Grade 8 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 8.

Quadrilaterals Formulas

Properties of Quadrilaterals (General)

- A quadrilateral is a polygon with four sides and four angles.
- The sum of the interior angles of any quadrilateral is 360 degrees.

Properties and Formulas for Specific Quadrilaterals

Parallelogram

- Opposite sides are equal and parallel.
- Opposite angles are equal.
- Consecutive angles are supplementary (sum to 180 degrees).
- Diagonals bisect each other.

- Area of a Parallelogram = base multiplied by height

- Perimeter of a Parallelogram = 2 multiplied by (side1 + side2)

Rectangle

- All properties of a parallelogram apply.

- All four angles are right angles (90 degrees).

- Diagonals are equal and bisect each other.

- Area of a Rectangle = length multiplied by width

- Perimeter of a Rectangle = 2 multiplied by (length + width)

Square

- All properties of a parallelogram and rectangle apply.

- All four sides are equal.

- Diagonals are equal, bisect each other at 90 degrees, and bisect the angles.

- Area of a Square = side multiplied by side or side squared

- Perimeter of a Square = 4 multiplied by side

Rhombus

- All properties of a parallelogram apply.

- All four sides are equal.

- Diagonals bisect each other at 90 degrees and bisect the angles.

- Area of a Rhombus = (1/2) multiplied by (diagonal1 multiplied by diagonal2)

- Perimeter of a Rhombus = 4 multiplied by side

Trapezium (Trapezoid)

- One pair of opposite sides is parallel.

- Area of a Trapezium = (1/2) multiplied by (sum of parallel sides) multiplied by height

Kite

- Two pairs of adjacent sides are equal.

- One pair of opposite angles is equal (the angles between unequal sides).

- Diagonals are perpendicular.

- One diagonal bisects the other diagonal.

- Area of a Kite = (1/2) multiplied by (diagonal1 multiplied by diagonal2)

Data Handling Formulas

Understanding Data

- Data: A collection of facts or information.

- Raw Data: Data collected in its original form.

- Frequency: The number of times a particular observation occurs in a data set.

- Frequency Distribution Table: A table that shows the frequency of each observation or class interval.

- Class Interval: A range of values within which data is grouped (e.g., 0-10, 10-20).

- Upper Class Limit: The highest value in a class interval.

- Lower Class Limit: The lowest value in a class interval.

- Class Mark (Midpoint): (Upper Class Limit + Lower Class Limit) divided by 2

- Range of Data: Highest value - Lowest value.

Measures of Central Tendency (Ungrouped Data)

These are values that represent the center or typical value of a data set.

- **Mean (Average):**
  Mean = Sum of all observations divided by Total number of observations
  Example: Mean of 2, 4, 6 is (2 + 4 + 6) divided by 3 = 12 divided by 3 = 4.

- **Median:**
  The middle value of a data set when arranged in ascending or descending order.
    - If the number of observations (n) is odd, the Median is the ((n + 1) divided by 2)th observation.
    - If the number of observations (n) is even, the Median is the average of the (n divided by 2)th and ((n divided by 2) + 1)th observations.

  Example (odd n): Median of 3, 5, 8, 10, 12 (sorted) is the 3rd term, which is 8.
  Example (even n): Median of 10, 15, 20, 25 (sorted) is the average of the 2nd and 3rd terms: (15 + 20) divided by 2 = 17.5.

- **Mode:**
  The observation that occurs most frequently in the data set.
  A data set can have one mode (unimodal), more than one mode (multimodal), or no mode.
  Example: Mode of 5, 7, 7, 8, 9 is 7.
  Example: Mode of 10, 12, 12, 15, 15 is 12 and 15.

Graphical Representation of Data (Concepts)

- Bar Graph: Uses bars of uniform width with heights proportional to the frequencies. Used for comparing discrete data.

- Histogram: A type of bar graph where the bars are adjacent to each other. Used for continuous data grouped into class intervals. The area of each bar is proportional to the frequency of the class interval.

- Pie Chart (Circle Graph): Represents data as sectors of a circle. The size of each sector is proportional to the fraction of the whole that it represents.

Angle of Sector = (Frequency of the component divided by Total frequency) multiplied by 360 degrees.

Squares & Square Roots Formulas

Squares

- The square of a number is the result of multiplying the number by itself. Example: Square of 5 is 5 multiplied by 5 = 25.
- A perfect square (or square number) is a number that can be obtained by squaring an integer. Example: 1, 4, 9, 16, 25, 36, ... are perfect squares.
- Properties of Perfect Squares:
    - A number ending in 2, 3, 7, or 8 is never a perfect square.
    - A number ending in an odd number of zeros is never a perfect square.
    - The number of zeros at the end of a perfect square is always even.
    - The square of an even number is even.
    - The square of an odd number is odd.

Square Roots

- The square root of a number 'x' is the number 'y' such that y multiplied by y = x.
- The symbol for square root is $\sqrt{}$. Example: $\sqrt{25} = 5$ because 5 multiplied by 5 = 25.
- For a positive number 'x', $\sqrt{x}$ represents the positive square root. Every positive number has both a positive and a negative square root (e.g., the square roots of 25 are 5 and -5).

- Finding Square Roots:
  - Prime Factorization Method: Factorize the number into its prime factors. Group the factors in pairs. For each pair, take one factor. The product of these factors is the square root.
  - Example: To find $\sqrt{36}$: Prime factors of 36 are 2, 2, 3, 3. Pairs are (2,2) and (3,3). Take one from each pair: 2 and 3. $\sqrt{36} = 2 \times 3 = 6$.
  - Long Division Method (More complex, typically introduced for larger numbers or decimals).
- Square root of a fraction: $\sqrt{a/b} = \sqrt{a} / \sqrt{b}$ (where b is not equal to 0).
- Square root of a product: $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$.

End of Complete Formula Sheet - Grade 8