

Lines and slope

- ✓ A **line** extends forever both ways; a **line segment** has two endpoints
- ✓ **Slope** $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$: steepness and direction
- ✓ **Positive**: up to the right; **negative**: down to the right
- ✓ **Zero**: horizontal (no rise); **undefined**: vertical (no run)

The equation of a line

- ✓ **Slope-intercept form**: $y = mx + b$; m is the slope, b the y -intercept
- ✓ $y = 2x - 4$: slope 2, crosses the y -axis at -4
- ✓ **From two points**: find m , then put one point in to find b
- ✓ $(-2, 7)$ and $(4, 1)$: $m = \frac{-6}{6} = -1$; $7 = 2 + b$, so $y = -x + 5$

Two lines

- ✓ **Different slopes**: cross at one point
- ✓ **Same slope, different intercepts**: parallel; never cross
- ✓ **Same slope and intercept**: the same line
- ✓ **Perpendicular**: cross at four 90° angles; slopes are **opposite reciprocals**, so flip the fraction and change the sign
- ✓ $\frac{2}{3} \rightarrow -\frac{3}{2}$ and $-5 \rightarrow \frac{1}{5}$

Angles

- ✓ **Right angle**: 90° ; **straight line**: 180° ; **full circle**: 360°
- ✓ **Complementary**: add to 90° ; **supplementary**: add to 180°
- ✓ **Vertical (opposite) angles**, across from each other where two lines cross, are equal
- ✓ **Congruent**: the same measure
- ✓ **Vertex**: where the two sides of an angle meet

Transversals

- ✓ A **transversal** crosses two parallel lines and makes eight angles of only two sizes
- ✓ Any two of them are **equal** or **supplementary**
- ✓ One angle 55° : every angle is 55° or 125°
- ✓ A parallelogram's opposite angles are equal and its neighboring angles supplementary

The coordinate plane

- ✓ x -axis across, y -axis up; they meet at the **origin**, $(0, 0)$
- ✓ A point (x, y) : move along x first (right +), then y (up +)
- ✓ Quadrants, counterclockwise from the upper right: I $(+, +)$, II $(-, +)$, III $(-, -)$, IV $(+, -)$

Midpoint and distance

- ✓ **Midpoint**: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$; $(-3, 8)$ and $(5, -2)$ give $(1, 3)$
- ✓ **Distance**: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, the Pythagorean theorem on the right triangle the two points make
- ✓ $(3, -4)$ and $(-2, 8)$: $\sqrt{5^2 + 12^2} = \sqrt{169} = 13$