

MP01 : Numerical Chart

NUMERICAL CHART									
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

MP02 : Addition

SYMBOL +

One and one are two
 $1 + 1 = 2$

Three and two are five
 $3 + 2 = 5$

Six and two are eight
 $6 + 2 = 8$

Four and three are seven
 $4 + 3 = 7$

Three are two and one
 $3 = 2 + 1$

Eight are three and five
 $8 = 3 + 5$

One & two & three are six
 $(1+2)+3 = 3+3=6$

One & two & three are six
 $1+(2+3) = 1+5=6$

$2+(3+4) = 2+7=9$

$(2+3)+4 = 5+4=9$

$3+(2+3) = 3+5=8$

$(3+2)+4 = 5+4=9$

$1+(3+5) = 1+8=9$

$(1+3)+5 = 4+5=9$

$10+0=10$

$9+1=10$

$8+2=10$

$7+3=10$

$6+4=10$

$5+5=10$

$4+6=10$

$3+7=10$

$2+8=10$

$1+9=10$

5 Tens - 3 Units = $50 + 3 = 53$

4 Tens - 2 Units = $40 + 2 = 42$

8 Tens - 5 Units = $80 + 5 = 85$

6 Tens + 7 Units = $60 + 7 = 67$

2 Tens + 5 Units = $20 + 5 = 25$

8 Tens + 1 Ten + 2 Units = $80 + 10 + 2 = 92$

3 Tens + 6 Units = $30 + 6 = 36$

5 Tens + 5 Units = $50 + 5 = 55$

8 Tens + 1 Ten + 1 Unit = $80 + 10 + 1 = 91$

MP03 : Subtraction

SYMBOL -

Birds 6
Fly 2
Balance 4
 $6 - 2 = 4$

I had Mangoes 6
I ate 3
Balance 3
 $6 - 3 = 3$

I had Books 4
Sold 3
Balance 1
 $4 - 3 = 1$

I had Balloon 5
Burst 2
Balance 3
 $5 - 2 = 3$

I had Toffees 5
Mother gave me Toffees + 5
I ate Toffees - 6
Balance I had = 4
 $5 + 5 - 6 = 4$

Father gave me Apples 3
Mother gave me Apples 2
I gave to sister Apple - 1
Balance = 4
 $3 + 2 - 1 = 4$

Tens Units
 $56 - 34 = 22$

Hundreds Tens Units
 $684 - 432 = 252$

Hundreds Tens Units
 $874 - 485 = 389$

Or difference of 56 and 34 is 22.
Or difference of 684 and 432 is 252.
Or difference of 874 and 485 is 389.

MP04 : Multiplication

SYMBOL x

Four times three
 $3 + 3 + 3 + 3 = 3 \times 4 = 12$

$10 + 10 + 6 = 10 \times 2 + 6 = 26$

$10 + 10 + 10 + 4 = 10 \times 3 + 4 = 34$

20 2
18 10 1 4
16 8 3 6
14 7 5 8
12 10

30 3
27 10 1 6
24 8 3 9
21 6 5 12
18 15

40 4
36 10 1 8
32 8 3 12
28 6 5 16
24 20

50 5
45 10 1 10
40 8 3 15
35 6 5 20
30 25

60 6
54 10 1 12
48 8 3 18
42 6 5 24
36 30

70 7
63 10 1 14
56 8 3 21
49 6 5 28
42 35

80 8
72 10 1 16
64 8 3 24
56 6 5 32
48 40

90 9
81 10 1 18
72 8 3 27
63 6 5 36
54 45

100 10
90 10 1 20
80 8 3 30
70 6 5 40
60 50

MP05 : Division

SYMBOL ÷

1 Part of the collection is shaded. There are 2 equal parts of the collection.
So one-half or 1/2 of the collection is shaded.

1 Part of the collection is shaded. There are 3 equal parts of the collection.
So one-third or 1/3 of the collection is shaded.

1 Part of the collection is shaded. There are 4 equal parts of the collection.
So one-fourth or 1/4 of the collection is shaded.

