Warm up

**Which of the following equations represents a line parallel to the graph of $y = \frac{1}{4}x + 2$?**

**A.** $y = \frac{1}{4}x - 5$

**B.** $y = -\frac{1}{4}x + 2$

**C.** $y = 4x + 3$

**D.** $y = -4x - 1$

Section 2.9 Proving lines are Parallel

**Then**

You used slopes to identify parallel and perpendicular lines.

**Now**

- Recognize angle pairs that occur with parallel lines.
- Prove that two lines are parallel.

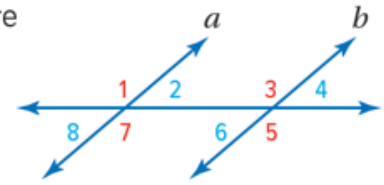
When you see a roller coaster track, the two sides of the track are always the same distance apart, even thought he track curves and turns.

Why are the two sides of the track constructed to be parallel at all points?

## Postulate 2.13 Converse of the Corresponding Angle Postulate

If two lines are cut by a transversal so that corresponding angles are congruent, then the lines are parallel.

**Example** If $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$, $\angle 5 \cong \angle 7$, $\angle 6 \cong \angle 8$, then $a \parallel b$.

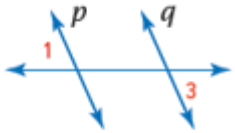



## Postulate 2.14 Parallel Postulate

If given a line and a point not on the line, then there exists exactly one line through the point that is parallel to the given line.

Theorems

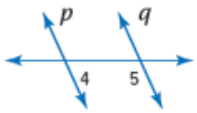
**2.5 Alternate Exterior Angles Converse**
If two lines in a plane are cut by a transversal so that a pair of alternate exterior angles is congruent, then the two lines are parallel.




If $\angle 1 \cong \angle 3$, then $p \parallel q$.

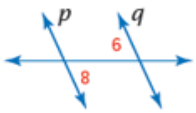
Same Side Interior Angle Converse

**2.6 Consecutive Interior Angles Converse** If two lines in a plane are cut by a transversal so that a pair of consecutive interior angles is supplementary, then the lines are parallel.

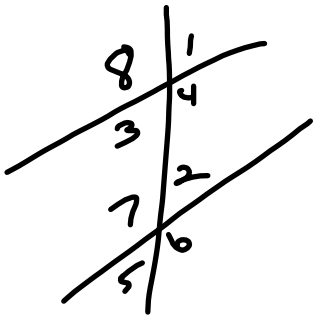



If $m\angle 4 + m\angle 5 = 180$, then $p \parallel q$.

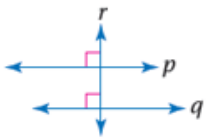
**2.7 Alternate Interior Angles Converse** If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the lines are parallel.




If $\angle 6 \cong \angle 8$, then $p \parallel q$.



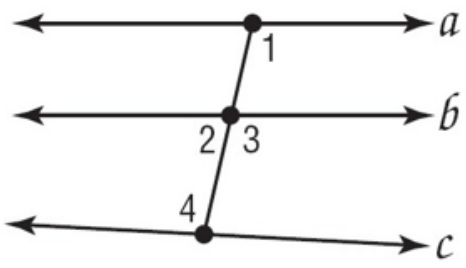

**2.8 Perpendicular Transversal Converse** In a plane, if two lines are perpendicular to the same line, then they are parallel.




If $p \perp r$ and $q \perp r$, then $p \parallel q$.

