Class 8 Math's Formula

CBSE Class 8 Math's Summary

This pdf lists all the Class 8 CBSE math's formula in a concise manner to help the students in revision and examination as per NCERT syllabus

Rational Numbers

S.no	Type of Numbers	Description
1	Natural Numbers	N = {1,2,3,4,5………} It is the counting numbers
2	Whole number	W= {0,1,2,3,4,5……..} It is the counting numbers + zero
3	Integers	Z={…-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6…}
4	Positive integers	Z_+= {1,2,3,4,5……..}
5	Negative integers	Z_-={…-7,-6,-5,-4,-3,-2,-1}
6	Rational Number	A number is called rational if it can be expressed in the form p/q where p and q are integers (q> 0). Example: ½, 4/3 ,5/7 ,1 etc.

S.no	Terms	Descriptions
1	Additive Identity/Role of Zero	Zero is called the identity for the addition of rational numbers. It is the additive identity for integers and whole numbers as well a+0=a
2	Multiplicative identity/Role of one	1 is the multiplicative identity for rational numbers. It is the multiplicative identity for integers and whole numbers as well a×1=a
3	Reciprocal or	The multiplicative inverse of any rational number a/b is

	multiplicative inverse	defined as b/a so that (a/b) x (b/a) =1 Zero does not have any reciprocal or multiplicative inverse

Properties of Rational Numbers

Closure Property

Numbers	**Closed Under**			
	addition	subtraction	multiplication	division
Rational numbers	Yes	Yes	Yes	No
Integers	Yes	Yes	Yes	No
Whole Numbers	Yes	No	Yes	No
Natural Numbers	Yes	No	Yes	No

Commutativity Property

Numbers	**Commutative Under**			
	addition	subtraction	multiplication	division
Rational numbers	Yes	No	Yes	No
Integers	Yes	No	Yes	No
Whole Numbers	Yes	No	Yes	No
Natural Numbers	Yes	No	Yes	No

Associativity Property

Numbers	**Associative Under**

	addition	subtraction	multiplication	division
Rational numbers	Yes	No	Yes	No
Integers	Yes	No	Yes	No
Whole Numbers	Yes	No	Yes	No
Natural Numbers	Yes	No	Yes	No

LINEAR EQUATIONS IN ONE VARIABLE

Algebraic Equation

An algebraic equation is an equality involving variables. It says that the value of the expression on one side of the equality sign is equal to the value of the expression on the other side.

What is Linear equation in one Variable

We will restrict the above equation with two conditions

a) algebraic equation in one variable
b) variable will have power 1 only

or

An equation of the form $ax + b = 0$, where a and b are real numbers, such that a is not equal to zero, is called a linear equation in one variables

Important points to Note

S.no	Points
1	These all equation contains the equality (=) sign.
2	The expression on the left of the equality sign is the Left Hand Side (LHS). The expression on the right of the equality sign is the Right Hand Side (RHS)
3	In an equation the values of the expressions on the LHS and RHS are equal. This happens to be true only for certain values of the variable. These values are the solutions of the equation
4	We assume that the two sides of the equation are balanced. We perform the same mathematical operations on both sides of the equation, so that the balance is not disturbed. We get the solution after generally performing few steps
5	A linear equation in one variable has only one solution

How to solve Linear equation in one variable

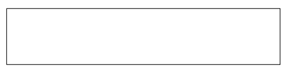
S.no	Type of method	Working of method
1	Solving Equations which have Linear Expressions on one Side and Numbers on the other Side	1) Transpose (changing the side of the number) the Numbers to the side where all number are present. We know the sign of the number changes when we transpose it to other side 2) Now you will have an equation have variable on one side and number on other side. Add/subtract on both the side to get single term 3) Now divide or multiply on both the side to get the value

		of the variable
2	Solving Equations having the Variable on both Sides	1) Here we Transpose (changing the side of the number) both the variable and Numbers to the side so that one side contains only the number and other side contains only the variable. We know the sign of the number changes when we transpose it to other side. Same is the case with Variable 2) Now you will have an equation have variable on one side and number on other side. Add/subtract on both the side to get single term 3) Now divide or multiply on both the side to get the value of the variable
3	Solving Complex Equations (having number in denominator) having the Variable on both Sides	1) Take the LCM of the denominator of both the LHS and RHS 2) Multiple the LCM on both the sides, this will reduce the number without denominator and we can solve using the method described above
4	Equations Reducible to the Linear Form	Here the equation is of the form $\frac{x+a}{x+b} = \frac{c}{d}$ We can cross multiply the numerator and denominator to reduce it to linear for (x+a)d=c(x+b) Now it can be solved by above method

Understanding Quadrilaterals

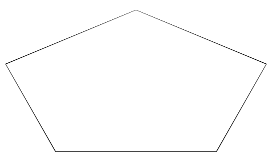
Polygons

A simple closed curve made up of only line segments is called a polygon.