9 Divided by 3 equals 3
Mother has 12 Mangoes she divided them among her 4 children. Each gets 3.
 $12 \div 4 = 3$

One half of 4 is 2
One third of 6 is 2
One fourth of 20 is 5
How many 7 are there in 28?

Divide 4 Tens 3 Units by 3
6 Tens = 3 x 2 Tens
3 Units = 3 x 1 Unit
2 Tens 1 Unit = 21
or
21
3 63
- 21
0

The word which is divided by a number is called DIVIDEND. The number by which it is divided is called DIVISOR. The answer is called QUOTIENT. The left over number is REMAINDER.

8 912
- 84
11
- 13
32
- 32
0

24 (Quotient)
3 (Divisor)
64 (Dividend)
13 (Remainder)

Quotient = Dividend ÷ Divisor
Dividend = Quotient x Divisor + Remainder
Divisor = (Dividend - Remainder) ÷ Quotient

MP06 : Multiplication Tables

NUMBERS	MULTIPLICATION BY TWO	MULTIPLICATION BY THREE	MULTIPLICATION BY FOUR	MULTIPLICATION BY FIVE
1	2	3	4	5
2	4	6	8	10
3	6	9	12	15
4	8	12	16	20
5	10	15	20	25
6	12	18	24	30
7	14	21	28	35
8	16	24	32	40
9	18	27	36	45
10	20	30	40	50
11	22	33	44	55
12	24	36	48	60
13	26	39	52	65
14	28	42	56	70
15	30	45	60	75
16	32	48	64	80
17	34	51	68	85
18	36	54	72	90
19	38	57	76	95
20	40	60	80	100
21	42	63	84	105
22	44	66	88	110
23	46	69	92	115
24	48	72	96	120
25	50	75	100	125
26	52	78	104	130
27	54	81	108	135
28	56	84	112	140
29	58	87	116	145
30	60	90	120	150
31	62	93	124	155
32	64	96	128	160
33	66	99	132	165
34	68	102	136	170
35	70	105	140	175
36	72	108	144	180
37	74	111	148	185
38	76	114	152	190
39	78	117	156	195
40	80	120	160	200

MP07 : Roman Numeral Chart

I = 1	V = 5	X = 10	L = 50	C = 100	D = 500	M = 1000
I	XI	XXI	XXXI	XLI		
1	11	21	31	41		
II	XII	XXII	XXXII	XLII		
2	12	22	32	42		
III	XIII	XXIII	XXXIII	XLIII		
3	13	23	33	43		
IV	XIV	XXIV	XXXIV	XLIV		
4	14	24	34	44		
V	XV	XXV	XXXV	XLV		
5	15	25	35	45		
VI	XVI	XXVI	XXXVI	XLVI		
6	16	26	36	46		
VII	XVII	XXVII	XXXVII	XLVII		
7	17	27	37	47		
VIII	XVIII	XXVIII	XXXVIII	XLVIII		
8	18	28	38	48		
IX	XIX	XXIX	XXXIX	XLIX		
9	19	29	39	49		
X	XX	XXX	XL	L		
10	20	30	40	50		
LX = 60	LXX = 70	LXXX = 80	XC = 90	C = 100		

MKS06a : Mensuration

MENSURATION

A graphical list of the formulae for measurement concepts.

