

Chapter 3

Parallel and Perpendicular Lines

3.1 Pairs of Lines and Angles

- 2 lines: that do NOT intersect
 - 1. Parallel: coplanar
 - 2. Skew: not coplanar
- 2 Planes: that do NOT intersect
 - Are parallel

- 2 lines in a plane.....
- Postulate 13: Parallel Postulate
 - There is only 1 line parallel to another line through point A
- Postulate 14: Perpendicular Postulate
 - There is only 1 line perpendicular to another line through point A

2 Lines cut by a Transversal (line)

- 2 lines cut by a transversal (line)
 - Form special pairs of angles
 - 1. Corresponding Angles
 - 2. Alternate Interior Angles
 - 3. Alternate Exterior Angles
 - 4. Consecutive Angles

3.2 Use Parallel Lines and Transversals

- If the 2 lines are PARALLEL....
- **Postulate: Corresponding Angles**
 - If 2 lines are parallel, then the corresponding angles are congruent

Theorems

- If 2 lines are parallel, the Alternate Interior \cong
- If 2 lines are parallel, the Alternate Exterior \cong
- If 2 lines are parallel, the Consecutive 180°

Pairs of Angles

- VA \cong
- Corresponding \cong
- AIA \cong
- AEA \cong
- Consecutive 180°
- Linear Pair 180°

3.3 Prove Lines are Parallel

- **Postulate:** If corresponding angles are \cong , then the lines are parallel
- **Theorems:**
 - IF AIA \cong , then lines \parallel
 - IF AEA \cong , then lines \parallel
 - IF Consecutive \angle 's supplementary, then lines \parallel

3.4 Find and Use Slopes of Lines

- **Slope:** tilt, slant of line
 - The bigger the number the steeper the line
- **Slope:** $\frac{\textit{vertical change (y)}}{\textit{horizontal change (x)}} = \frac{y_2 - y_1}{x_2 - x_1}$
 - Between 2 points (x_1, y_1) and (x_2, y_2)
- **Slopes:** + , – , 0 (horizontal) , or undefined (vertical)

- **Postulate: Slopes of Parallel Lines**
 - Two lines are parallel *iff* $m_1 = m_2$
- **Postulate: Slopes of Perpendicular Lines**
 - Two lines are perpendicular *iff* $m_1 = -\frac{1}{m_2}$
- To determine if two lines are parallel or perpendicular.....USE SLOPE

3.5 Write and Graph Equations of Lines

- To **write** an equation of a line need 2 things:
 - Slope (m) and y -intercept (b)
 - Use $y = mx + b$
 - May need to plug in (x,y) to find b
- If writing **parallel** line: Use $m_1 = m_2$
- If writing **perpendicular** line: Use $m_1 = -\frac{1}{m_2}$

- **To Graph Lines:** Draw a picture of all points
- **1. Standard Form:** $Ax + By = C$
 - Use intercepts: x-int $x =$ and y-int $y =$
- **2. Slope-Intercept Form:** $y = mx + b$
 - Use y-int: b
 - Then slope rise/run

3.6 Prove Theorems about Perpendicular Lines

- Rules...
- **Theorem 3.8:**
 - If two lines intersect to form a linear pair of congruent angles.....
 - Then the lines are Perpendicular.
- **Theorem 3.9:**
 - If two lines are perpendicular.....
 - Then they intersect to form 4 right angles

- **Theorem 3.10:**

- If two sides of two adjacent acute angles are perpendicular.....
- Then the angles are complementary

- **Theorem 3.11 Perpendicular Transversal Theorem**
 - If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other.

- **Theorem 3.12: Lines Perpendicular to a Transversal**
 - In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.

- **Distance between 2 parallel lines:**
 - Is measured with the perpendicular
 - Find 2 points, one on each line
 - Use the Distance Formula

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$