

List of Mathematics Formulas for Classes 6 to 12 PDF | Complete Chapter-wise Formula Sheet for Students

List of Formulas from Various Chapters of Mathematics for Students of Classes 6 to 12

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Fundamental Mathematics Formulas (Classes 6 & 7)

Mathematics is one of the most important subjects for every student. Whether you are preparing for school examinations, Olympiads, scholarship exams, NTSE, Navodaya, Sainik School, or future competitive examinations like SSC, Banking, Railway, UPSC, JEE, and NEET, having a strong command over mathematical formulas is essential.

Many students lose marks not because they do not understand the concepts but because they forget the formulas during examinations. A well-organized formula sheet helps students revise quickly before exams and improves confidence while solving questions.

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This comprehensive article has been prepared especially for students of **Classes 6 to 12**. Every important chapter is covered with easy-to-remember formulas arranged chapter-wise.

Chapter 1: Numbers and Number System

The Number System is the backbone of Mathematics. Every advanced topic begins with understanding numbers.

Even Numbers

Formula

$$2n$$

Example

2, 4, 6, 8, 10

Odd Numbers

Formula

$$2n + 1$$

Example

1, 3, 5, 7, 9

Sum of First n Natural Numbers

$$n(n+1)/2$$

Example

Sum of first 20 numbers

$$20 \times 21 \div 2 = 210$$

Sum of First n Even Numbers

$$n(n+1)$$

Example

First 5 even numbers

$$5 \times 6 = 30$$

Sum of First n Odd Numbers

$$n^2$$

Example

First 8 odd numbers

$$8^2 = 64$$

Square of a Number

Number $\times$ Number

Example

$$18^2 = 324$$

Cube of a Number

Number $\times$ Number $\times$ Number

Example

$$7^3 = 343$$

Prime Numbers

A prime number has exactly two factors:

- 1
- The number itself

Examples

2, 3, 5, 7, 11, 13

Composite Numbers

A composite number has more than two factors.

Examples

4, 6, 8, 10, 12

Chapter 2: Factors and Multiples

Highest Common Factor (HCF)

HCF = Greatest common factor of two or more numbers

Example

HCF (18, 24)

= 6

Least Common Multiple (LCM)

LCM = Smallest common multiple

Example

LCM (8,12)

=24

Relationship

$\text{LCM} \times \text{HCF} = \text{Product of the Numbers}$

Applicable for two numbers.

Divisibility Rules

Divisible by 2

Last digit is even.

Example

246

Divisible by 3

Sum of digits divisible by 3.

Example

327

$3+2+7=12$

12 divisible by 3

Divisible by 4

Last two digits divisible by 4.

Example

816

16 divisible by 4

Divisible by 5

Ends in

0 or 5

Divisible by 6

Divisible by both 2 and 3.

Divisible by 8

Last three digits divisible by 8.

Divisible by 9

Sum of digits divisible by 9.

Divisible by 10

Ends in 0.

Chapter 3: Fractions

A fraction represents a part of a whole.

General Form

Numerator / Denominator

Addition

$$a/b + c/d$$

$$= (ad + bc)/bd$$

Subtraction

$$a/b - c/d$$

$$= (ad - bc)/bd$$

Multiplication

$$a/b \times c/d$$

$$= ac/bd$$

Division

$$a/b \div c/d$$

$$= a/b \times d/c$$

Reciprocal

Reciprocal of

$$a/b$$

=

$$b/a$$

Equivalent Fractions

Multiply numerator and denominator by the same number.

Example

$$2/3$$

=

$$4/6$$

=

6/9

Chapter 4: Decimals

Fraction to Decimal

Divide numerator by denominator.

Example

$\frac{3}{4}$

=0.75

Decimal to Fraction

Example

0.25

= $\frac{25}{100}$

= $\frac{1}{4}$

Percentage to Decimal

Percentage $\div 100$

Example

40%

=0.40

Decimal to Percentage

Decimal $\times 100$

Example

0.75

=75%

Chapter 5: Ratio and Proportion

Ratio

Ratio

=a:b

$$=a/b$$

Equivalent Ratio

Multiply both numbers by the same value.