<p>Rectangle</p> <p>Perimeter: $P = 2l + 2b$</p> <p>Area: $A = l \times b$</p>	<p>Cube</p> <p>Lateral Surface Area = $4s^2$</p> <p>Total Surface Area = $6s^2$</p> <p>Volume = s^3</p>
<p>Circle</p> <p>Circumference = $2\pi r$ or πd</p> <p>Area = πr^2 or $\pi \left(\frac{d}{2}\right)^2$</p>	<p>Rectangular Solid (Cuboid)</p> <p>Volume = $l \times b \times h$</p> <p>Surface Area = $2(lb + bh + hl)$</p>
<p>Triangle</p> <p>Perimeter: $P = a + b + c$</p> <p>Area: $A = \frac{1}{2} \times \text{base} \times \text{height}$</p>	<p>Cylinder</p> <p>Volume: $V = \pi r^2 h$</p> <p>Surface Area = $2\pi r^2 + 2\pi rh$</p>
<p>Trapezium</p> <p>Perimeter: $P = a + b + c + d$</p> <p>Area: $A = \frac{1}{2}(a+b)h$</p>	<p>Cone</p> <p>Volume: $V = \frac{1}{3}\pi r^2 h$</p> <p>Total Surface Area = $\pi r^2 + \pi rl$</p>
<p>Parallelogram</p> <p>Area: $A = \text{base} \times \text{height}$</p>	<p>Sphere</p> <p>Volume: $V = \frac{4}{3}\pi r^3$</p> <p>Surface Area = $4\pi r^2$</p>

MKS06b : Graph Chart

GRAPH CHART

MKS06c : Shapes And Figures

SHAPES AND FIGURES

<p>Right Triangle</p> <p>A triangle having a right angle. One of the angles of the triangle measures 90 degrees. The side opposite the right angle is called the hypotenuse.</p>	<p>Parallelogram</p> <p>A four-sided polygon with two pairs of parallel sides. The sum of the angles of a parallelogram is 360 degrees.</p>
<p>Scalene Triangle</p> <p>A triangle having three sides of different lengths.</p>	<p>Trapezoid</p> <p>A four-sided polygon having one pair of parallel sides. The sum of the angles of a trapezoid is 360 degrees.</p>
<p>Polygon</p> <p>A polygon is a closed figure made by joining five segments.</p>	<p>Obtuse Triangle</p> <p>A triangle having an obtuse angle. One of the angles of the triangle measures more than 90 degrees.</p>
<p>Regular Polygon</p> <p>A regular polygon is a polygon whose sides are of the same length, and whose angles are equal. The sum of the angles of a polygon with 'n' sides where 'n' is four or more, is $180 \times (n - 2)$ degrees.</p>	<p>Quadrilateral</p> <p>A four-sided polygon. The sum of the angles of a quadrilateral is 360 degrees.</p>
<p>Triangle</p> <p>A three-sided polygon. The sum of the angles of a triangle is 180 degrees.</p>	<p>Square</p> <p>A four-sided polygon having equal length sides having all right angles. The sum of the angles of a square is 360 degrees.</p>
<p>Isosceles Triangle</p> <p>A triangle having two sides of equal length.</p>	<p>Rectangle</p> <p>A four-sided polygon having all right angles. The sum of the angles of a rectangle is 360 degrees.</p>
<p>Equilateral Triangle</p> <p>A triangle having all three sides of equal length. The angles of an equilateral triangle all measure 60 degrees.</p>	<p>Rhombus</p> <p>A four-sided polygon having all four sides of equal length. The sum of the angles of a rhombus is 360 degrees.</p>
	<p>Hexagon</p> <p>A six-sided polygon. The sum of the angles of a hexagon is 720 degrees.</p>
	<p>Heptagon</p> <p>A seven-sided polygon. The sum of the angles of a heptagon is 900 degrees.</p>
	<p>Octagon</p> <p>An eight-sided polygon. The sum of the angles of an octagon is 1080 degrees.</p>
	<p>Nonagon</p> <p>A nine-sided polygon. The sum of the angles of a nonagon is 1260 degrees.</p>

MKS06d : Mathematical Symbol

MATHEMATICAL SYMBOL

+ Plus; Positive	∫ Integral
- Minus; Negative	∠ Angle
± Plus or minus; error margin	⊥ Perpendicular
∓ Minus or plus	∥ Parallel
× Multiplied by	≅ Congruent to
÷ Divided by	∴ Therefore
= Equal to	∵ Because
≠ Not equal to	∀ For all
≈ Approximately equal to	{ } Set
> Greater than	∩ Union
< Less than	∩ Intersection
∝ Directly Proportional to	⊂ Is a subset of
∞ Infinity	⊄ Is not a subset of
√ Square root	⇒ Implies that
! Factorial	⇔ If and only if
% Per Cent	... etc.
∇ Del (differential operator)	○ Composite function
° Degrees	△ Increment
	∑ Sum

