Geometry Info Sheet #6

Lines, Slopes, Formulas, and Equations

Definitions

The **slope of a line** is a number representing the steepness of the line, and is usually represented by the letter m. In a coordinate plane, between any two points, it is the ratio of the vertical change in the y coordinate (rise) to the horizontal change in the x coordinate (run).

A line with a positive slope rises from left to right. A line with a negative slope rises from right to left.

The **slope of a horizontal line** is zero.

The **slope of a vertical line** is undefined.

A **directed line segment** is a segment that represents moving from one point to another.

Postulates

If the slopes of two distinct non-vertical lines are equal, then the lines are parallel.
If two non-vertical lines are parallel, then their slopes are equal.
Any two vertical lines are parallel.

If the slopes of two lines have a product of -1, then the lines are perpendicular.
If two non-vertical lines are perpendicular, then the product of their slopes is -1.
Any horizontal line and vertical line are perpendicular.

Formulas

In a coordinate plane, the **slope of a non-vertical line** containing the points (x_1, y_1) and (x_2, y_2) is $\frac{y_2 - y_1}{x_2 - x_1}$.

In a coordinate plane, the **midpoint of a segment** with endpoints (x_1, y_1) and (x_2, y_2) has the coordinates $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$. The coordinates of the midpoint are the averages of the coordinates of the endpoints.

Distance d in a coordinate plane **between two points** (x_1, y_1) and (x_2, y_2): $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Forms of Lines in Coordinate Planes

Standard Form of Equation of line containing point (x, y): $Ax + By = C$

Slope-Intercept Form of line containing point (x, y) with slope m and y-intercept b: $y = mx + b$

Point-Slope Form of line containing points (x_1, y_1) and (x_2, y_2) with slope m: $y_2 - y_1 = m(x_2 - x_1)$