle ABC, AB=AC and angle B = 65 deg, so angle A =

- (a) 50 deg
- (b) 65 deg
- (c) 70 deg
- (d) 55 deg

Answer: (a)

Q9. Longest side of a triangle is opposite the:

- (a) Smallest angle
- (b) Largest angle
- (c) Right angle only
- (d) Any angle

Answer: (b)

Q10. AAA condition proves triangles are:

- (a) Congruent
- (b) Similar
- (c) Equal in area

(d) None

Answer: (b)

CHAPTER 7

Quadrilaterals

7.1 Types & Properties

| | |
|---------------|---|
| Parallelogram | Opposite sides parallel and equal; opposite angles equal; diagonals bisect each other |
| Rectangle | Parallelogram with all angles 90 deg; diagonals are equal |
| Rhombus | All sides equal; diagonals bisect each other at 90 deg |
| Square | All sides equal + all angles 90 deg; diagonals equal and bisect at 90 deg |
| Trapezium | Exactly one pair of parallel sides (called bases) |
| Kite | Two pairs of adjacent equal sides; one diagonal bisects the other at 90 deg |

7.2 Mid-Point Theorem

The line segment joining mid-points of two sides of a triangle

is **PARALLEL** to the third side and **HALF** its length.

If E, F are mid-points of AB and AC \Rightarrow EF is parallel to BC and $EF = BC / 2$

7.3 MCQ Practice — Quadrilaterals

Q1. Sum of angles of a quadrilateral is:

- (a) 270 deg
- (b) 360 deg
- (c) 180 deg
- (d) 540 deg

Answer: (b)

Q2. Diagonals of a rectangle are:

- (a) Perpendicular
- (b) Equal
- (c) Unequal
- (d) Bisect at 90 deg

Answer: (b)

Q3. In parallelogram ABCD, angle A = 70 deg, angle B =

- (a) 70 deg
- (b) 110 deg
- (c) 90 deg
- (d) 140 deg

Answer: (b)

Q4. All sides equal and all angles 90 deg describes a:

- (a) Rectangle
- (b) Rhombus
- (c) Square
- (d) Parallelogram

Answer: (c)

Q5. Diagonals of a rhombus:

- (a) Are equal
- (b) Bisect each other at 90 deg
- (c) Are parallel
- (d) Do not bisect

Answer: (b)

Q6. Line joining mid-points of two sides is ___ the third side:

- (a) Perpendicular to
- (b) Parallel to and half of
- (c) Equal to
- (d) Longer than

Answer: (b)

Q7. Quadrilateral with one pair of parallel sides is:

- (a) Parallelogram
- (b) Square
- (c) Trapezium
- (d) Rhombus

Answer: (c)

Q8. Square PQRS with diagonal = 10 cm, side =

- (a) $5\sqrt{2}$ cm
- (b) $10\sqrt{2}$ cm
- (c) 5 cm
- (d) 10 cm

Answer: (a)

Q9. Angle sum of polygon with n sides =

- (a) 180 deg
- (b) $(n-2) \times 180$ deg
- (c) $(n+2) \times 180$ deg
- (d) 360 deg

Answer: (b)

Q10. Diagonals of a parallelogram:

- (a) Are equal
- (b) Bisect each other
- (c) Bisect at 90 deg
- (d) Are perpendicular

Answer: (b)

CHAPTER 8

Circles

8.1 Key Theorems

A **circle** is the set of all points equidistant (radius r) from a fixed point (centre O).

Theorem 1: Equal chords of a circle are equidistant from the centre.

Theorem 2: Perpendicular from centre to a chord bisects the chord.

Theorem 3: Angle at centre = $2 \times$ angle at any point on the remaining arc.

Theorem 4: Angles in the same segment of a circle are equal.

Theorem 5: Angle in a semicircle = 90 degrees.

Theorem 6: Opposite angles of a cyclic quadrilateral are supplementary (sum = 180 deg).

Tangent Property: Tangent is perpendicular to radius at point of contact.

Two tangents from external point to circle are equal in length.