MKS06e : Algebraic Identities

ALGEBRAIC IDENTITIES

<p>Product of 2 Binomials</p> <p>$(a + b)(c + d) = ac + ad + bc + bd$</p>	<p>Product of a Binomial and a Binomial</p> <p>$(a + b)(c + d) = ac + ad + bc + bd$</p>	<p>Multiplication of Binomials</p> <p>$(a + b)(c + d) = ac + ad + bc + bd$</p>
<p>The square of a Binomial of the form $(a + b)^2$ is equal to the square of the first term + square of the 2nd term + twice the product of both the terms.</p>		
<p>$(a + b)^2 = a^2 + 2ab + b^2$</p>	<p>$(a - b)^2 = a^2 - 2ab + b^2$</p>	<p>$(a + b)(a - b) = a^2 - b^2$</p>
<p>The square of a Binomial of the form $(a - b)^2$ is equal to the square of the first term + square of the 2nd term - twice the product of both the terms.</p>		
<p>$(a + b)^2 = a^2 + 2ab + b^2$</p>	<p>$(a - b)^2 = a^2 - 2ab + b^2$</p>	<p>$(a + b)(a - b) = a^2 - b^2$</p>
<p>The product of the sum and difference of two quantities is equal to the difference in their squares.</p>		
<p>$(a + b)(a - b) = a^2 - b^2$</p>	<p>$(a + b)(a - b) = a^2 - b^2$</p>	<p>$(a + b)(a - b) = a^2 - b^2$</p>

MUP01 : Number System

NUMBER SYSTEM

Natural Numbers Counting numbers starting from 1.	1 2 3 4 5 ...
Whole Numbers When zero is added to natural numbers, it gives whole numbers.	0 1 2 3 4 ...
Integers System of numbers containing whole numbers and negative of natural numbers is system of integers.	... -3 -2 -1 0 1 2 3
Rational Numbers A number in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$, is a rational number.	$\frac{100}{17}$ $\frac{21}{31}$ $-\frac{61}{19}$ $-\frac{38}{1}$ $\frac{0}{1}$
Even Numbers Numbers exactly divisible by 2 are even numbers. Unit digit of even numbers is either 0, 2, 4, 6 or 8.	22 164 198 100 8 100
Odd Numbers Numbers which are not divisible by 2. Unit digit of odd numbers is either 1, 3, 5, 7 or 9.	31 197 2001 109 83 105
Prime Numbers Numbers which have only two factors either 1 or the number itself. 2 is the smallest prime number.	2 3 5 7 11 13 ...
Composite Numbers Numbers which have more than two factors.	4 6 10 18 23 25 ...

MUP02 : Algebra (Definition & Formulae)

ALGEBRA

Definitions & Formulae

Definitions

- A combination of terms connected by sign of + and - is called an Algebraic Expression.
- A monomial is another name for a term.
- A binomial is made up of two monomials and a trinomial is made up of three monomials connected by + or - signs.
- A polynomial is made up of more than three terms (monomials) linked by + and - signs.
- A linear equation is a statement of equality between two expressions of the first degree.
- The value of a variable in an equation is called its root.

Formulae

- $(a - b)^2 = a^2 + b^2 - 2ab$
- $(a + b)^2 = a^2 + b^2 + 2ab$
- $a^2 - b^2 = (a + b)(a - b)$
- $(a - b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
- $(a - b)^3 = a^3 + b^3 + 3ab(a - b)$
- $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$
- $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
- $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
- $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
- If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

MUP03 : Addition of Rational Numbers

ADDITION OF RATIONAL NUMBERS

- Closure Property** :- The sum of two rational numbers is always a rational number. If a and b are two rational numbers and $a + b = c$, then c is also a rational number.
- Commutative Property** :- Two rational numbers can be added in any order. If a and b are two rational numbers then $a + b = b + a$
- Associative Property** :- Three rational numbers to be added can be grouped in any order. If a, b and c are three rational numbers then $(a + b) + c = a + (b + c)$
- Addition of Zero** :- The sum of any rational number and zero is the rational number itself. 0 is a rational number such that for every rational number 'a', $a + 0 = 0 + a = a$
- Additive Inverse** :- The negative of a rational number added to it makes it 0. So, the + and - forms of a rational number are called the additive inverse of each other. For rational number 'a' and -a, $a + (-a) = (-a) + a = 0$ is true. -a is additive inverse of a.