Example

2:5

=

4:10

=

6:15

Proportion

$$a:b = c:d$$

Cross multiplication

$$ad = bc$$

Unitary Method

Value of One Unit

=

Total Value $\div$ Number of Units

Chapter 6: Percentage

Percentage

$$(\text{Value} / \text{Total Value}) \times 100$$

Increase Percentage

$$(\text{New} - \text{Old}) / \text{Old} \times 100$$

Decrease Percentage

$$(\text{Old} - \text{New}) / \text{Old} \times 100$$

Percentage to Fraction

25%

= $\frac{1}{4}$

50%

= $\frac{1}{2}$

75%

= $\frac{3}{4}$

20%

= $\frac{1}{5}$

10%

= $\frac{1}{10}$

Chapter 7: Profit and Loss

Profit

Selling Price – Cost Price

Loss

Cost Price – Selling Price

Profit Percentage

Profit/Cost Price $\times 100$

Loss Percentage

Loss/Cost Price $\times 100$

Selling Price

Cost Price + Profit

or

Cost Price – Loss

Chapter 8: Simple Interest

Simple Interest

SI

$$=(P \times R \times T)/100$$

Where

P = Principal

R = Rate

T = Time

Amount

Principal + Simple Interest

Chapter 9: Speed, Time and Distance

Speed

Distance $\div$ Time

Distance

Speed $\times$ Time

Time

Distance $\div$ Speed

Unit Conversion

1 km

=1000 m

1 hour

=60 minutes

1 minute

=60 seconds

km/h to m/s

Multiply by

5/18

m/s to km/h

Multiply by

18/5

Chapter 10: Integers

Addition Rule

Same sign

Add numbers

Keep sign

Example

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

$$(-7) + (-4) = -11$$

Different Signs

Subtract

Keep larger sign

Example

$$7 + (-5) = 2$$

Multiplication Rules

Positive $\times$ Positive = Positive

Negative $\times$ Negative = Positive

Positive $\times$ Negative = Negative

Negative $\times$ Positive = Negative

Division Rules

Same as multiplication rules.

Chapter 11: Introduction to Algebra

Variable

Represented by letters

x, y, z

Constant

Fixed value

Example

10

25

100

Expression

$3x+5$

Equation

$3x+5=20$

Perimeter of Rectangle

$2(l+b)$

Perimeter of Square

$4a$

Algebraic Identity

$(a+b)^2$

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

Algebraic Identity

$(a-b)^2$

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

Difference of Squares

$$(a+b)(a-b)$$

$$=a^2-b^2$$

Geometry, Mensuration, Algebra & Statistics Formulas (Classes 7–9)

In this section, we cover the important formulas related to **Geometry, Mensuration, Exponents, Algebra, Statistics, Coordinate Geometry, and Linear Equations**. These topics form the backbone of Class 8 and Class 9 Mathematics and are frequently used in school examinations, Olympiads, NTSE, foundation courses, and competitive examinations.

Chapter 12: Lines and Angles

Understanding angles is essential for Geometry.

Types of Angles

- Acute Angle = Less than **90°**
 - Right Angle = **90°**
 - Obtuse Angle = Between **90° and 180°**
 - Straight Angle = **180°**
 - Reflex Angle = Between **180° and 360°**
 - Complete Angle = **360°**
-

Complementary Angles

$$\text{Sum} = 90^\circ$$

Example:

$$30^\circ + 60^\circ = 90^\circ$$

Supplementary Angles

$$\text{Sum} = 180^\circ$$

Example:

$$110^\circ + 70^\circ = 180^\circ$$

Angles Around a Point

$$360^\circ$$

Angles on a Straight Line

180°

Vertically Opposite Angles

Always Equal

Parallel Lines

When two parallel lines are cut by a transversal:

- Corresponding Angles = Equal
 - Alternate Interior Angles = Equal
 - Alternate Exterior Angles = Equal
 - Co-interior Angles = 180°
-

Chapter 13: Triangles

Triangles are among the most important topics in Mathematics.