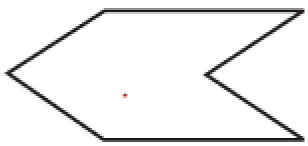
Convex Polygon

We have all the diagonals inside the Polygon



Concave Polygon

We don't have all the diagonals inside the Polygon



Regular and Irregular Polygons

A regular polygon is both 'equiangular' and 'equilateral'.

So all the sides and angles should be same

a) So square is a regular polygon but rectangle is not

b) Equilateral triangle is a regular polygon

Angle Sum in the Polygons

The Sum of the angles in the polygon is given by

$=(n-2) \times 180^0$

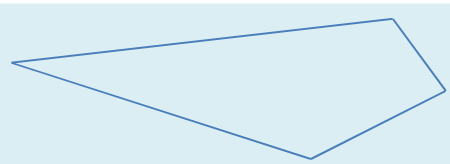
For Triangle, n=3

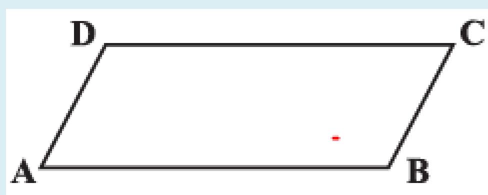
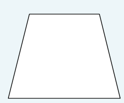
So Total $=180^0$ For quadrilateral, n=4 So total $=360^0$

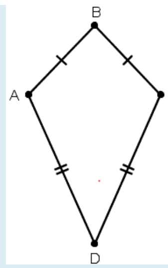
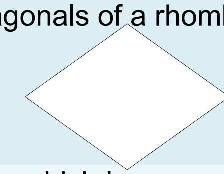
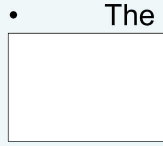
Classification of polygons

We classify polygons according to the number of sides (or vertices)

Number of sides	**Classification**
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon

S.no	**Terms**	**Descriptions**
1	Quadrilateral	 A quadrilateral is a four-sided polygon with four angles. There are many kinds of quadrilaterals. The five most

		common types are the parallelogram, the rectangle, the square, the trapezoid, and the rhombus.
2	Angle Property of Quadrilateral	1) Sum of all the interior angles is 360^0 2) Sum of all the exterior angles is 360^0
3	Parallelogram	A quadrilateral which has both pairs of opposite sides parallel is called a parallelogram. Its properties are: • The opposite sides of a parallelogram are equal. • The opposite angles of a parallelogram are equal. • The diagonals of a parallelogram bisect each other. • The adjacent angles in a parallelogram are supplementary. 
4	Trapezium	A quadrilateral which has one pair of opposite sides parallel is called a trapezium. 
5	Kite	It is a quadrilaterals having exactly two distinct consecutive pairs of sides of equal length Here ABCD is a Kite

		 AB=BC AD=CD
6	Rhombus	Rhombus is a parallelogram in which any pair of adjacent sides is equal. Properties of a rhombus: • All sides of a rhombus are equal • The opposite angles of a rhombus are equal • The diagonals of a rhombus bisect each other at right angles. 
7	Rectangles	A parallelogram which has one of its angles a right angle is called a rectangle. Properties of a rectangle are: • The opposite sides of a rectangle are equal • Each angle of a rectangle is a right-angle. • The diagonals of a rectangle are equal. • The diagonals of a rectangle bisect each other. 
8	Square	A quadrilateral, all of whose sides are equal and all of whose angles are right angles. Properties of square are: • All the sides of a square are equal. • Each of the angles measures 90°. • The diagonals of a square bisect each other at right angles.

The diagonals of a square are equal.

Practical Geometry

Condition for Uniquely drawing the Triangle

We need three measurements for Uniquely drawing the Triangle

Three Measurement could be (Two sides, One Angle), (three sides) and (2 angles, 1 side).

Condition for Uniquely drawing the Quadrilaterals

Five measurements can determine a quadrilateral uniquely

Here is some the measurement which will help us uniquely draw the quadrilaterals

1) A quadrilateral can be constructed uniquely if the lengths of its four sides and a diagonal is given.

2) A quadrilateral can be constructed uniquely if its two diagonals and three sides are known.

3) A quadrilateral can be constructed uniquely if its two adjacent sides and three angles are known.

