Class 9th (C.B.S.E.)

Mathematics Formulas

1. Number System:

a. Natural Numbers: N= 1, 2, 3, 4, 5, 6, 7, 8, ……..

b. Whole Numbers: W= 0, 1, 2, 3, 4, 5, 6, 7, 8, ……

c. Integers: Z= ….-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, …….

d. Positive Integers: 1, 2, 3, 4, 5, …..

e. Negative Integers: …..-5, -4, -3, -2, -1

f. Rational Number: A number 'x' is referred to as rational if it can be written in the form x/y, where x and y are integers (y>0)

g. Irrational Number: A number 'x' is referred to as irrational if it cannot be written in the form x/y, where x and y are integers (y>0)

h. Real Numbers: All rational and irrational numbers are real numbers.

i. Laws of exponents:

- $x^a . x^b = x^{a+b}$
- $x^a/x^b\ x=^{a-b}$
- $(x^a)^b = x^{ab}$
- $x^a . y^a = (xy)^a$
- $x-^a = 1/ x^a$
- $x^0 = 1$

2. Polynomials:

a. Any real number; let's say 'a' is considered to be the zero of a polynomial 'p(x)' if p(a) = 0. In this case, a is said to be the equation p(x) = 0.

b. Every one variable linear polynomial will contain a unique zero, a real number which is a zero of the zero polynomial, and a non-zero constant polynomial that does not have any zeros.

c. Remainder Theorem: If p(x) has the degree greater than or equal to 1 and p(x) when divided by the linear polynomial x – a will give the remainder as p(a).

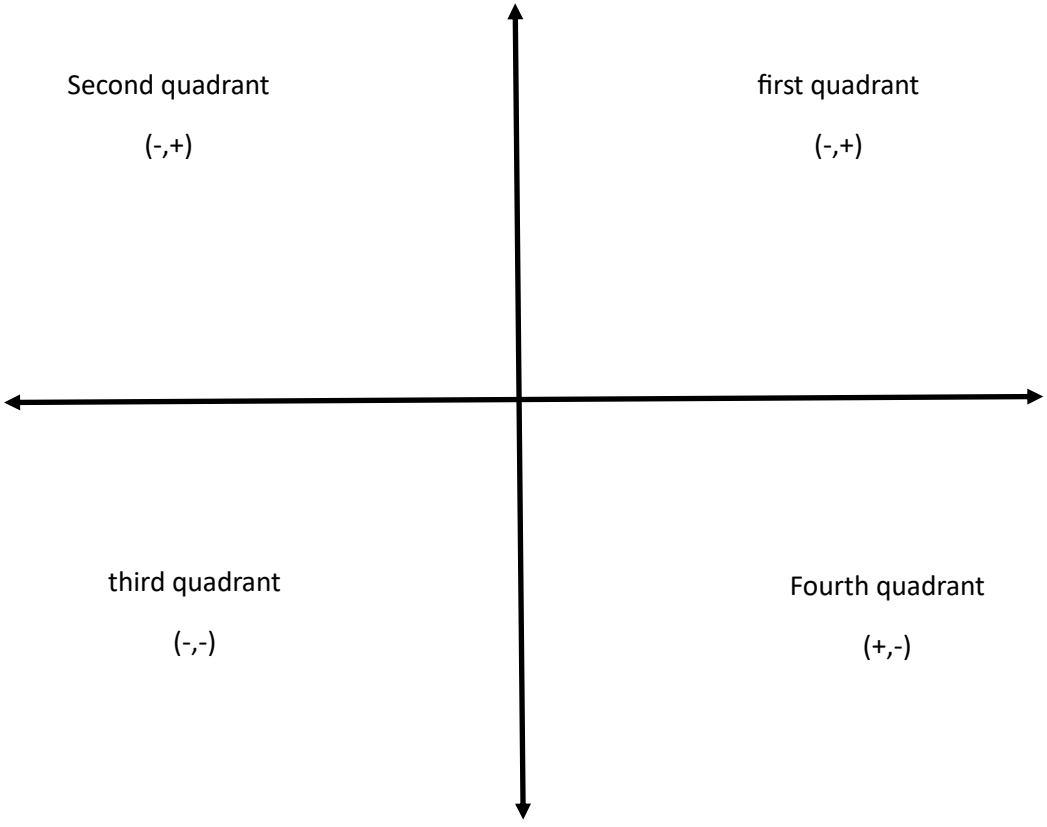
d. Factor Theorem: x – a will be the factor of the polynomial p(x), whenever p(a) = 0. The vice-versa also holds true every time.

e. A polynomial is a mathematical expression made up of variables and numbers, combined using addition, subtraction, and multiplication. The variables in a polynomial have exponents that are whole numbers (0 or higher). A polynomial in one variable, like p(x), is written as an expression involving x with different powers.

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + ... + a_2 x^2 + a_1 x + a_0$$

3. Coordinate Geometry:

a. The coordinate geometry is a part of geometry where the position of the points on the plane is described with the help of an ordered pair of numbers called coordinates. Coordinate geometry: Quadrants



b. Whenever you have to locate an object on a plane, you need two divide the plane into two perpendicular lines, thereby, making it a Cartesian Plane.

c. The horizontal line is known as the x-axis and the vertical line is called the y-axis.

d. The coordinates of a point are in the form of (+, +) in the first quadrant, (–, +) in the second quadrant, (–, –) in the third quadrant, and (+, –) in the fourth quadrant; where + and – denotes the positive and the negative real number respectively.

e. The coordinates of the origin are (0, 0) and thereby it gets up to move in the positive and negative numbers.