8.2 MCQ Practice — Circles

Q1. Angle subtended by diameter at any point on circle is:

- (a) 45 deg
- (b) 60 deg
- (c) 90 deg
- (d) 180 deg

Answer: (c)

Q2. Equal chords subtend ___ angles at the centre:

- (a) Unequal
- (b) Equal
- (c) Supplementary
- (d) Complementary

Answer: (b)

Q3. Opposite angles of cyclic quadrilateral sum to:

- (a) 90 deg
- (b) 180 deg
- (c) 270 deg
- (d) 360 deg

Answer: (b)

Q4. Perpendicular from centre to chord:

- (a) Bisects the chord
- (b) Equals the radius

- (c) Equals the diameter
- (d) Is a tangent

Answer: (a)

Q5. Angle at centre is ___ times angle at circumference (same arc):

- (a) Half
- (b) Equal
- (c) Double
- (d) Triple

Answer: (c)

Q6. Two tangents from an external point to a circle are:

- (a) Perpendicular
- (b) Unequal
- (c) Equal
- (d) Parallel

Answer: (c)

Q7. Angles in the same segment of a circle are:

- (a) Supplementary
- (b) Complementary
- (c) Equal
- (d) Different

Answer: (c)

Q8. Tangent makes what angle with radius at point of contact?

- (a) 45 deg
- (b) 60 deg
- (c) 90 deg
- (d) 180 deg

Answer: (c)

Q9. If angle AOB = 100 deg at centre, angle in major segment =

- (a) 50 deg
- (b) 80 deg
- (c) 100 deg
- (d) 200 deg

Answer: (b)

Q10. Tangents from external point to circle:

- (a) 1 tangent
- (b) 2 tangents
- (c) 3 tangents
- (d) Infinite

Answer: (b)

CHAPTER 9

Heron's Formula & Surface Area / Volume

9.1 Heron's Formula

Used when all three sides of a triangle are known.

$$s = (a + b + c) / 2 \text{ (semi-perimeter)}$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

Example: sides 5, 6, 7 $\Rightarrow s = 9 \Rightarrow \text{Area} = \sqrt{9 \times 4 \times 3 \times 2} = 6\sqrt{6}$ sq cm

9.2 Surface Area & Volume Formulas

| | | | |
|----------------|------------|---------------|------------------|
| Cube (side a) | $4a^2$ | $6a^2$ | a^3 |
| Cuboid (l,b,h) | $2(l+b)h$ | $2(lb+bh+lh)$ | lbh |
| Cylinder (r,h) | $2\pi r h$ | $2\pi r(r+h)$ | $\pi r^2 h$ |
| Cone (r,l,h) | $\pi r l$ | $\pi r(r+l)$ | $(1/3)\pi r^2 h$ |
| Sphere (r) | $4\pi r^2$ | $4\pi r^2$ | $(4/3)\pi r^3$ |
| Hemisphere (r) | $2\pi r^2$ | $3\pi r^2$ | $(2/3)\pi r^3$ |

Note: Slant height of cone: $l = \sqrt{r^2 + h^2}$. Use $\pi = 22/7$ unless stated otherwise.

9.3 MCQ Practice — Mensuration

Q1. Area of right triangle with sides 3, 4, 5 cm:

- (a) 6 sq cm
- (b) 8 sq cm
- (c) 10 sq cm
- (d) 12 sq cm

Answer: (a)

Q2. Total SA of cube with side 5 cm:

- (a) 100 sq cm
- (b) 125 sq cm
- (c) 150 sq cm
- (d) 75 sq cm

Answer: (c)

Q3. Volume of cylinder $r=7$ cm, $h=10$ cm ($\pi=22/7$):

- (a) 1540 cu cm
- (b) 770 cu cm

- (c) 3080 cu cm
- (d) 385 cu cm

Answer: (a)

Q4. In Heron's formula, 's' stands for:

- (a) Side
- (b) Sum of sides
- (c) Semi-perimeter
- (d) Slant height

Answer: (c)

Q5. Curved SA of sphere with $r = 3$ cm:

- (a) 9 pi
- (b) 18 pi
- (c) 36 pi
- (d) 12 pi

Answer: (c)

Q6. Slant height of cone with $r=5$, $h=12$:

- (a) 13 cm
- (b) 7 cm
- (c) 17 cm
- (d) 11 cm

Answer: (a)

Q7. Volume of cone compared to cylinder (same base & height):

- (a) Half
- (b) $1/3$
- (c) $2/3$
- (d) $1/4$

Answer: (b)

Q8. Total SA of hemisphere with $r=6$ cm:

- (a) 108 pi
- (b) 72 pi
- (c) 36 pi
- (d) 216 pi

Answer: (a)

Q9. Area of equilateral triangle with side 4 cm:

- (a) $4\sqrt{3}$
- (b) $8\sqrt{3}$
- (c) $16\sqrt{3}$
- (d) $2\sqrt{3}$

Answer: (a)

Q10. Volume of cuboid 4 x 5 x 6 cm:

- (a) 60 cu cm
- (b) 90 cu cm

(c) 120 cu cm

(d) 150 cu cm

Answer: (c)