4). A quadrilateral can be constructed uniquely if its three sides and two included angles are given

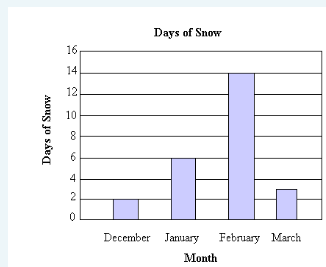
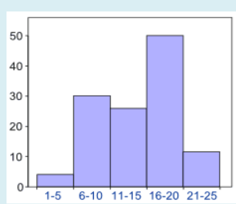
5) Some special property can help in uniquely drawing the quadrilaterals.

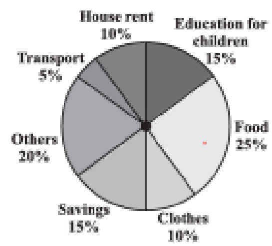
Example

Square with side given Rectangle with side given Rhombus with diagonals given

Data Handling

S.no	Term	Description
2	Data	A systematic record of facts or different values of a quantity is called **data**. Data mostly available to us in an unorganized form is called **raw data.**
3	Features of data	• Arranging data in an order to study their salient features is called presentation of data. • **Frequency** gives the number of times that a particular entry occurs • Table that shows the frequency of different values in the given data is called a **frequency distribution table** • A table that shows the frequency of groups of values in the given data is called a **grouped frequency distribution table** • The groupings used to group the values in given data are called classes or class-intervals. The number of values that each class contains is called the class size or class width. The lower value in a class is called the **lower class limit**. The higher value in a class is called the **upper class limit.**

<table>
<tr><td></td><td></td><td>• The common observation will belong to the higher class.</td></tr>
<tr><td>**4**</td><td>Bar graph</td><td>A bar graph is a pictorial representation of data in which rectangular bars of uniform width are drawn with equal spacing between them on one axis, usually the x axis. The value of the variable is shown on the other axis that is the y axis.

</td></tr>
<tr><td>**5**</td><td>Histogram</td><td>Grouped data can be presented using histogram. Histogram is a type of bar diagram, where the class intervals are shown on the horizontal axis and the heights of the bars show the frequency of the class interval. Also, there is no gap between the bars as there is no gap between the class intervals.

</td></tr>
<tr><td>**6**</td><td>Circle Graph or Pie-chart</td><td>A circle graph shows the relationship between a whole and its part</td></tr>
</table>



Chance or Probability

S.no	Term	Description
1	Random Experiment	A **random experiment** is one whose outcome cannot be predicted exactly in advance
2	Equally Likely outcome	Outcomes of an experiment are **equally likely** if each has the same chance of occurring
3	Event	One or more outcomes of an experiment make an **event**.
4	Probability	$Probability\ of\ an\ event = \frac{Number\ of\ outcomes\ that\ makes\ the\ event}{Total\ number\ of\ outcomes\ of\ the\ experiment}$ This is applicable when the all outcomes are equally likely

Square and Square roots

Square Number

if a natural number m can be expressed as n^2, where n is also a natural number, then m is a square number

Some Important point to Note

S.no	Points
1	All square numbers end with 0, 1, 4, 5, 6 or 9 at unit's place
2	if a number has 1 or 9 in the unit's place, then it's square ends in 1.
3	when a square number ends in 6, the number whose square it is, will have either 4 or 6 in unit's place
4	None of square number with 2, 3, 7 or 8 at unit's place.
5	Even number square is even while odd number square is Odd
6	there are 2n non perfect square numbers between the squares of the numbers n and (n + 1)
7	if a natural number cannot be expressed as a sum of successive odd natural numbers starting with 1, then it is not a perfect square

<u>How to find the square of Number easily</u>

S.no	Method	Working
1	Identity method	We know that $(a+b)^2 = a^2 + 2ab + b^2$

		Example $23^2 = (20+3)^2 = 400+9+120=529$
2	Special Cases	$(a5)^2$ $= a(a+1)$ hundred $+ 25$ Example $25^2=2(3)$ hundred $+25=625$

Pythagorean triplets

For any natural number $m > 1$, we have $(2m)^2 + (m^2 - 1)^2 = (m^2 + 1)^2$
So, $2m$, $m^2 - 1$ and $m^2 + 1$ forms a Pythagorean triplet

Example

6,8,10

$6^2 + 8^2 = 10^2$

Square Root

Square root of a number is the number whose square is given number

So we know that

$m=n^2$

Square root of m

$\sqrt{m} = n$

Square root is denoted by expression √

How to Find Square root

Name	Description
Finding square root through repeated subtraction	We know sum of the first n odd natural numbers is n^2. So in this method we subtract the odd number starting from 1 until we get the reminder as zero. The count of odd number will be the square root Consider 36 Then, (i) 36 – 1 = 35 (ii) 35 – 3 = 32 (iii) 32 – 5 = 27 (iv) 27 – 7 = 20 (v) 20 – 9 = 11 (vi)11 – 11 = 0 So 6 odd number, Square root is 6
Finding square root through prime Factorisation	This method, we find the prime factorization of the number. We will get same prime number occurring in pair for perfect square number. Square root will be given by multiplication of prime factor occurring in pair Consider 81

