

5.1

Visiting Washington, D.C.

Transversals and Parallel Lines

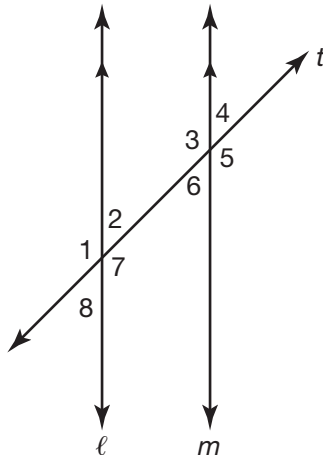
Students should be able to answer these questions after Lesson 5.1:

- What is the relationship between the angles formed by two parallel lines and a transversal?
- How are the angles formed by two lines and a transversal classified?

Directions

Read Question 1 and its solution. Then find the measures of the angles in Question 2.

1. Lines ℓ and m are parallel and $m\angle 8 = 45^\circ$. Identify all of the indicated angle pairs and find the measure of each angle.



Angle Pairs

Corresponding Angles:

$\angle 1$ and $\angle 3$, $\angle 2$ and $\angle 4$, $\angle 5$ and $\angle 7$, $\angle 6$ and $\angle 8$

Alternate Interior Angles: $\angle 3$ and $\angle 7$, $\angle 2$ and $\angle 6$

Alternate Exterior Angles: $\angle 1$ and $\angle 5$, $\angle 4$ and $\angle 8$

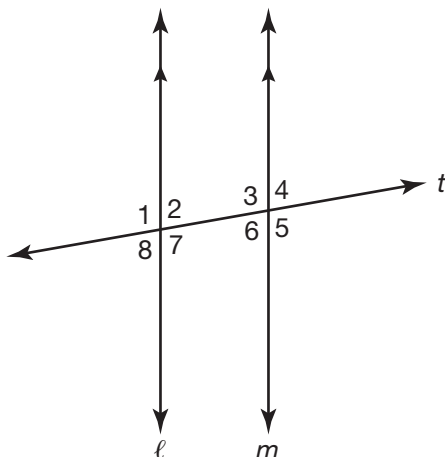
Same-Side Interior: $\angle 2$ and $\angle 3$, $\angle 7$ and $\angle 6$

Same-Side Exterior: $\angle 1$ and $\angle 4$, $\angle 5$ and $\angle 8$

Angle Measures

$m\angle 1 = 135^\circ$, $m\angle 2 = 45^\circ$, $m\angle 3 = 135^\circ$, $m\angle 4 = 45^\circ$,
 $m\angle 5 = 135^\circ$, $m\angle 6 = 45^\circ$

2. Lines ℓ and m are parallel and $m\angle 5 = 100^\circ$.



Angle Pairs:

Angle Measures:

5.2

Going Up?

Introduction to Proofs

Students should be able to answer these questions after Lesson 5.2:

- How are the hypothesis and conclusion of a conditional statement identified?
- How are geometric properties used in proofs?

Directions

Read Question 1 and its solution. Then complete Question 2.

1. In the figure shown at the right, $m\angle 3 = 105^\circ$. Find the measure of angles 1 and 2.

Step 1 Find the measure of $\angle 2$. Angles 2 and 3 are supplementary because the angles form a linear pair. The sum of the measures of supplementary angles is 180° .

$$m\angle 2 + m\angle 3 = 180^\circ$$

$$m\angle 2 + 105^\circ = 180^\circ \quad \text{Substitute the known angle measure.}$$

$$m\angle 2 = 75^\circ \quad \text{Solve for } m\angle 2.$$

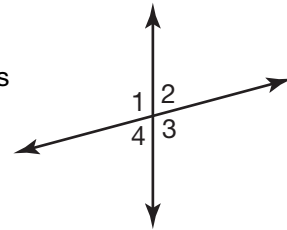
Step 2 Find the measure of $\angle 1$. Using the Vertical Angles Congruence Theorem, $\angle 1$ is congruent to $\angle 3$. So, $m\angle 1 = m\angle 3$.

