Grade 7 Math Formulas

Complete Formula Sheet

Based on Maharashtra Board Syllabus (NEP 2025-26)

> **Note:**
>
> This document contains a collection of key mathematical formulas and concepts typically covered in Grade 7.

Linear Equations Formulas

What is a Linear Equation?

- An equation is a mathematical statement that shows two expressions are equal using an equality sign (=).
- A linear equation is an equation where the highest power of the variable is 1. It can have one or more variables. In Grade 7, we typically focus on linear equations in one variable.
- General form of a linear equation in one variable: $ax + b = c$, where a, b, and c are constants and a is not equal to 0.

Solving Linear Equations (Balancing Method)

- The goal is to isolate the variable on one side of the equation.

- Rule 1: If you add a number to one side of the equation, you must add the same number to the other side.

- Rule 2: If you subtract a number from one side of the equation, you must subtract the same number from the other side.

- Rule 3: If you multiply one side of the equation by a non-zero number, you must multiply the other side by the same number.

- Rule 4: If you divide one side of the equation by a non-zero number, you must divide the other side by the same number.

- Use inverse operations to undo operations on the variable. (Addition undoes Subtraction, Multiplication undoes Division).

- Example: Solve $x + 5 = 12$. Subtract 5 from both sides: $x + 5 - 5 = 12 - 5 \rightarrow x = 7$.

- Example: Solve $y - 3 = 8$. Add 3 to both sides: $y - 3 + 3 = 8 + 3 \rightarrow y = 11$.

- Example: Solve $4z = 20$. Divide both sides by 4: $4z / 4 = 20 / 4 \rightarrow z = 5$.

- Example: Solve $w / 2 = 6$. Multiply both sides by 2: $(w / 2) * 2 = 6 * 2 \rightarrow w = 12$.

Solving Linear Equations (Transposition Method)

- Transposition means moving a term from one side of the equation to the other.

- When a term is transposed, its sign changes.
  - Addition becomes Subtraction.
  - Subtraction becomes Addition.
  - Multiplication becomes Division.
  - Division becomes Multiplication.

- Example: Solve $x + 5 = 12$. Transpose +5 to the right side: $x = 12 - 5 \rightarrow x = 7$.

- Example: Solve $y - 3 = 8$. Transpose -3 to the right side: $y = 8 + 3 \rightarrow y = 11$.

- Example: Solve $4z = 20$. Transpose 4 (which is multiplying) to the right side by dividing: $z = 20 / 4 \rightarrow z = 5$.

- Example: Solve w / 2 = 6. Transpose 2 (which is dividing) to the right side by multiplying: w = 6 * 2 -> w = 12.

Congruence Formulas

Understanding Congruence

- Congruent figures are figures that have the exact same size and shape.
- If two figures are congruent, one can be placed exactly on top of the other by sliding, rotating, or flipping it.
- The symbol for congruence is $\cong$.

Congruence of Basic Figures

- Congruence of Line Segments: Two line segments are congruent if they have the same length. Example: If length of AB = length of CD, then line segment AB $\cong$ line segment CD.
- Congruence of Angles: Two angles are congruent if they have the same measure. Example: If measure of angle P = measure of angle Q, then angle P $\cong$ angle Q.

Congruence of Triangles

Two triangles are congruent if their corresponding sides and corresponding angles are equal. We use congruence criteria to prove triangles are congruent without checking all parts.

- **SSS Congruence Criterion (Side-Side-Side):** If three sides of one triangle are equal to the corresponding three sides of another triangle, then the two triangles are congruent.

- **SAS Congruence Criterion (Side-Angle-Side):** If two sides and the included angle (the angle between the two sides) of one triangle are equal to the corresponding two sides and the included angle of another triangle, then the two triangles are congruent.

- **ASA Congruence Criterion (Angle-Side-Angle):** If two angles and the included side (the side between the two angles) of one triangle are equal to the corresponding two angles and the included side of another triangle, then the two triangles are congruent.

- **AAS Congruence Criterion (Angle-Angle-Side):** If two angles and a non-included side (a side not between the two angles) of one triangle are equal to the corresponding two angles and the corresponding non-included side of another triangle, then the two triangles are congruent.

Corresponding Parts of Congruent Triangles (CPCTC)

- If two triangles are congruent, then their corresponding sides are equal and their corresponding angles are equal. This is often abbreviated as CPCTC.

- Example: If triangle ABC $\cong$ triangle PQR, then AB = PQ, BC = QR, AC = PR, angle A = angle P, angle B = angle Q, and angle C = angle R.

Algebraic Expressions Formulas

Basic Concepts (Revision from Grade 6)

- Variable: A letter representing an unknown value (e.g., x, y).

- Constant: A fixed numerical value (e.g., 5, -3).

- Term: A single number, a single variable, or a product of numbers and variables (e.g., 7, y, 3x, -4ab).

- Coefficient: The numerical factor of a term (e.g., in 5x, the coefficient is 5).

- Algebraic Expression: A combination of terms using addition and subtraction (e.g., 2x + 5, 3a - 4b).

- Like Terms: Terms that have the same variables raised to the same powers (e.g., 3x and 5x, $2y^2$ and $-7y^2$).

- Unlike Terms: Terms that have different variables or the same variables raised to different powers (e.g., 3x and 5y, 2x and $2x^2$).

Operations on Algebraic Expressions

- Addition and Subtraction: Only like terms can be added or subtracted. Add or subtract their coefficients and keep the variables the same. Example: 3x + 5x = (3+5)x = 8x. Example: 7y - 2y = (7-2)y = 5y. Example: (2x + 3y) + (4x - y) = (2x + 4x) + (3y - y) = 6x + 2y.

- Multiplication of Monomials: Multiply the coefficients and multiply the variables (using exponent rules if applicable). Example: (3x) multiplied by (5y) = (3*5) * (x*y) = 15xy. Example: ($2a^2$) multiplied by ($4a^3$) = (2*4) * (a^2 * a^3) = $8a^{(2+3)}$ = $8a^5$.

- Multiplying a Monomial by a Polynomial: Use the distributive property. Multiply the monomial by each term inside the polynomial. Example: 2x(x + 3) = (2x * x) + (2x * 3) = $2x^2$ + 6x.

- Multiplying a Binomial by a Binomial: Use the distributive property (often remembered as FOIL - First, Outer, Inner, Last). Example: $(a + b)(c + d) = a(c + d) + b(c + d) = ac + ad + bc + bd$.

Evaluating Algebraic Expressions

- To evaluate an algebraic expression, substitute the given numerical values for the variables and then perform the operations using the order of operations (BODMAS/PEMDAS).
- Example: Evaluate $2x + 5$ when $x = 3$. Substitute x=3: $2(3) + 5 = 6 + 5 = 11$.
- Example: Evaluate $a^2 - b$ when $a = 4$ and $b = 2$. Substitute a=4, b=2: $4^2 - 2 = 16 - 2 = 14$.

End of Complete Formula Sheet - Grade 7