	$81=(3\times3)\times(3\times3)$ $\sqrt{81}= 3\times3=9$
Finding square root by division method	This can be well explained with the example **Step 1** Place a bar over every pair of digits starting from the digit at one's place. If the number of digits in it is odd, then the left-most single digit too will have a bar. So in the below example 6 and 25 will have separate bar **Step 2** Find the largest number whose square is less than or equal to the number under the extreme left bar. Take this number as the divisor and the quotient with the number under the extreme left bar as the dividend. Divide and get the remainder In the below example 4 < 6, So taking 2 as divisor and quotient and dividing, we get 2 as reminder **Step 3** Bring down the number under the next bar to the right of the remainder. In the below example we bring 25 down with the reminder, so the number is 225 **Step 4** Double the quotient and enter it with a blank on its right.

In the below example, it will be 4

Step 5 Guess a largest possible digit to fill the blank which will also become the new digit in the quotient, such that when the new divisor is multiplied to the new quotient the product is less than or equal to the dividend.

In this case 45 × 5 = 225 so we choose the new digit as 5. Get the remainder.

Step 6 Since the remainder is 0 and no digits are left in the given number, therefore the number on the top is square root

	25
2	$\overline{6}\,\overline{25}$
	4
45	225
	225
	0

In case of Decimal Number, we count the bar on the integer part in the same manner as we did above, but for the decimal part, we start pairing the digit from first decimal part.

Cube and Cube roots

Cube Number

Numbers obtained when a number is multiplied by itself three times are known as cube numbers

Example

$1=1^3$

$8=2^3$

$27=3^3$

Some Important point to Note

S.no	Points
1	All cube numbers can end with any digit unlike square number when end with 0, 1, 4, 5, 6 or 9 at unit's place
2	if a number has 1 in the unit's place, then it's cube ends in 1.
5	Even number cubes are even while odd number cubes are Odd
6	There are only ten perfect cubes from 1 to 1000
7	There are only four perfect cubes from 1 to 100

Prime Factorization of Cubes

When we perform the prime factorization of cubes number, we find one special property

$8= 2\times2\times2$ (Triplet of prime factor 2)
$216 = (2 \times 2 \times 2) \times (3 \times 3 \times 3)$ (Triplet of 2 and 3)

Each prime factor of a number appears three times in the prime factorization of its cube.

Cube Root

Cube root of a number is the number whose cube is given number

So we know that

$27=3^3$

Cube root of 27

$\sqrt[3]{27} = 3$

Cube root is denoted by expression $\sqrt[3]{\ }$

How to Find cube root

Name	Description
Finding cube root through prime factorization	This method, we find the prime factorization of the number. We will get same prime number occurring in triplet for perfect cube number. Cube root will be given by multiplication of prime factor occurring in pair Consider $74088 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 \times 7 = 2^3 \times 3^3 \times 7^3$ $\sqrt[3]{74088} = 2 \times 3 \times 7 = 42$

Finding cube root by estimation method	This can be well explained with the example The given number is 17576. **Step 1** Form groups of three starting from the rightmost digit of 17576. 17 576. In this case one group i.e., 576 has three digits whereas 17 has only two digits. **Step 2** Take 576. The digit 6 is at its one's place. We take the one's place of the required cube root as 6. **Step 3** Take the other group, i.e., 17. Cube of 2 is 8 and cube of 3 is 27. 17 lies between 8 and 27. The smaller number among 2 and 3 is 2. The one's place of 2 is 2 itself. Take 2 as ten's place of the cube root of 17576. Thus, $\sqrt[3]{17576} = 26$

Comparing Quantities

S.no	Terms	Descriptions
1	Unitary Method	Unitary method is on the most useful method to solve ratio, proportion and percentage problems. In this we first find value of one unit and then find the value of required number of units. So in Short Unitary method comprises two following steps:

		Step 1 = Find the value of one unit. Step 2 = Then find the value of required number of units.
2	Percentages	Percentages are ways to compare quantities. They are numerators of fractions with denominator 100 or it basically means per 100 value Per cent is derived from Latin word 'per centum' meaning 'per hundred' It is denoted by % symbol 1% means 1/100= .01 We can use either unitary method or we need to convert the fraction to an equivalent fraction with denominator 100
3	Discounts	Discount is a reduction given on the Marked Price (MP) of the article. This is generally given to attract customers to buy goods or to promote sales of the goods. You can find the discount by subtracting its sale price from its marked price. So, Discount = Marked price – Sale price
4	Profit and Loss	Cost Price: It is the actual price of the item Overhead charges/expenses: These additional expenses are made while buying or before selling it. These expenses have to be included in the cost price Cost Price: Actual CP + overhead charges Selling Price: It is price at which the item is sold to the

		customer If S.P > C.P, we make some money from selling the item. This is called Profit Profit = SP – CP Profit % = (P/CP) X 100 If S.P < C.P, we lose some money from selling the item. This is called Loss Loss = C.P – S.P Loss % = (L/C. P) X 100
5	Sales Tax and VAT	**Sales Tax(ST)** This is the amount charged by the government on the sale of an item. It is collected by the shopkeeper from the customer and given to the government. This is, therefore, always on the selling price of an item and is added to the value of the bill. **Value added tax(VAT)** This is the again the amount charged by the government on the sale of an item. It is collected by the shopkeeper from the customer and given to the government. This is, therefore, always on the selling price of an item and is added to the value of the bill. Earlier You must have seen Sales tax on the bill, now a day, you will mostly see Value Added Tax **Calculation** If the tax is x%, then Total price after including tax would

		be Final Price= Cost of item + (x/cost of item) X100
6	Interest	Interest is the extra money paid by institutions like banks or post offices on money deposited (kept) with them. Interest is also paid by people when they borrow money
7	Simple Interest	Principal (P): The original sum of money loaned/deposited. Also known as capital. Time (T): The duration for which the money is borrowed/deposited. Rate of Interest (R): The percent of interest that you pay for money borrowed, or earn for money deposited Simple interest is calculated as $$SI = \frac{P \times R \times T}{100}$$ Total amount at the end of time period A= P + SI
8	Compound interest	Principal (P): The original sum of money loaned/deposited. Time (n): The duration for which the money is borrowed/deposited. Rate of Interest (R): The percent of interest that you pay for money borrowed, or earn for money deposited Compound interest is the interest calculated on the previous year's amount (A = P + I).

$$A = P\left(1 + \frac{R}{100}\right)^n$$

Algebraic Expressions and Identities

Algebraic expression is the expression having constants and variable. It can have multiple variable and multiple power of the variable

Example

$11x$
$2y - 3$
$2x + y$

Some Important points on Algebraic expressions

Terms	Description
Terms	Terms are added to form expressions
Factors	Terms themselves can be formed as the product of factors
Coefficient	The numerical factor of a term is called its numerical coefficient or simply coefficient
Monomial	Algebraic expression having one terms is called monomials

	Example 3x
Binomial	Algebraic expression having two terms is called Binomial Example 3x+y
Trinomial	Algebraic expression having three terms is called Trinomial Example 3x+y+z
Polynomial	An expression containing, one or more terms with non-zero coefficient (with variables having non negative exponents) is called a polynomial
Like Terms	When the variable part of the terms is same, they are called like terms
Unlike Terms	When the variable part of the terms is not same, they are called unlike terms

Operation on Algebraic Expressions

S.no	Operation	Descriptions
1	Addition	1) We write each expression to be added in a separate row. While doing so we write like terms one below the other Or We add the expression together on the same line and arrange the like term together

		2) Add the like terms 3) Write the Final algebraic expression
2	Subtraction	1) We write each expression to be subtracted in a separate row. While doing so we write like terms one below the other and then we change the sign of the expression which is to be subtracted i.e. + becomes – and – becomes + Or We subtract the expression together on the same line, change the sign of all the term which is to be subtracted and then arrange the like term together 2) Add the like terms 3) Write the Final algebraic expression
3	Multiplication	1) We have to use distributive law and distribute each term of the first polynomial to every term of the second polynomial. 2) when you multiply two terms together you must multiply the coefficient (numbers) and add the exponents 3) Also as we already know ++ equals =, +- or -+ equals - and -- equals + 4) group like terms

What is an Identity

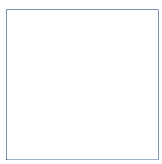
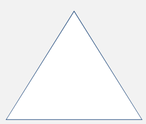
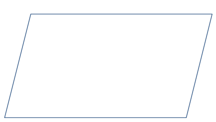
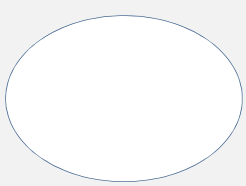
An identity is an equality, which is true for all values of the variables in the equality.