SUBTRACTION OF RATIONAL NUMBERS

- Closure Property** :- The difference of two rational numbers is a rational number. If a and b are two rational numbers and $a - b = c$ then c is also a rational number.
- Subtraction is not Commutative** :- If a and b are two rational numbers and $a = b$, then $a - b = b - a$. If $a \neq b$, then $a - b \neq b - a = -a - b$
- Subtraction is not Associative** :- If a, b and c are three rational numbers then $(a - b) - c \neq a - (b - c)$, $c \neq -c$
- Subtraction with Zero** :- If a is a rational number then $a - 0 = a$ but $0 - a = -a$

MUP04 : Multiplication of Rational Numbers

MULTIPLICATION OF RATIONAL NUMBERS

- Closure Property** :- The product of two rational numbers is always a rational number. If a and b are two rational numbers and $a \times b = c$, then c is also a rational number.
- Commutative Property** :- Two rational numbers can be multiplied in any order. If a and b are two rational numbers then $a \times b = b \times a$
- Associative Property** :- Three or more rational numbers can be grouped in any order for multiplication. If a, b and c are three rational numbers then $a \times (b \times c) = (a \times b) \times c$
- Identity Element** :- The product of any rational numbers and 1 is the rational number itself. If a is a rational number then $a \times 1 = 1 \times a = a$. Therefore 1 is identity element for multiplication.
- Multiplication with 0** :- Any rational number multiplied by 0 is equal to 0. If a is a rational number then $a \times 0 = 0 \times a = 0$

DIVISION OF RATIONAL NUMBERS

- Closure Property** :- The division of two rational numbers is always a rational number. If a and b are two rational numbers and $a \div b = c$, then c is also a rational number, $b \neq 0$
- Division is not Commutative** :- If a and b are two rational numbers then $a \div b \neq b \div a$
- Division is not Associative** :- If a, b and c are three rational numbers then $(a \div b) \div c \neq a \div (b \div c)$
- Division by 1** :- If a is a rational number then $a \div 1 = a$ and $1 \div a = \frac{1}{a} \neq a$
- Division by 0** :- If a is a rational number then $a \div 0$ is not possible and $0 \div a = 0$

If a, b and c are three rational numbers then

- $a \div (b \times c) = a \div b \times a \div c = (a \div b) \times c$
- $a \div (b \div c) = a \div b \times c = (a \div b) \times c$
- $(a \div b) \div c = a \div b \times c = (a \div b) \times c$
- $(a \div b) \times c = a \div b \times c = (a \div b) \times c$

MUP05 : Some Geometrical Concepts

SOME GEOMETRICAL CONCEPTS

Point A dot having no length, width or depth, only fixed position is a point. It is represented by capital letters.	Line Line is a set of continuous points which extends indefinitely. It has only length, no width and no end points. It is represented by small letters written on one side.
Line Segment It is a part of a line. It has two end points. It has fixed length.	Ray A ray is a part of a line which has one end point. It moves indefinitely in one direction. It has indefinite length.
Collinear Points Three or more points lying on a same line are called Collinear Points. Points A, B, C, D, P, Q, and R are collinear.	Non-Collinear Points Points not lying on the same line are Non-Collinear points.
Concurrent Lines Three or more lines passing through the same point are concurrent lines. Point of intersection is called point of concurrence.	Non-Concurrent Lines Three or more lines which do not pass through the same point are non-concurrent lines.
Perpendicular Lines Lines intersecting each other at right angles.	Parallel Lines Two straight lines that are at the same distance and which do not meet each other are called parallel lines.
Intersecting Lines Lines which meet each other at a point are called intersecting lines. Point of meeting is called point of intersection.	Perpendicular Bisector A line which bisects a line segment at right angle is called perpendicular bisector. It bisects AB perpendicularly at O such that AO = OB