CHAPTER 10

Statistics & Probability

10.1 Measures of Central Tendency

Mean = Sum of all observations / Total number of observations = $(\sum x_i) / n$

Median = Middle value when arranged in ascending order

Odd n: Median = value at position $(n+1)/2$

Even n: Median = average of values at positions $n/2$ and $(n/2 + 1)$

Mode = Value that appears most frequently

Empirical Relation: Mode = $3 \times \text{Median} - 2 \times \text{Mean}$

10.2 Probability

$P(\text{Event } E) = \text{Number of favourable outcomes} / \text{Total number of outcomes}$

$$0 \leq P(E) \leq 1$$

$$P(E) + P(\text{not } E) = 1 \Rightarrow P(E \text{ complement}) = 1 - P(E)$$

$$P(\text{certain event}) = 1 \quad P(\text{impossible event}) = 0$$

Example: Die thrown, $P(\text{even}) = 3/6 = 1/2$

10.3 MCQ Practice — Statistics & Probability

Q1. Mean of 4, 7, 8, 9, 12 is:

- (a) 7
- (b) 8
- (c) 9
- (d) 10

Answer: (b)

Q2. Median of 3, 5, 7, 9, 11 is:

- (a) 5
- (b) 6
- (c) 7
- (d) 9

Answer: (c)

Q3. Mode of 2, 3, 3, 4, 5, 3, 6 is:

- (a) 2
- (b) 3

(c) 4

(d) 5

Answer: (b)

Q4. P(King) when one card drawn from 52 cards =

(a) $1/13$

(b) $1/52$

(c) $4/52$

(d) $2/13$

Answer: (a)

Q5. P(impossible event) =

(a) 0

(b) 1

(c) 0.5

(d) Undefined

Answer: (a)

Q6. If $P(E) = 0.3$, then $P(\text{not } E) =$

(a) 0.3

(b) 0.6

(c) 0.7

(d) 1

Answer: (c)

Q7. Mean of first 10 natural numbers:

(a) 5

(b) 5.5

(c) 6

(d) 4.5

Answer: (b)

Q8. A coin is tossed. $P(\text{head}) =$

(a) 0

(b) 1

(c) $1/2$

(d) $1/4$

Answer: (c)

Q9. Data with two modes is called:

(a) Unimodal

(b) Bimodal

(c) Trimodal

(d) No mode

Answer: (b)

Q10. Range of 4, 7, 2, 9, 5 is:

(a) 5

(b) 6

(c) 7

(d) 9

Answer: (c)

QUICK REVISION

All Key Formulas at a Glance

Algebra & Identities

$$(a+b)^2 = a^2+2ab+b^2 \quad (a-b)^2 = a^2-2ab+b^2 \quad a^2-b^2 = (a+b)(a-b)$$

$$(a+b)^3 = a^3+3a^2b+3ab^2+b^3 \quad (a-b)^3 = a^3-3a^2b+3ab^2-b^3$$

$$a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$$

$$a^m \times a^n = a^{(m+n)} \quad a^m/a^n = a^{(m-n)} \quad (a^m)^n = a^{mn} \quad a^0 = 1$$

Geometry

Triangle angle sum = 180 deg Exterior angle = sum of two remote interior angles

$$\text{Pythagoras: } c^2 = a^2 + b^2 \quad \text{Distance: } \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

Cyclic quad: opp angles = 180 deg Angle at centre = 2 x angle at circumference

Mid-point Theorem: $EF = BC/2$ and EF is parallel to BC

Mensuration

$$\text{Heron's: Area} = \sqrt{s(s-a)(s-b)(s-c)}, \quad s = (a+b+c)/2$$

$$\text{Cylinder: CSA} = 2\pi r h, \quad \text{TSA} = 2\pi r(r+h), \quad V = \pi r^2 h$$

$$\text{Cone: CSA} = \pi r l, \quad \text{TSA} = \pi r(r+l), \quad V = (1/3)\pi r^2 h, \quad l = \sqrt{r^2+h^2}$$

$$\text{Sphere: SA} = 4\pi r^2, \quad V = (4/3)\pi r^3 \quad \text{Hemisphere: CSA} = 2\pi r^2, \quad V = (2/3)\pi r^3$$

Statistics & Probability

Mean = $\text{Sum}(x)/n$ Mode = most frequent Median = middle value

$$\text{Mode} = 3 \times \text{Median} - 2 \times \text{Mean} \quad \text{Range} = \text{Max} - \text{Min}$$

$$P(E) = \text{Favourable} / \text{Total} \quad 0 \leq P(E) \leq 1 \quad P(E) + P(E \text{ complement}) = 1$$