Sum of Interior Angles

180°

Exterior Angle Property

Exterior Angle = Sum of Opposite Interior Angles

Triangle Inequality

Sum of any two sides $>$ Third side

Area of Triangle

Area = $(1/2) \times \text{Base} \times \text{Height}$

Equilateral Triangle

Perimeter = **$3a$**

$$\text{Area} = (\sqrt{3}/4)a^2$$

Isosceles Triangle

Two sides are equal.

Scalene Triangle

All sides are different.

Right Triangle (Pythagoras Theorem)

$$\text{Hypotenuse}^2 = \text{Base}^2 + \text{Perpendicular}^2$$

or

$$c^2 = a^2 + b^2$$

Chapter 14: Quadrilaterals

Sum of Interior Angles

$$360^\circ$$

Rectangle

$$\text{Perimeter} = 2(l + b)$$

$$\text{Area} = l \times b$$

$$\text{Diagonal} = \sqrt{l^2 + b^2}$$

Square

$$\text{Perimeter} = 4a$$

$$\text{Area} = a^2$$

$$\text{Diagonal} = a\sqrt{2}$$

Parallelogram

$$\text{Area} = \text{Base} \times \text{Height}$$

$$\text{Perimeter} = 2(a + b)$$

Rhombus

$$\text{Area} = \left(\frac{1}{2}\right) \times d_1 \times d_2$$

$$\text{Perimeter} = 4a$$

Trapezium

$$\text{Area} = \left(\frac{1}{2}\right)(a + b) \times h$$

Where

a and b are parallel sides.

Kite

$$\text{Area} = \left(\frac{1}{2}\right)d_1d_2$$

Chapter 15: Circle

Circle formulas are frequently asked in examinations.

Circumference

$$2\pi r$$

Diameter

$$2r$$

Radius

$$\text{Diameter} \div 2$$

Area of Circle

$$\pi r^2$$

Semicircle

$$\text{Area} = \left(\frac{1}{2}\right)\pi r^2$$

$$\text{Perimeter} = \pi r + 2r$$

Arc Length

$$(\theta/360^\circ) \times 2\pi r$$

Sector Area

$$(\theta/360^\circ) \times \pi r^2$$

Chapter 16: Practical Geometry

Important properties:

- Radius of the same circle are equal.
 - Diameter is the longest chord.
 - Perpendicular from center bisects the chord.
 - Equal chords subtend equal angles.
-