4. Linear Equations in two variables

a. Any equation which can be defined in the form ax + by + c = 0, where a, b and c are real numbers, and a and b are not both zero, is called a linear equation in two variables. Given below are the algebraic identities.

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a – b)^2 = a^2 – 2ab + b^2$
- $(a + b)(a – b) = a^2 - b^2$
- $(x + a)(x + b) = x^2 + (a + b)x + ab$
- $(x + a)(x – b) = x^2 + (a – b)x – ab$
- $(x – a)(x + b) = x^2 + (b – a)x – ab$
- $(x – a)(x – b) = x^2 – (a + b)x + ab$
- $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
- $(a – b)^3 = a^3 – b^3 – 3ab(a – b)$
- $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2xz$
- $(x + y – z)^2 = x^2 + y^2 + z^2 + 2xy – 2yz – 2xz$
- $(x – y + z)^2 = x^2 + y^2 + z^2 – 2xy – 2yz + 2xz$
- $(x – y – z)^2 = x^2 + y^2 + z^2 – 2xy + 2yz – 2xz$
- $x^3 + y^3 + z^3 – 3xyz = (x + y + z)(x^2 + y^2 + z^2 – xy – yz - xz)$
- $x^2 + y^2 = 1212[(x + y)^2 + (x – y)^2]$
- $(x + a)(x + b)(x + c) = x^3 + (a + b + c)x^2 + (ab + bc + ca)x + abc$
- $x^3 + y^3 = (x + y)(x^2 – xy + y^2)$
- $x^3 – y^3 = (x – y)(x^2 + xy + y^2)$
- $x^2 + y^2 + z^2 – xy – yz – zx = 1212[(x – y)^2 + (y – z)^2 + (z – x)^2]$

5. Introduction to Euclid's geometry:

a. Axioms: The basic facts which are taken for granted without proof are called axioms. Some of Euclid's axioms are:

i. Things which are equal to the same thing are equal to one another.
ii. If equals are added to equals, the wholes are equal.
iii. If equals are subtracted from equals, the remainders are equal.
iv. Things which coincide with one another are equal to one another.
v. The whole is greater than the part.

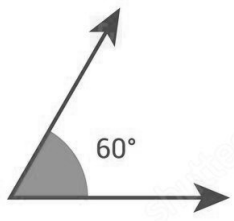
b. Postulates: Axioms are the general statements, postulates are the axioms relating to a particular field. Euclid's five postulates are.

i. A straight line may be drawn from anyone point to any other point.
ii. A terminated line can be produced indefinitely.
iii. A circle can be drawn with any center and any radius.
iv. All right angles are equal to one another.
v. If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely meet on that side on which the angles are less than two right angles.

6. Lines and Angles

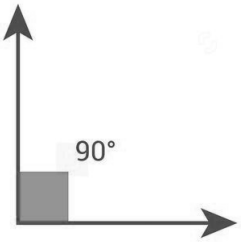
a. Angle: The union of two non-collinear rays with a shared beginning point is called an angle.

i. Types of Angles: Following are the major types of angles-
ii. Acute angle: An acute angle measure between 0° and 90°.



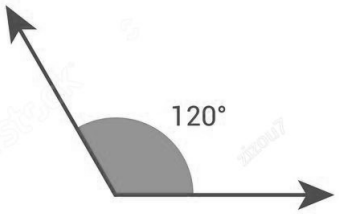
Acute Angle

iii. Right angle: A right angle is exactly equal to 90°.



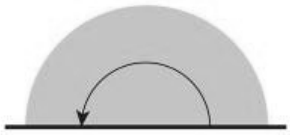
Right Angle

iv. Obtuse angle: An angle greater than 90° but less than 180°.



Obtuse Angle

v. Straight angle: A straight angle is equal to 180°. Reflex angle: An angle that is greater than 180° but less than 360° is called a reflex angle.



180 °
Straight Angle

vi. Complementary angles: Two angles whose sum is 90° are called complementary angles. Let one angle be x, then its complementary angle is (90°−x).

vii. Supplementary angles: Two angles whose sum is 180° are called supplementary angles. Let one angle be x, then its supplementary angle is (180°−x).

viii. Adjacent angles: Two angles are Adjacent when they have a common side and a common vertex (corner point) and don't overlap.

ix. Linear pair: A linear pair of angles is formed when two lines intersect. Two angles are said to be linear if they are adjacent angles formed by two intersecting lines. The measure of a straight angle is 180°, so a linear pair of angles must add up to 180°.

x. Vertically opposite angles: Vertically opposite angles are formed when two lines intersect each other at a point. Vertically opposite angles are always equal.

b. Transversal: A line that intersects two or more given lines at distinct points, is called a transversal of the given line. Following are the angles that are made on a traversal as,

i. Corresponding angles

ii. Alternate interior angles

iii. Alternate exterior angles

iv. Interior angles on the same side of the transversal.

7. Triangles

a. A triangle is a three-sided polygon with three edges and three vertices, as described by geometry. The Angle sum property of a triangle is the most significant and widely used characteristic, which states that the sum of a triangle's interior angles is only 180 degrees. Three sides and three angles make up a triangle, which is a closed geometrical object.

b. Congruence: Congruent refers to figures that are identical in all aspects, such as their forms and sizes. Two circles with the same radii, for example, are congruent. Also congruent are two squares with the same sides.

c. Congruent Triangles: Two triangles are congruent if and only if one of them can be superimposed over the other to entirely cover it.

d. Congruence Rules: Following are the list of some important congruence rules of triangles,

- *Side angle side (SAS) Congruence*
- *Angle Side Angle (ASA) Congruence*
- *Angle angle side (AAS) Congruence*

- *Side side side (SSS) Congruence*
- *Right-angle Hypotenuse Side (RHS) Congruence*