Geometry A
3.3: Proving Lines Parallel

Name: Key
Date: ______ Period: ______

LEARNING TARGETS

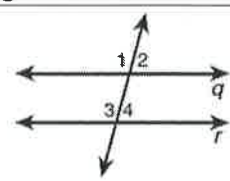
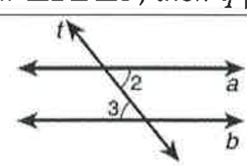
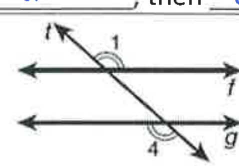
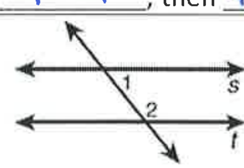
- I can prove lines are parallel.
  - I can use the corresponding angles converse
  - I can use the alternate interior angles converse.
  - I can use the alternate exterior angles converse.
  - I can use the consecutive interior angles converse.

You may have noticed that the postulates and theorems that we've studied so far have been written in the form "If *p*, then *q*." The **converse** of such a statement *switches the order of the parts of the statement* and has the form "If *q*, then *p*." The **converse** of a postulate or theorem may or may not be true, just as the **converse** of a mathematical statement may or may not be true.

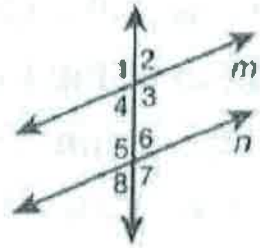
Mathematical Example:

Statement	Write the *converse* of the Statement	*Is the converse __always__ true?*
If $x \overset{p}{=} 2$, *then* $3x \overset{q}{=} 6$	If 3x=6, then x=2	Yes
If $x \underset{p}{=} 2$ and $y = 3$, *then* $x + y \underset{q}{=} 5$	If x+y=5, then x=2 and y=3	No, x could be 1 and y could be 4

The **converse** of the Corresponding Angles Postulate is accepted as **true**, and this makes it possible to prove that the **converses** of the Alternate Interior Angle Theorem, Alternate Exterior Angle Theorem, and Consecutive Interior Angle Theorem are also true.

Converse	In words…	Diagram
Corresponding Angles Converse	If two lines are cut by a transversal so that corresponding angles are __congruent__, then the lines are __parallel__.	 If $\angle 1 \cong \angle 3$, then $q \parallel r$
Alternate Interior Angles Converse	If two lines are cut by a transversal so that alternate interior angles are __congruent__, then the lines are __parallel__.	 If __∠2 ≅ ∠3__, then __a∥b__
Alternate Exterior Angles Converse	If two lines are cut by a transversal so that alternate exterior angles are __congruent__, then the lines are __parallel__.	 If __∠1 ≅ ∠4__, then __f∥g__
Consecutive Interior Angles Converse	If two lines are cut by a transversal so that consecutive interior angles are __supplementary__, then the lines are __parallel__.	 If __m∠1+m∠2=180__, then __s∥t__

For questions 1 – 4, use the given information to explain why $m \parallel n$.



1. $\angle 1 \cong \angle 7$ alternate exterior angles converse
2. $m\angle 4 + m\angle 5 = 180°$ consecutive interior angles converse
3. $\angle 5 \cong \angle 3$ alternate interior angles converse
4. $\angle 8 \cong \angle 4$ corresponding angles converse

5. If $m\angle 1 = 47°$ and $m\angle 5 = 49°$, are the lines parallel? Explain.

no, in order for the lines to be parallel, corresponding angles 1 and 5 must be congruent.

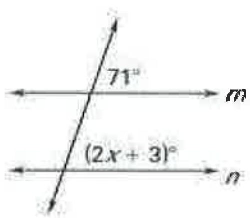
6. If $m\angle 3 = 119°$, what does the measure of $\angle 6$ need to be to prove $m \parallel n$?

$m\angle 6 + 119 = 180$

$m\angle 6 = 61°$ by the consecutive interior angles converse

Example 1: Find value of x that makes line parallel.

a) Find the value of x that makes $m \parallel n$. Explain your reasoning.

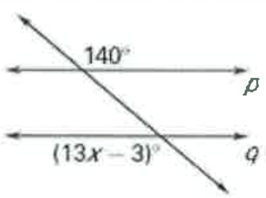


$71 = 2x + 3$

$68 = 2x$

$\boxed{x = 34}$ so $m \parallel n$ by corresponding angles converse

b) Find the value of x that makes $p \parallel q$. Explain your reasoning.

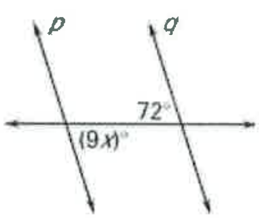


$140 = 13x - 3$

$143 = 13x$

$\boxed{x = 11}$ so $p \parallel q$ by alternate exterior angles converse

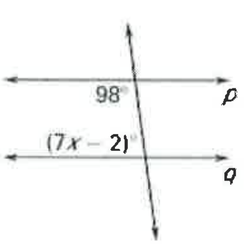
c) Find the value of x that makes $p \parallel q$. Explain your reasoning.



$72 = 9x$

$\boxed{x = 8}$ so $p \parallel q$ by alternate interior angles converse

d) Find the value of x that makes $p \parallel q$. Explain your reasoning.



$98 + 7x - 2 = 180$

$7x + 96 = 180$

$7x = 84$

$\boxed{x = 12}$ so $p \parallel q$ by consecutive interior angles converse