Chapter 17: Perimeter and Area

Rectangle

$$\text{Area} = \text{Length} \times \text{Breadth}$$

$$\text{Perimeter} = 2(l+b)$$

Square

$$\text{Area} = \text{Side}^2$$

$$\text{Perimeter} = 4 \times \text{Side}$$

Triangle

$$\text{Area} = \frac{1}{2} \times \text{Base} \times \text{Height}$$

Parallelogram

$$\text{Area} = \text{Base} \times \text{Height}$$

Rhombus

$$\text{Area} = \frac{1}{2} \times d_1 \times d_2$$

Trapezium

Area = $\frac{1}{2} \times (\text{Sum of Parallel Sides}) \times \text{Height}$

Chapter 18: Mensuration

Cube

Volume = a^3

Total Surface Area = $6a^2$

Lateral Surface Area = $4a^2$

Diagonal = $a\sqrt{3}$

Cuboid

Volume = $l \times b \times h$

Total Surface Area = $2(lb + bh + hl)$

Lateral Surface Area = $2h(l+b)$

Diagonal = $\sqrt{l^2 + b^2 + h^2}$

Cylinder

Volume = $\pi r^2 h$

Curved Surface Area = $2\pi rh$

Total Surface Area = $2\pi r(r+h)$

Cone

Volume = $\frac{1}{3}\pi r^2 h$

Curved Surface Area = πrl

Total Surface Area = $\pi r(r+l)$

Slant Height

$l = \sqrt{r^2 + h^2}$

Sphere

Volume = $\frac{4}{3}\pi r^3$

$$\text{Surface Area} = 4\pi r^2$$

Hemisphere

$$\text{Volume} = \frac{2}{3}\pi r^3$$

$$\text{Curved Surface Area} = 2\pi r^2$$

$$\text{Total Surface Area} = 3\pi r^2$$

Chapter 19: Exponents and Powers

Product Rule

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

Quotient Rule

$$a^m \div a^n = a^{m-n}$$

Power Rule

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

Product Power

$$(ab)^n = a^n b^n$$

Quotient Power

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

Zero Exponent

$$a^0 = 1$$

Negative Exponent

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

Chapter 20: Squares and Square Roots

Square

$$n^2 = n \times n$$

Square Root

$$\sqrt{a} \times \sqrt{a} = a$$

Perfect Squares

$$1^2 = 1$$

$$2^2 = 4$$

$$3^2 = 9$$

$$4^2 = 16$$

$$5^2 = 25$$

$$10^2 = 100$$

$$20^2 = 400$$

$$30^2 = 900$$

$$50^2 = 2500$$

$$100^2 = 10000$$

Chapter 21: Cubes and Cube Roots

Cube

$$n^3 = n \times n \times n$$

Cube Root

$$\sqrt[3]{a} \times \sqrt[3]{a} \times \sqrt[3]{a} = a$$

Perfect Cubes

$$1^3 = 1$$

$$2^3 = 8$$

$$3^3 = 27$$

$$4^3 = 64$$

$$5^3 = 125$$

$$10^3 = 1000$$

$$20^3 = 8000$$

Chapter 22: Data Handling

Mean (Average)

Sum of Observations ÷ Number of Observations

Median

Middle value after arranging data.

Mode

Most frequently occurring value.

Range

Highest Value – Lowest Value

Chapter 23: Statistics

Arithmetic Mean

$$\bar{x} = \frac{\sum x}{n}$$

Frequency Mean

$$\bar{x} = \frac{\sum f x}{\sum f}$$

Total Frequency

Sum of all frequencies.

Chapter 24: Probability

Probability Formula

$$P(E) = \frac{\text{Favourable Outcomes}}{\text{Total Outcomes}}$$

Certain Event

Probability = 1

Impossible Event

Probability = 0

Probability Range

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

Chapter 25: Coordinate Geometry

Distance Between Two Points

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

Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Origin

Coordinates = (0,0)

Quadrants

- First = (+,+)
 - Second = (-,+)
 - Third = (-,-)
 - Fourth = (+,-)
-

Chapter 26: Linear Equations

General Form

$$ax + b = 0$$

Solution

$$x = \frac{-b}{a}$$

Example

$$2x + 8 = 0$$

$$x = -4$$

Chapter 27: Algebraic Identities

These identities are extremely important and are repeatedly used in higher Mathematics.

$$(a + b)^2$$

$$a^2 + 2ab + b^2$$

$$(a - b)^2$$

$$a^2 - 2ab + b^2$$

$$a^2 - b^2$$

$$(a + b)(a - b)$$

$$(a + b)^3$$

$$a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a - b)^3$$

$$a^3 - 3a^2b + 3ab^2 - b^3$$

$$a^3 + b^3$$

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

$$a^3 - b^3$$

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

Quick Revision Table

Topic	Important Formula
Triangle Area	$\frac{1}{2} \times \text{Base} \times \text{Height}$
Rectangle Area	$\text{Length} \times \text{Breadth}$
Square Area	Side^2
Circle Area	πr^2
Circle Circumference	$2\pi r$
Cube Volume	a^3
Cuboid Volume	$l \times b \times h$
Cylinder Volume	$\pi r^2 h$
Cone Volume	$\frac{1}{3}\pi r^2 h$
Sphere Volume	$\frac{4}{3}\pi r^3$
Mean	$\text{Sum} \div \text{Number}$
Probability	$\text{Favorable} \div \text{Total Outcomes}$
Pythagoras	$c^2 = a^2 + b^2$
Distance Formula	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Advanced Mathematics Formulas (Classes 10 & 11)