$$\angle 1 \cong \angle 3 \quad \text{Vertical Angles Congruence Theorem}$$

$$m\angle 1 = m\angle 3 \quad \text{Definition of congruence}$$

$$m\angle 1 = 105^\circ \quad \text{Substitute the known angle measure.}$$

$$\text{So, } m\angle 1 = 105^\circ \text{ and } m\angle 2 = 75^\circ.$$



2. Using the figure shown above, find $m\angle 4$.

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Read Question 3 and its solution. Then identify the property in Questions 4 through 6.

3. If $x = 5$, then $5 = x$.

Reason: Symmetric Property

4. If $x = 2$ and $2 = y$, then $x = y$.

Reason: _____

5. If $x = 5$, then $x + 2 = 5 + 2$.

Reason: _____

6. If $x + 4 = 10$, then $x = 6$.

Reason: _____

5.4

Parking Lot Design

Parallel and Perpendicular Lines in the Coordinate Plane

Students should be able to answer these questions after Lesson 5.4:

- How are the slopes of parallel and perpendicular lines determined?
- How are the equations of parallel and perpendicular lines determined?
- How are the equations of horizontal and vertical lines determined?

Directions

Read Question 1 and its solution. Then, write the equations of one line parallel to and one line perpendicular to the given line in Questions 2 and 3.

1. Write the equation of one line that is parallel and one that is perpendicular to the line represented by the equation $y = 2x + 1$.

Step 1 Identify the slope of the equation. The slope is the coefficient of the x -term. In this example, the slope is 2.

Step 2 Determine the slopes of the parallel and perpendicular lines. Parallel lines have the same slope. Lines parallel to $y = 2x + 1$ have a slope of 2. Perpendicular lines have slopes that are negative reciprocals of each other. Lines perpendicular to $y = 2x + 1$ have a slope of $-\frac{1}{2}$.

Step 3 Write the equations of the lines. The value of the constant in the equation does not affect whether the line is parallel or perpendicular.

Parallel Line: $y = 2x + 7$ Perpendicular Line: $y = -\frac{1}{2}x - 4$

2. $y = 3x - 5$

Parallel Line: _____

Perpendicular Line: _____

3. $y = -\frac{2}{3}x + 1$

Parallel Line: _____

Perpendicular Line: _____

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Read Question 4 and its solution. Then complete Question 5.

4. Write the equation of a horizontal line and a vertical line that passes through the point $(-1, 2)$.

Step 1 A horizontal line will pass through the y -coordinate. The horizontal line has the equation $y = 2$.

Step 2 A vertical line will pass through the x -coordinate. The vertical line has the equation $x = -1$.

5. Write the equation of a horizontal line and a vertical line that passes through $(3, -6)$.

5.6

Building a Roof Truss

Angle and Line Segment Bisectors

Students should be able to answer these questions after Lesson 5.6:

- What are the properties of an angle bisector?
- What are the properties of a line segment bisector?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. If $m\angle A = 35^\circ$, what is the measure of each angle formed when $\angle A$ is bisected?

Step 1 The measure of each angle is half of $m\angle A$. So, each angle is 17.5° .

2. If $m\angle A = 130^\circ$, what is the measure of each angle formed when $\angle A$ is bisected?

3. What is the measure of $\angle A$ if its bisected angles measure 30° ?

Read Question 4 and its solution. Then complete Questions 5 and 6.

4. A line segment that is 30 inches long is bisected. What is the measure of the line segments that are formed by the segment bisector?

Step 1 The length of each line segment is half of the length of the original segment. So, each segment is 15 inches.

5. A line segment that is 22 inches long is bisected. What is the measure of the line segments that are formed by the segment bisector?

6. If the segments formed by a segment bisector are 13 cm long, what is the original length of the segment that was bisected?