## Example 1 — Identify Parallel Lines

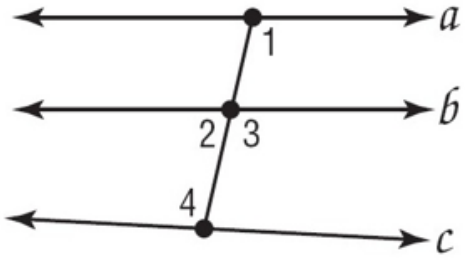
**A.** Given $\angle 1 \cong \angle 3$, is it possible to prove that any of the lines shown are parallel? If so, state the postulate or theorem that justifies your answer.




a ∥ b

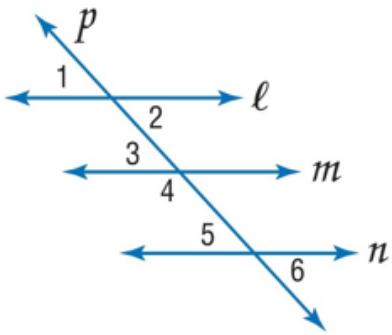
Corr ∠ Converse

**B.** Given $m\angle 1 = 103$ and $m\angle 4 = 100$, is it possible to prove that any of the lines shown are parallel? If so, state the postulate or theorem that justifies your answer.




NOT Parallel because ∠s ≠

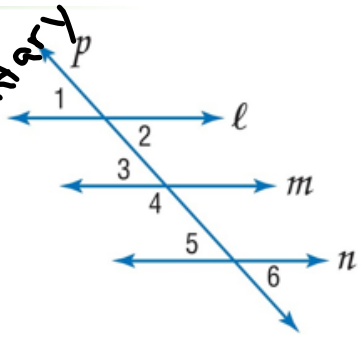
**A.** Given $\angle 1 \cong \angle 5$, is it possible to prove that any of the lines shown are parallel?




$\ell \parallel n$

Corr ∠ Converse

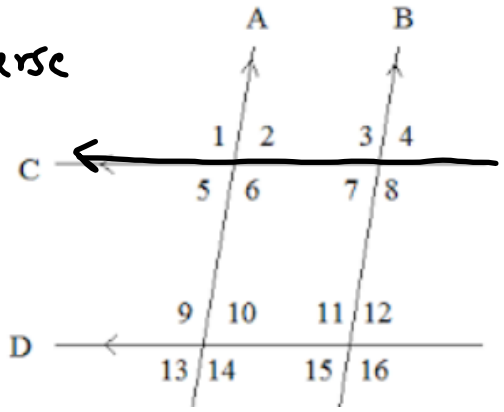
**B.** Given $m\angle 4 = 105$ and $m\angle 5 = 70$, is it possible to prove that any of the lines shown are parallel?




NOT Parallel because not supplementary

Use the diagram and the given information to determine if any lines are parallel.

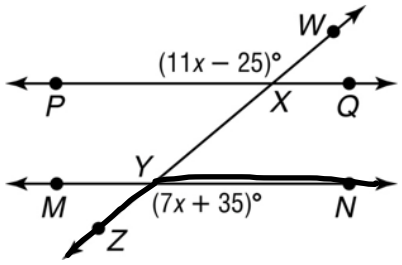
1. $\angle 2 \cong \angle 7$ a ∥ b AIA converse
2. $\angle 9 \cong \angle 11$ a ∥ b corr ∠ converse
3. $\angle 3 \cong \angle 16$ c ∥ d AEA converse
4. $\angle 10 + \angle 11 = 180$ a ∥ b SSI converse




≅ ≅ ≅

**Example 2** Use Angle Relationships

**Find $m\angle ZYN$ so that $\overleftrightarrow{PQ} \parallel \overleftrightarrow{MN}$. Identify the postulate or theorem you used.**




AEA Converse

$11x - 25 = 7x + 35$

$\frac{4x}{4} = \frac{60}{4}$

$x = 15$

$7(15) + 35$

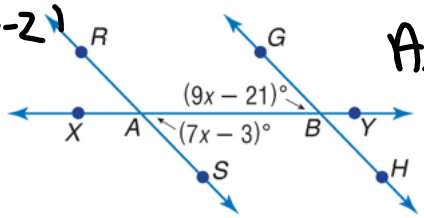
$105 + 35 = 140°$

**Find $x$ so that $\overleftrightarrow{GH} \parallel \overleftrightarrow{RS}$.**

$7x - 3 = 9x - 21$

$18 = 2x$

$x = 9$




AIA Converse

Page 190

#1-21