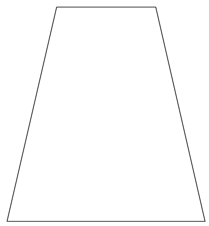
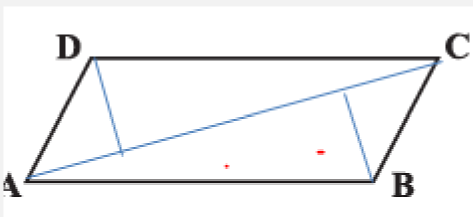
$(a + b)^2 = a^2 + 2ab + b^2$
$(a - b)^2 = a^2 - 2ab + b^2$
$(a + b)(a - b) = a^2 - b^2$
$(x + a)(x + b) = x^2 + (a + b)x + ab$

Mensuration

S.no	Term	Description
1	Mensuration	It is branch of mathematics which is concerned about the measurement of length, area and Volume of plane and Solid figure
2	Perimeter	a) The perimeter of plane figure is defined as the length of the boundary b) It units is same as that of length i.e. m, cm, km
3	Area	a) The area of the plane figure is the surface enclosed by its boundary b) It unit is square of length unit. i.e. m^2 , km^2

Shapes where Area and Perimeter are known

Shapes	Perimeter	Area
Rectangle 	P= 2(L+B) L and B are Length and Breadth of the rectangle	A=L×B
Square 	P=4a a is the side of the square	$A=a^2$
Triangle 	P=Sum of sides	A=(1/2)×(Base)×(Height/Altitude)
Parallelogram 	P=2(Sum of Adjacent sides)	A=(Base) ×(Height)
Circle 	P=2πr r is the radius of the circle	$A=\pi r^2$
Trapezium	P= Sum of length of all the sides	A=(1/2)h(a+b) Half the product of the sum of

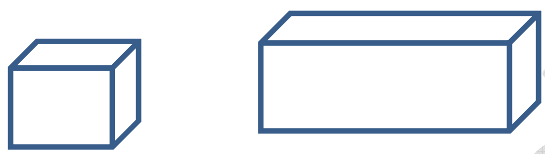
		the lengths of parallel sides and the perpendicular distance between them gives the area of trapezium
General Quadrilaterals 	P= Sum of length of all the sides	$A=(1/2)d(h_1+h_2)$
Rhombus	P=4a	$A=(1/2)\times d_1\times d_2$ Where d_1 and d_2 are the diagonals of the Rhombus.

Important Terms to remember in case of Solid Figures

Surface Area	**Surface area of a solid is the sum of the areas of its faces**
Lateral Surface Are	The faces excluding the top and bottom) make the lateral surface area of the solid

Volume	Amount of space occupied by a three dimensional object (Solid figure) is called its volume. we use square units to find the area of a two dimensional region. In case of volume we will use cubic units to find the volume of a solid, as cube is the most convenient solid shape (just as square is the most convenient shape to measure area of a region) Volume is sometimes refer as capacity also

Surface Area and Volume of Cube and Cuboid



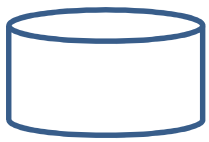
Cube

Cuboid

Type	Measurement
Surface Area of Cuboid of Length L, Breadth B and Height H	2(LB + BH + LH).
Lateral surface area of the cuboids	2(L + B) H
Diagonal of the cuboids	$\sqrt{L^2 + B^2 + H^2}$
Volume of a cuboids	LBH
Length of all 12 edges of the cuboids	4 (L+B+H).
Surface Area of Cube of side L	$6L^2$
Lateral surface area of the cube	$4L^2$

Diagonal of the cube	$L\sqrt{3}$
Volume of a cube	L^3

Surface Area and Volume of Right circular cylinder



Radius	**The radius (r) of the circular base is called the radius of the cylinder**
Height	The length of the axis of the cylinder is called the height (h) of the cylinder
Lateral Surface	The curved surface joining the two base of a right circular cylinder is called Lateral Surface.

Type	**Measurement**
Curved or lateral Surface Area of cylinder	$2\pi rh$
Total surface area of cylinder	$2\pi r\,(h+r)$
Volume of Cylinder	$\pi\, r^2h$

Exponents And Power

Laws of Exponents

Here are the laws of exponents when *a* and *b* are non-zero integers and *m*, *n* are any integers.

$a^{-m} = 1/a^m$

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

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

$a^m \times b^m = (ab)^m$

$a^m / b^m = (a/b)^m$

$a^0 = 1$

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

$(1)^n = 1$ for infinitely many *n*.

$(-1)^p = 1$ for any even integer p

Direct and Inverse Proportion

S.no	Term	Description
1	Direct Proportion	Two quantities *x* and *y* are said to be in **direct proportion** if they increase (decrease) together in such a manner that the ratio of their corresponding values remains constant.

