


3.3 Proving Lines Parallel

Learning Targets for today

- ① To be able to use the postulates and theorems of parallel lines to prove two lines are parallel.
 - ① To be able to prove lines are parallel using the converse theorems.
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KEY CONCEPTS!

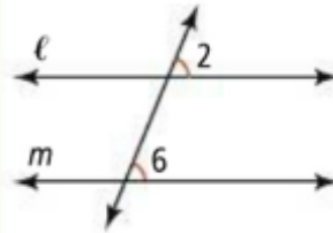
CONVERSE of the Corresponding Angles Theorem

Theorem

If two lines and a transversal form corresponding angles that are congruent, then the lines are parallel.

If ...

$$\angle 2 \cong \angle 6$$



Then ...

$$\underline{l \parallel m}$$

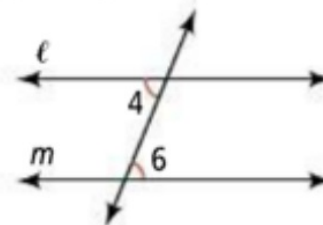
CONVERSE of the Alternate Interior Angles Theorem

Theorem

If two lines and a transversal form alternate interior angles that are congruent, then the two lines are parallel.

If ...

$$\angle 4 \cong \angle 6$$



Then ...

$$\underline{l \parallel m}$$



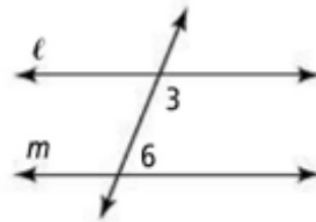
CONVERSE of the Same-Side Angles Postulate

Theorem

If two lines and a transversal form same-side interior angles that are supplementary, then the two lines are parallel.

If ...

$$m\angle 3 + m\angle 6 = 180$$



Then ...

$$\underline{\ell \parallel m}$$

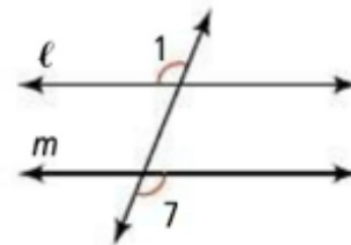
CONVERSE of the Alternate Exterior Angle Theorem

Theorem

If two lines and a transversal form alternate exterior angles that are congruent, then the two lines are parallel.

If ...

$$\angle 1 \cong \angle 7$$



Then ...

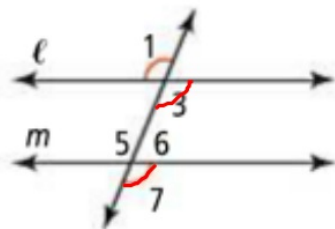
$$\underline{\ell \parallel m}$$

Proving Lines are Parallel

Example for you...

Proving Theorem 3-7 (Corresponding Angles are \cong).

1. Given: $\angle 1 \cong \angle 7$
 Prove: $l \parallel m$

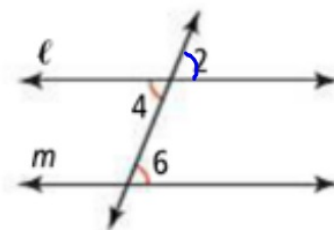


Statements	Reasons
a. $\angle 1 \cong \angle 7$	a. <u>GIVEN</u>
b. $\angle 3 \cong \angle 1$	b. <u>VERTICAL \angle'S</u>
c. $\angle 3 \cong \angle 7$	c. <u>Transitive Prop.</u>
d. $l \parallel m$	d. <u>Corresponding \angle's Converse.</u>

Your turn to try...

Proving Theorem 3-7 (Alt. Interior Angles are \cong).

1. Given: $\angle 4 \cong \angle 6$
 Prove: $l \parallel m$



Statements	Reasons
a. $\angle 4 \cong \angle 6$	a. <u>GIVEN</u>
b. $\angle 4 \cong \angle 2$	b. <u>VERTICAL \angle'S</u>
c. $\angle 6 \cong \angle 2$	c. <u>TRANSITIVE Prop.</u>
d. $l \parallel m$	d. <u>Corresponding \angle's CONVERSE</u>

Using Algebra to Prove Parallel Lines

Example for you...

Find the value of x that would prove the lines parallel.

1.

$$\begin{array}{r}
 9x - 2 = 6x + 34 \\
 -6x \quad -6x \\
 \hline
 3x - 2 = 34 \\
 +2 \quad +2 \\
 \hline
 3x = 36 \\
 \frac{3x}{3} = \frac{36}{3} \\
 \boxed{x = 12}
 \end{array}$$

2.

$$\begin{array}{r}
 5x = 3x + 20 \\
 -3x \quad -3x \\
 \hline
 2x = 20 \\
 \frac{2x}{2} = \frac{20}{2} \\
 \boxed{x = 10}
 \end{array}$$

Your turn to try...

Find the value of x that would prove the lines parallel.

1.

$$\begin{array}{r}
 3w - 2 = 55 \\
 +2 \quad +2 \\
 \hline
 3w = 57 \\
 \frac{3w}{3} = \frac{57}{3} \\
 \boxed{w = 19}
 \end{array}$$

2.

$$\begin{array}{r}
 20x + 13x + 15 = 180 \\
 33x + 15 = 180 \\
 -15 \quad -15 \\
 \hline
 33x = 165 \\
 \frac{33x}{33} = \frac{165}{33} \\
 \boxed{x = 5}
 \end{array}$$