MUP06 : Angles

ANGLES

Acute angle Angle of measure less than 90° and greater than 0°.	Right angle Angle of measure of 90°.
Obtuse angle Angle of measure greater than 90° but less than 180°.	Straight angle Angle of measure of 180°.
Reflex angle Angle of measure greater than 180° but less than 360°.	Complete angle Angle of measure of 360°.
Complementary angles If the sum of measures of two angles is equal to 90°, then they are complementary angles.	Supplementary angles If the sum of measures of two angles is equal to 180° then they are supplementary angles.

MUP07 : Pair of Angles

PAIR OF ANGLES

ADJACENT ANGLES Two angles having a common vertex and one common arm and the other two arms or opposite sides of the common arm are called adjacent angles.	LINEAR PAIR Pair of adjacent angles whose sum is 180°. In a pair of angles opposite rays form straight line.
VERTICALLY OPPOSITE ANGLES Pair of angles made by two intersecting lines so that no arm is common. Vertically opposite angles are always equal to each other.	CORRESPONDING ANGLES A pair of exterior and interior angles formed when a transversal intersects two lines so that both the angles are on the same side of the transversal and they are not forming linear pair.
ALTERNATE ANGLES A pair of exterior and interior angles formed when a transversal intersects two lines so that the angles are on opposite sides of the transversal and they are not forming linear pair.	INTERIOR ADJACENT ANGLES Pair of interior angles formed on the same side of a transversal when it intersects two lines.

MUP08 : Triangles

TRIANGLES

A CLOSED FIGURE MADE UP OF THREE LINE SEGMENTS & THREE ANGLES

WHAT TRIANGLES HAVE

- Three sides
- Three angles
- Three vertices
- Total of 3 angles = 180°
- An exterior angle equals the sum of its two interior opposite angles.
- The sum of any two sides of a triangle is greater than the third side.

WHAT TRIANGLES CANNOT HAVE

- Two right angles
- Two obtuse angles
- All angles = 60°
- All angles = 90°
- One obtuse and one right angle

Equilateral Triangle All sides equal. All angles are also equal.	Isosceles Triangle Two sides equal. Two angles are also equal.	Scalene Triangle All sides unequal. All angles are unequal.
Acute Triangle All angles less than 90°.	Obtuse Triangle One angle more than 90°.	Right Triangle One angle 90°.

Pythagoras Theorem
In a right-angled triangle, the square of the hypotenuse equals the sum of the squares of its sides.

Concurrent Lines
The altitudes of a triangle are concurrent, i.e. they meet at a point called orthocentre.

Interior Angles
The three interior angles of a triangle are concurrent, i.e. they meet at a point called incentre.

Exterior Angles
The exterior angles of a triangle are concurrent and meet at a point called circumcentre.

MUP09 : Quadrilaterals

QUADRILATERALS

Closed Figure made up of four line segments

Properties of Quadrilaterals

- Points A, B, C, D are called the vertices of the quadrilateral.
- Line segments AB, BC, CD and DA are called the sides of the quadrilateral.
- Four angles of the quadrilateral: $\angle A, \angle B, \angle C, \angle D$.
- The two line segments joining the opposite vertices are called diagonals.
- The sum of the angles of a quadrilateral is 360° .

Convex Quadrilateral

With each angle less than 180° .

With each of its angle less than 180° .

Concave Quadrilateral

With one angle less than 180° .

Trapezium

A quadrilateral with two parallel sides and the other two non-parallel.

Parallelogram

A quadrilateral with both the pairs of opposite sides parallel.

- The opposite sides of a parallelogram are equal and parallel.
- The opposite angles of a parallelogram are equal.
- Diagonals of a parallelogram bisect each other.

Rhombus

A parallelogram whose all sides are equal.