In this section, we cover the most important formulas from **Class 10 and Class 11 Mathematics**, including **Polynomials, Quadratic Equations, Arithmetic Progressions, Trigonometry, Coordinate**

Geometry, Sets, Relations, Functions, Complex Numbers, Sequences & Series, Binomial Theorem, Permutations & Combinations, and Mathematical Induction.

These formulas are extremely useful for **CBSE, ICSE, State Boards, Olympiads, JEE Main, NDA, CUET, SSC, Railway, Banking, Defence, and other competitive examinations.**

Chapter 28: Polynomials

A polynomial is an algebraic expression consisting of variables and coefficients.

General Form

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

Linear Polynomial

$$ax + b$$

Quadratic Polynomial

$$ax^2 + bx + c$$

Cubic Polynomial

$$ax^3 + bx^2 + cx + d$$

Sum of Zeroes

For

$$ax^2 + bx + c$$
$$\alpha + \beta = -\frac{b}{a}$$

Product of Zeroes

$$\alpha\beta = \frac{c}{a}$$

Chapter 29: Quadratic Equations

General Form

$$ax^2 + bx + c = 0$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

$$D = b^2 - 4ac$$

If

- $D > 0 \rightarrow$ Two distinct real roots
 - $D = 0 \rightarrow$ Equal roots
 - $D < 0 \rightarrow$ Imaginary roots
-

Sum of Roots

$$-\frac{b}{a}$$

Product of Roots

$$\frac{c}{a}$$

Chapter 30: Pair of Linear Equations

General Form

$$\begin{aligned}a_1x + b_1y + c_1 &= 0 \\a_2x + b_2y + c_2 &= 0\end{aligned}$$

Unique Solution

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

No Solution

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

Infinite Solutions

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

Chapter 31: Arithmetic Progression (AP)

An Arithmetic Progression has a constant common difference.

nth Term

$$a_n = a + (n - 1)d$$

Where

- a = First Term
 - d = Common Difference
-

Sum of First n Terms

$$S_n = \frac{n}{2}[2a + (n - 1)d]$$

Alternative Formula

$$S_n = \frac{n(a + l)}{2}$$

Where

l = Last Term

Chapter 32: Coordinate Geometry

Distance Formula

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

Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Section Formula

For ratio

m:n

$$\left(\frac{mx_2 + nx_1}{m + n}, \frac{my_2 + ny_1}{m + n} \right)$$

Area of Triangle

$$\frac{1}{2} | x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) |$$

Chapter 33: Trigonometry

Basic Ratios

$$\sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$$

$$\cos \theta = \frac{\text{Base}}{\text{Hypotenuse}}$$

$$\tan \theta = \frac{\text{Perpendicular}}{\text{Base}}$$

$$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

Standard Trigonometric Values

θ	$\sin \theta$	$\cos \theta$	$\tan \theta$
----------	---------------	---------------	---------------

0°	0	1	0
-----------	---	---	---

30°	$1/2$	$\sqrt{3}/2$	$1/\sqrt{3}$
------------	-------	--------------	--------------

45°	$1/\sqrt{2}$	$1/\sqrt{2}$	1
------------	--------------	--------------	---

60°	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$
------------	--------------	-------	------------

90°	1	0	Undefined
------------	---	---	-----------

Important Identities

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$$

Chapter 34: Heights and Distances

Using Right Triangle:

Height

$$= \text{Distance} \times \tan \theta$$

Distance

$$= \frac{\text{Height}}{\tan \theta}$$

Chapter 35: Sets

Union

$$A \cup B$$

Elements in either set.