		That is if *x/y=k*= [*k* is a positive number] = Constant Then *x* and *y* are said to vary directly. In such a case if *y*1, *y*2 are the values of *y* corresponding to the values *x*1, *x*2 of *x* respectively then $$\frac{x_1}{y_1} = \frac{x_2}{y_2}$$
2	Inverse proportion	Two quantities *x* and *y* are said to be in **inverse proportion** if an increase in *x* causes a proportional decrease in *y* (and vice-versa) in such a manner that the product of their corresponding values remains constant. That is, if $xy = k$= Constant Then *x* and *y* are said to vary inversely. In this case if y_1, y_2 are the values of *y* corresponding to the values x_1, x_2 of *x* respectively then $x_1 y_1 = x_2 y_2$

Factorisation

Factorisation of algebraic expression

When we factorise an algebraic expression, we write it as a product of factors. These factors may be numbers, algebraic variables or algebraic expressions

The expression $6x\ (x - 2)$. It can be written as a product of factors.
2,3, x and $(x - 2)$

$6x\ (x - 2). = 2 \times 3 \times x \times (x - 2)$

The factors 2,3, x and $(x + 2)$ are irreducible factors of $6x\ (x + 2)$.

Method of Factorisation

Name	**Working**
Common factor method	1) We can look at each of the term in the algebraic expression, factorize each term 2) Then find common factors to factorize the expression **Example** 2x+4 =2(x+2)
Factorisation by regrouping terms	1) First we see common factor across all the terms 2) we look at grouping the terms and check if we find binomial factor from both the groups. 3) Take the common Binomial factor out **Example** 2xy + 3x + 2y + 3 = 2 × x × y + 3 × x + 2 × y + 3 = x × (2y + 3) + 1 × (2y + 3) = (2y + 3) (x + 1)
Factorisation using identities	Use the below identities to factorise it $(a + b)^2 = a^2 + 2ab + b^2$ $(a - b)^2 = a^2 - 2ab + b^2$ $(a + b)(a - b) = a^2 - b^2$

Factorisation of the form (x+a)(x+b)	Given x^2+ px + q, 1) we find two factors a and b of q (i.e., the constant term) such that ab = q and a + b = p 2) Now expression can be written $x^2+ (a + b) x + ab$ or $x^2 + ax + bx + ab$ or $x(x + a) + b(x + a)$ or $(x + a) (x + b)$ which are the required factors. **Example** $x^2 - 7x + 12$ Now $12 = 3 \times 4$ and $3 + 4 = 7$ $=x^2 - 3x - 4x + 12$ $= x (x - 3) - 4 (x - 3) = (x - 3) (x - 4)$

Division of algebraic expression

Division of algebraic expression is performed by Factorisation of both the numerator and denominator and then cancelling the common factors.

Steps of Division

1) Identify the Numerator and denominator
2) Factorise both the Numerator and denominator by the technique of Factorisation using common factor, regrouping, identities and splitting
3) Identify the common factor between numerator and denominator
4) Cancel the common factors and finalize the result

Example

$48\,(x^2yz + xy^2z + xyz^2)\,/4xyz$

$=48xyz\,(x + y + z)/4xyz$

$= 4 \times 12 \times xyz\,(x + y + z)\,/4xyz$

$= 12\,(x + y + z)$

Here Dividend=48 $(x^2yz + xy^2z + xyz^2)$

Divisor=4xyz

Quotient=12 $(x + y + z)$

So, we have

Dividend = Divisor × Quotient.

In general, however, the relation is

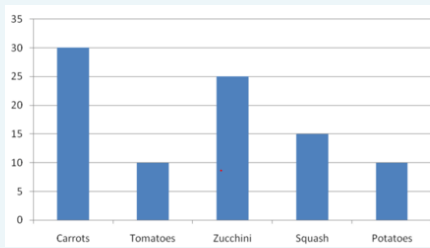
Dividend = Divisor × Quotient + Remainder

When reminder is not zero

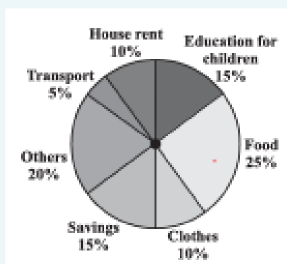
Graph's

S.no	Term	Description

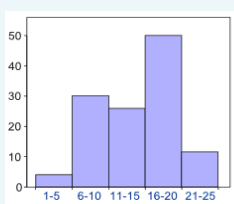
1	Graph	Graphs are visual representations of data collected
2	Bar Graph	A **bar graph** is used to show comparison among categories



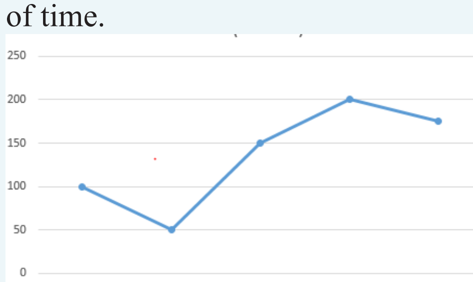
3	Pie Chart	A circle graph shows the relationship between a whole and its part