The diagonals of a rhombus bisect each other at right angle.

Rectangle

A parallelogram with each of its angle a right angle.

- Perimeter is equal to $2 \times$ sum of its sides.
- Area of a rectangle is $l \times b$ (length \times breadth).
- Each angle of a rectangle is a right angle.
- The diagonals of a rectangle are equal and bisect each other at right angle.

Square

A rhombus with all of its angles right angle or a rectangle with all of its sides equal.

- Perimeter is equal to $4 \times$ side.
- Area of a square is s^2 (side \times side).
- Each angle of a square is a right angle.
- The diagonals of a square are equal and bisect each other at right angle.

MUP10 : Circle

CIRCLE

Set of all points equidistant from a fixed point called centre or focus.

Radius: Fixed distance (OC) between centre and circle.
Diameter: Chord (AB) passing through centre.
Circumference: $C = 2\pi r$

Circumference

Perimeter of circle.

Chord

Line segment joining two points on the circle.

Diameter (PQ) is the longest chord.

Semicircle

Perimeter of semicircle = πr .

Diameter divides the circle in two equal parts and each part is called semicircle.

Arc

Continuous piece of a circle is an arc.

Major arc: \widehat{PQR}
Minor arc: \widehat{PQ}

Sector

Two parts of a circle region divided by a chord and radii are called sectors. Sector with greater central angle is major sector. Sector with smaller central angle is minor sector.

Segment

Two parts of a circle region divided by a chord are segments. Segment with major arc is major segment. Segment with minor arc is minor segment.

Area

Region occupied by the circular disc is called area of the circle.

Area of a circle = πr^2

Concentric Circles

Circles with different radii and same centre.

$\pi = 22/7$ or 3.14 $r =$ Radius $\theta =$ Central angle
 $O =$ Centre of circle $C =$ Circumference

MUP11 : Congruent Triangles

CONGRUENT TRIANGLES

Two triangles are congruent if:

- Their corresponding sides are equal.
- Their corresponding angles are equal.

SSS Congruency

If the corresponding sides of two triangles are equal, they are congruent.

$\triangle ABC \cong \triangle PQR$ (SSS)

ASA Congruency

If two angles and included side of a triangle is equal to two corresponding angles and included side of another triangle, then they are congruent.

$\triangle ABC \cong \triangle PQR$ (ASA)

SAS Congruency

If two sides and included angle of a triangle is equal to two corresponding sides and included angle of another triangle, then they are congruent.

$\triangle ABC \cong \triangle PQR$ (SAS)

AAA Congruency

If two angles and a side of a triangle is equal to two corresponding angles and a side of another triangle, then they are congruent.

$\triangle ABC \cong \triangle PQR$ (AAA)

AAS Congruency

If two angles and a side of a triangle is equal to two corresponding angles and a side of another triangle, then they are congruent.

$\triangle ABC \cong \triangle PQR$ (AAS)

RHS Congruency

If the hypotenuse of a right triangle and a side is equal to the hypotenuse and a side of another right triangle, then they are congruent.

$\triangle ABC \cong \triangle PQR$ (RHS)

MUP12 : Properties of Circle

PROPERTIES OF CIRCLE

Perpendicular drawn from the centre of a circle to a chord bisects the chord.

$OM \perp AB$
 $AM = MB$

In a circle, line joining the centre of circle to the mid point of a chord is perpendicular to the chord.

$OM \perp AB$
 $OM \perp MS$

Equal chords of a circle are equidistant from the centre.

$AB = PQ$
and $OM = ON$

Chords of a circle equidistant from the centre are equal.

$OM \perp AB, ON \perp PQ$
and $OM = ON$
 $\therefore AB = PQ$

Equal chords of a circle subtend equal angles at the centre.

$AB = PQ$
 $\angle AOB = \angle POQ$

Chords of a circle which subtend equal angles at the centre are equal.

$\angle AOB = \angle POQ = \theta^\circ$
 $\therefore AB = PQ$

Angle subtended by an arc of a circle at the centre is twice the angle subtended by it at any point of the alternate segment of the circle.