Intersection

$$A \cap B$$

Common elements.

Difference

$$A - B$$

Complement

$$A'$$

Number of Elements

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

Chapter 36: Relations and Functions

Function

Every input has exactly one output.

Domain

Input values.

Range

Output values.

Composition

$$(f \circ g)(x) = f(g(x))$$

Chapter 37: Complex Numbers

General Form

$$z = a + ib$$

Imaginary Unit

$$i = \sqrt{-1}$$

Square

$$i^2 = -1$$

Modulus

$$|z| = \sqrt{a^2 + b^2}$$

Conjugate

$$a - ib$$

Chapter 38: Sequence and Series

Arithmetic Sequence

$$a, a + d, a + 2d \dots$$

Geometric Sequence

$$a, ar, ar^2 \dots$$

nth Term of GP

$$a_n = ar^{n-1}$$

Sum of GP

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

($r \neq 1$)

Infinite GP

$$S = \frac{a}{1 - r}$$

Where

$$|r| < 1$$

Chapter 39: Binomial Theorem

Expansion

$$(a + b)^n$$

General Term

$$T_{r+1} = {}^nC_r a^{n-r} b^r$$

Binomial Coefficient

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

Chapter 40: Permutations

Arrangement of objects.

Formula

$${}^nP_r = \frac{n!}{(n-r)!}$$

Chapter 41: Combinations

Selection of objects.

Formula

$${}^nC_r = \frac{n!}{r!(n-r)!}$$

Relation

$${}^nP_r = {}^nC_r \times r!$$

Chapter 42: Factorial

Definition

$$n! = n(n-1)(n-2)\dots$$

Examples

$$5! = 120$$

$$6! = 720$$

$$7! = 5040$$

Chapter 43: Mathematical Induction

Two Steps

1. Verify for $n=1$
2. Assume true for $n=k$

Prove true for $n=k+1$

Chapter 44: Logarithms

Definition

$$\log_a b = x$$

means

$$a^x = b$$

Product Rule

$$\log(MN) = \log M + \log N$$

Quotient Rule

$$\log\left(\frac{M}{N}\right) = \log M - \log N$$

Power Rule

$$\log(M^n) = n \log M$$

Change of Base

$$\log_a b = \frac{\log_c b}{\log_c a}$$

Chapter 45: Straight Lines

Slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Point-Slope Form

$$y - y_1 = m(x - x_1)$$

Slope-Intercept Form

$$y = mx + c$$

Two-Point Form

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

Distance from Origin

$$\frac{|c|}{\sqrt{a^2 + b^2}}$$

for

$$ax + by + c = 0$$

Quick Revision Table

Chapter	Key Formula
Quadratic Equation	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
AP nth Term	$a + (n - 1)d$
AP Sum	$\frac{n}{2}[2a + (n - 1)d]$
GP nth Term	ar^{n-1}
GP Sum	$\frac{a(r^n - 1)}{r - 1}$

Chapter	Key Formula
Distance Formula	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Pythagoras	$c^2 = a^2 + b^2$
Quadratic Discriminant	$b^2 - 4ac$
Permutation	${}^nP_r = \frac{n!}{(n-r)!}$
Combination	${}^nC_r = \frac{n!}{r!(n-r)!}$
Binomial Term	${}^nC_r a^{n-r} b^r$
Slope	$\frac{y_2 - y_1}{x_2 - x_1}$

Class 12 Mathematics Formulas, Quick Revision, FAQs & Conclusion

In this section, we cover the advanced topics of **Class 12 Mathematics**, including **Calculus, Matrices, Determinants, Vectors, Three-Dimensional Geometry, Linear Programming, Probability**, and a **complete quick revision chart**. These formulas are essential for **CBSE, ICSE, State Board examinations, JEE Main, JEE Advanced, NDA, CUET, SSC, Banking, Railways, Defence, and various competitive examinations**.

