

12: Graphing Linear Equations and Functions

Key Terms

- **Coordinate plane:** formed by a horizontal axis and a vertical axis labeled x -axis and y -axis, respectively.
- **Linear equation:** a statement in which two algebraic expressions, at least one of degree one, are equal.
- **Linear function:** a linear equation with two variables.
- **Ordered pair:** the two numbers that give the location of a point in the coordinate plane; written as (x, y) .
- **Parallel lines:** two or more distinct lines that have the same slope; they never intersect.
- **Perpendicular lines:** two lines that have opposite reciprocal slopes; they intersect at a right angle.
- **Quadrant:** one of the four sections the coordinate plane is divided into by the x - and y -axes.
- **Segment:** identified by the coordinates of its endpoints.
- **Slope:** the number that indicates the direction and steepness of a line.
- **x -intercept:** the point where a graph intersects the x -axis.
- **y -intercept:** the point where a graph intersects the y -axis.

Linear Equation Forms

- **Slope-intercept form:** $y = mx + b$
- **Standard form:** $Ax + By = C$
- **Point-slope form:** $y - y_1 = m(x - x_1)$

How-to: Find Points on a Line

To find the coordinates of a point on a line:

1. Replace one of the variables with an arbitrary value.
2. Solve the resulting equation for the other variable.
3. Put the values in point form (x, y) .

How-to: Locate Ordered Pairs

To locate an ordered pair (a, b) on the coordinate plane:

1. Locate $x = a$ on the x -axis, then draw a perpendicular line through the point.
2. Locate $y = b$ on the y -axis, then draw a perpendicular line through the point.
3. Plot a point at the intersection of the lines. This point represents (a, b) .

How-to: Graph Linear Functions

To graph a linear function:

1. Find two points on the line.
2. Plot the two points on the coordinate plane.
3. Connect the points with a line.

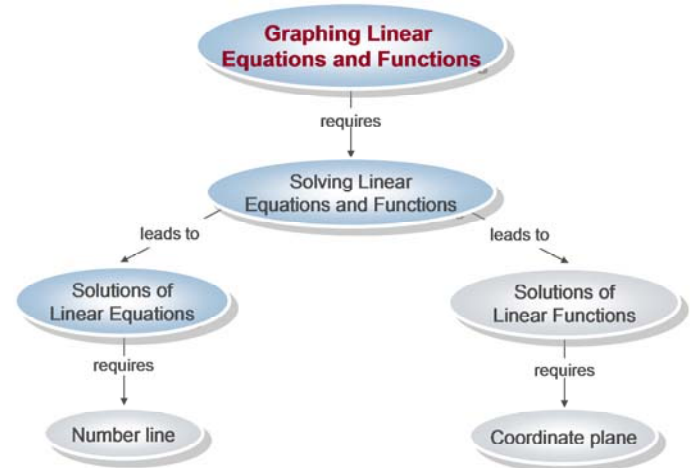
How-to: Find the Slope of a Line

To find the slope of a line, convert the equation to slope-intercept form:

$$y = mx + b$$

where m represents the slope of the line.

Concept Map



How-to: Graph Using Intercepts

To graph a linear function using its intercepts:

1. Find the coordinates of the x - and y -intercepts.
2. Plot the points.
3. Draw a line through the two points.

Midpoint Formula

Given (x_1, y_1) and (x_2, y_2) are the endpoints of a line segment in the coordinate plane, the coordinates of the midpoint of the segment are:

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

Example: Parallel, Perpendicular, Neither

Determine if these lines are parallel, perpendicular, or neither.

$$2x + y = 11 \qquad 4x + 2y = 6$$

Solution: Write each equation in slope-intercept form.

$$2x + y = 11 \quad \rightarrow \quad y = -2x + 11$$

$$4x + 2y = 6 \quad \rightarrow \quad y = -2x + 3$$

Both equations have a slope of -2 . Since the slopes are the same, these lines are parallel.

Tips and Reminders

- Solutions to some linear equations can be graphed on a number line.
- The numbers in an ordered pair cannot be interchanged.
- The slope of a line is also known as the rate of change.
- The variable m represents slope.
- Parallel lines have the same slope.
- Perpendicular lines have opposite reciprocal slopes.
- A segment in the coordinate plane is identified by its endpoints.
- Two points are needed to draw the graph of a linear equation.

How to Use This Cheat Sheet: These are the key concepts related this topic. Try to read through it carefully twice then rewrite it out on a blank sheet of paper. Review it again before the exam.