$m\angle AOB = 2 \times m\angle ACB$

Sun of either pair of opposite angles of a cyclic quadrilateral is 180° .

In cyclic quadrilateral ABCD
 $\angle A + \angle C = 180^\circ$
 $\angle B + \angle D = 180^\circ$

- Angle in the semi-circle is right angle.
- Angle in the major arc is acute angle.
- Angle in the minor arc is obtuse angle.

MUP13 : Mensuration - I

MENSURATION - I

Figure	Area	Perimeter	Illustrations
	$l \times b$	$2 \times (l + b)$	$l =$ length $b =$ breadth
	$s \times s$	$4 \times s$	$s =$ side
	$\frac{1}{2} \times d \times (h_1 + h_2)$	$p + q + r + s$	$d =$ diagonal $h_1, h_2 =$ altitudes $p, q, r, s =$ sides
	$\frac{1}{2} \times b \times h$ or $\frac{s_1(s_2 - s_3)}{2}$ or $\frac{s_2(s_1 - s_3)}{2}$ or $\frac{s_3(s_1 - s_2)}{2}$	$a + b + c$	$h =$ altitude $a, b, c =$ sides $b =$ base $s = \frac{a + b + c}{2}$
	$b \times h$	$2 \times (a + b)$	$h =$ altitude $a =$ side $b =$ base
	$\frac{1}{2} \times d_1 \times d_2$ or $h \times s$	$4 \times s$	$d_1, d_2 =$ diagonal $h =$ altitude $s =$ side
	$\frac{1}{2} \times (a + b) \times h$	$a + b + c + d$	$a, b =$ parallel sides $c, d =$ non-parallel sides $h =$ altitude
	πr^2	$2\pi r$	$\pi = 3.14$ or $22/7$ $r =$ radius

MUP14 : Mensuration - II

MENSURATION - II

Figure	Lateral Surface Area	Total Surface Area	Volume	Illustrations
	$2(l + b) \times h$	$2(lb + bh + hl)$	lbh	$l =$ length $b =$ breadth $h =$ height
	$4s^2$	$6s^2$	s^3	$s =$ Side
	$2\pi rh$	$2\pi r(r + h)$	$\pi r^2 h$	$r =$ Radius $h =$ height
	πrl	$\pi r(l + r)$	$\frac{1}{3}\pi r^2 h$	$r =$ Radius $h =$ height $l =$ Slant Height $l^2 = r^2 + h^2$
	—	$4\pi r^2$	$\frac{4}{3}\pi r^3$	$r =$ Radius
	—	$3\pi r^2$	$\frac{2}{3}\pi r^3$	$r =$ Radius

MUP15 : Profit & Loss

PROFIT & LOSS

- $\text{Gain} = \text{Selling Price} - \text{Cost Price}$
when
(Selling Price > Cost Price)
- $\text{Loss} = \text{Cost Price} - \text{Selling Price}$
when
(Cost Price > Selling Price)
- $\text{Gain \%} = \frac{\text{Gain} \times 100}{\text{Cost Price}}$
- $\text{Loss \%} = \frac{\text{Loss} \times 100}{\text{Cost Price}}$
- $\text{Selling Price} = \frac{(100 + \text{Gain \%}) \times \text{Cost Price}}{100}$
- $\text{Selling Price} = \frac{(100 - \text{Loss \%}) \times \text{Cost Price}}{100}$
- $\text{Cost Price} = \frac{\text{Selling Price} \times 100}{100 + \text{Gain \%}}$
- $\text{Cost Price} = \frac{\text{Selling Price} \times 100}{100 - \text{Loss \%}}$
- $\text{Discount} = \text{List Price} - \text{Selling Price}$
- $\text{Discount Rate} = \text{Discount \%} = \frac{\text{Discount} \times 100}{\text{List Price}}$
- $\text{Selling Price} = \frac{\text{List Price} \times (100 - \text{Discount \%})}{100}$
- $\text{List Price} = \frac{100 \times \text{Selling Price}}{100 - \text{Discount \%}}$