Chapter 46: Relations and Functions (Advanced)

Domain

The set of all permissible input values.

Range

The set of all output values.

Composite Function

$$(f \circ g)(x) = f(g(x))$$

Identity Function

$$f(x) = x$$

Inverse Function

$$f(f^{-1}(x)) = x$$

Chapter 47: Inverse Trigonometric Functions

Principal Value Ranges

- $\sin^{-1}x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
 - $\cos^{-1}x \in [0, \pi]$
 - $\tan^{-1}x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
-

Important Identities

$$\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$$

$$\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$$

Chapter 48: Limits

Standard Limits

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$\lim_{x \rightarrow 0} \frac{\tan x}{x} = 1$$

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$$

$$\lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1$$

$$\lim_{x \rightarrow 0} \frac{\ln(1+x)}{x} = 1$$

Chapter 49: Continuity

A function is continuous if

$$\lim_{x \rightarrow a} f(x) = f(a)$$

Chapter 50: Differentiation

Power Rule

$$\frac{d}{dx}(x^n) = nx^{n-1}$$

Constant Rule

$$\frac{d}{dx}(c) = 0$$

Product Rule

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$$

Quotient Rule

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

Chain Rule

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

Important Derivatives

$$\begin{aligned}\frac{d}{dx}(\sin x) &= \cos x \\ \frac{d}{dx}(\cos x) &= -\sin x \\ \frac{d}{dx}(\tan x) &= \sec^2 x \\ \frac{d}{dx}(e^x) &= e^x \\ \frac{d}{dx}(\ln x) &= \frac{1}{x}\end{aligned}$$

Chapter 51: Applications of Derivatives

Increasing Function

$$f'(x) > 0$$

Decreasing Function

$$f'(x) < 0$$

Maximum or Minimum

Find

$$f'(x) = 0$$

Then check

$$f''(x)$$

Chapter 52: Indefinite Integration

Basic Rule

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

where

$n \neq -1$

Important Integrals

$$\int \frac{1}{x} dx = \ln |x| + C$$

$$\int e^x dx = e^x + C$$

$$\int \sin x dx = -\cos x + C$$

$$\int \cos x dx = \sin x + C$$

$$\int \sec^2 x dx = \tan x + C$$

$$\int \operatorname{cosec}^2 x dx = -\cot x + C$$

Chapter 53: Definite Integration

Fundamental Formula

$$\int_a^b f(x) dx = F(b) - F(a)$$

where

$$F'(x) = f(x)$$

Chapter 54: Differential Equations

General Form

$$\frac{dy}{dx} = f(x)$$

Solution

$$y = \int f(x)dx + C$$

Chapter 55: Matrices

Order

$m \times n$

Addition

Possible only when order is the same.

Matrix Multiplication

Rows $\times$ Columns

Identity Matrix

$$I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Transpose

$$A^T$$

Chapter 56: Determinants

For

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix}$$

Determinant

$$ad - bc$$

Inverse Matrix

$$A^{-1} = \frac{Adj(A)}{|A|}$$

provided

$$|A| \neq 0$$

Chapter 57: Vectors

Magnitude

$$|\vec{A}| = \sqrt{x^2 + y^2 + z^2}$$

Dot Product

$$\vec{A} \cdot \vec{B} = |\vec{A}| |\vec{B}| \cos \theta$$

Cross Product

$$\vec{A} \times \vec{B} = |\vec{A}| |\vec{B}| \sin \theta$$

Unit Vector

$$\hat{A} = \frac{\vec{A}}{|\vec{A}|}$$

Chapter 58: Three-Dimensional Geometry

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

Midpoint Formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$$

Direction Cosines

$$l^2 + m^2 + n^2 = 1$$

Chapter 59: Linear Programming

Objective Function

$$Z = ax + by$$

Maximum Value

Evaluate objective function at feasible corner points.