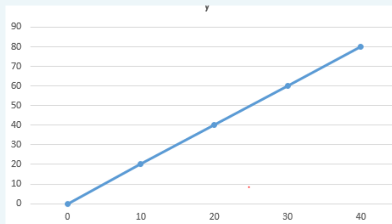


4	Histograms	A Histogram is a bar graph that shows data in intervals. It has adjacent bars over the intervals



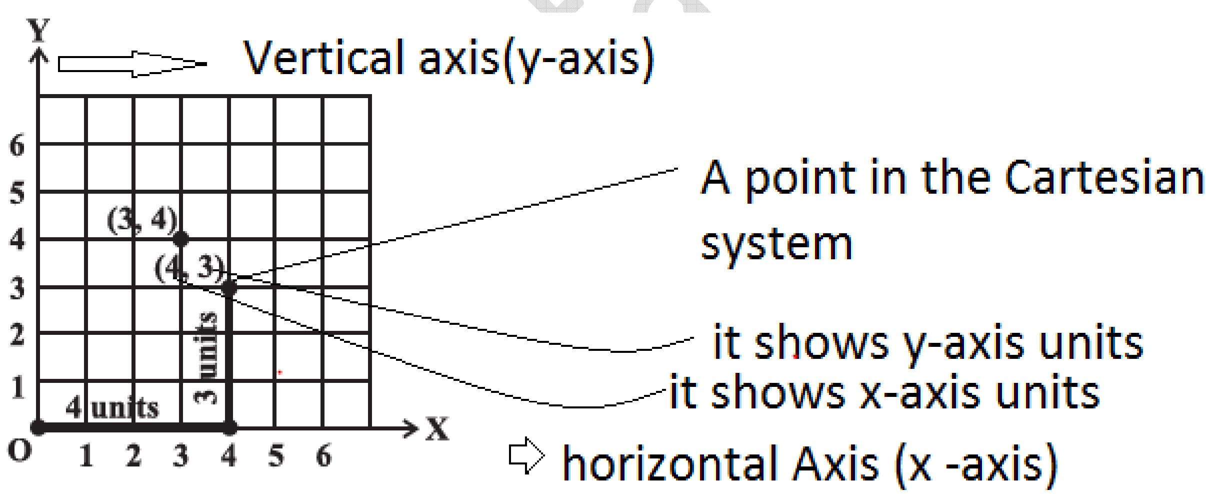
5	line graph	A **line graph** displays data that changes continuously over periods of time.



6	linear graph.	A line graph which is a whole unbroken line is called a **linear graph** 

Cartesian system

The system of fixing a point with the help of two measurements, vertical and horizontal is known as Cartesian system



Playing with Numbers

Numbers can be written in general form.

A two-digit number *ab* will be written as
$ab = 10a + b$

A three-digit number abc will be written as
abc= 100a+10b+c

A four-digit number abcd will be written as
abcd= 1000a+100b+10c+d

S.no	Divisibility	How it works
1	Divisibility by 10	Numbers ending with 0 are divisible by 10 **Why?** A three-digit number abc will be written as abc= 100a+10b+c So c has to be 0 for divisibility by 10
2	Divisibility by 5	Numbers ending with 0 and 5 are divisible by 5 **Why?** A three-digit number abc will be written as abc= 100a+10b+c So c has to be 0 or 5 for divisibility by 5
3	Divisibility by 2	Numbers ending with 0,2,4,6 and 8 are divisible by 2 **Why?** A three-digit number abc will be written as abc= 100a+10b+c So c has to be 2,4,6,8 or 0 for divisibility by 2
4	Divisibility by 3	The sum of digits should be divisible by 3 **Why?** A three-digit number abc will be written as

		abc= 100a+10b+c $=99c + 9b + (a + b + c)$ $=9(11c + b) + (a + b + c)$ Now 9 is divisible by 3, so sum of digits should be divisible by 3
5	Divisibility by 9	The sum of digits should be divisible by 9 **Why?** A three-digit number abc will be written as abc= 100a+10b+c $=99c + 9b + (a + b + c)$ $=9(11c + b) + (a + b + c)$ Now 9 is divisible by 9, so sum of digits should be divisible by 9
6	Divisibility by 11	The difference between the sum of digits at its odd places and that of digits at the even places should be divisible by 11 **Why?** $abcd = 1000a + 100b + 10c + d$ $= (1001a + 99b + 11c) – (a – b + c – d)$ $= 11(91a + 9b + c) + [(b + d) – (a + c)]$