Minimum Value

Evaluate objective function at feasible corner points.

Chapter 60: Probability (Advanced)

Conditional Probability

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$

Multiplication Rule

$$P(A \cap B) = P(A)P(B | A)$$

Independent Events

$$P(A \cap B) = P(A)P(B)$$

Bayes' Theorem

$$P(A_i | B) = \frac{P(A_i)P(B | A_i)}{\sum P(A_j)P(B | A_j)}$$

Complete Mathematics Quick Revision Chart

Topic	Important Formula
Rectangle Area	$l \times b$
Square Area	a^2
Circle Area	πr^2
Circle Circumference	$2\pi r$
Triangle Area	$\frac{1}{2}bh$
Cube Volume	a^3
Cuboid Volume	lbh
Cylinder Volume	$\pi r^2 h$
Cone Volume	$\frac{1}{3}\pi r^2 h$
Sphere Volume	$\frac{4}{3}\pi r^3$
Distance Formula	$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
AP nth Term	$a + (n - 1)d$
GP nth Term	ar^{n-1}
Quadratic Formula	$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Pythagoras	$c^2 = a^2 + b^2$
Trigonometric Identity	$\sin^2 x + \cos^2 x = 1$
Derivative of x^n	nx^{n-1}
Integral of x^n	$\frac{x^{n+1}}{n+1} + C$
Probability	Favorable Outcomes $\div$ Total Outcomes

Topic	Important Formula
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Conditional Probability	$\frac{P(A \cap B)}{P(B)}$
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Tips to Memorize Mathematics Formulas

- **Understand the concept** instead of memorizing formulas blindly.
 - **Prepare a chapter-wise formula notebook** for quick revision.
 - **Revise formulas daily** for 10–15 minutes.
 - **Solve practice problems** immediately after learning a formula.
 - **Create flashcards** or sticky notes for frequently used formulas.
 - **Group similar formulas** (such as area, volume, and trigonometric identities) to remember them more effectively.
 - **Practice previous years' question papers** to identify frequently tested formulas.
 - **Teach the formulas to someone else**, as explaining concepts reinforces memory.
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Frequently Asked Questions (FAQs)

Q1. Why should students learn Mathematics formulas?

Mathematics formulas simplify calculations, improve problem-solving speed, and help students score higher in school and competitive examinations.

Q2. Which formulas are most important for board examinations?

Students should focus on:

- Algebraic Identities
 - Quadratic Equations
 - Trigonometric Ratios and Identities
 - Coordinate Geometry
 - Mensuration
 - Calculus
 - Probability
 - Matrices and Determinants
-

Q3. Are these formulas useful for competitive examinations?

Yes. These formulas are useful for:

- JEE Main & Advanced
 - CUET
 - NDA
 - SSC
 - Banking Exams
 - Railway Recruitment Exams
 - Defence Exams
 - State-level Entrance Tests
 - Various Scholarship and Olympiad Examinations
-

Q4. How often should students revise formulas?

A quick revision of important formulas every day or at least 3–4 times a week helps improve retention and boosts confidence before examinations.

Q5. Is understanding concepts more important than memorizing formulas?

Yes. Understanding how and why a formula works enables students to apply it correctly in different types of problems, making learning more effective than rote memorization.

Conclusion

Mathematics is built on concepts, and formulas are the tools that make solving problems efficient and accurate. A strong command of chapter-wise formulas from **Classes 6 to 12** enables students to perform well in school examinations while also preparing them for higher education and competitive exams.

Instead of trying to memorize everything at once, revise formulas chapter by chapter, practice numerical problems regularly, and maintain your own personalized formula notebook. Consistent practice and conceptual understanding will significantly improve speed, accuracy, and confidence.

Keep this comprehensive formula guide handy for quick revision before tests and examinations. With regular practice, these formulas will become second nature and help you build a solid foundation for success in Mathematics.