

H: follows if C: follows then

Converse: Exchanging the hypothesis and conclusion in a conditional statement (if...then).

example: If ^Hit is sunny out, then ^Cyou will see your shadow. True

converse: If you see your shadow, then it is sunny out. True

This example and its converse are both true, but not sentence and its converse will be true.

example: If ^Hit is snowing, then ^Cit is cold outside. True

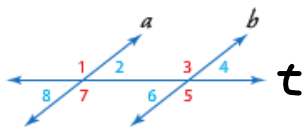
converse: If it is cold out, then it is snowing. False

Are the previous example and its converse both true? No

We will be using the concept of converse to help us to prove that lines are parallel if we are given certain angle-pair relationships. We will start with the Converse of the Corresponding Angles Postulate.

Corresponding Angles Postulate: If two parallel lines are cut by a transversal, then the pairs of corresponding angles are congruent.

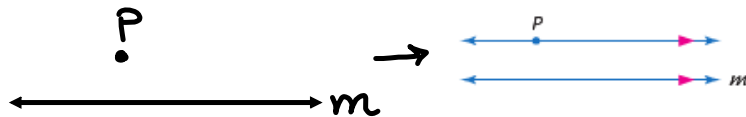
Converse of the Corresponding Angles Postulate: If two lines are cut by a transversal so that the pairs of corresponding angles are congruent, then the lines are parallel.



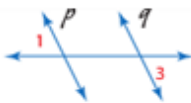
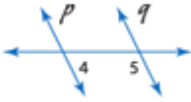
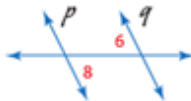
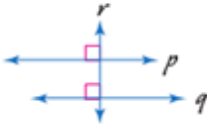
given angle pairs
 If $\angle 1 \cong \angle 3$, $\angle 2 \cong \angle 4$, $\angle 5 \cong \angle 7$, and $\angle 6 \cong \angle 8$, then $a \parallel b$
 4 pairs of congruent, corresponding angles.

The 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.

There is exactly one line thru P that is parallel to m.



Parallel lines that are cut by a transversal create several pairs of congruent or supplementary angles. These special angle pairs can also be used to prove that a pair of lines is parallel.

<p>Alternate Exterior Angles Converse</p> <p>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.</p> <p>(Same-side)</p>	 <p>If $\angle 1 \cong \angle 3$, then $p \parallel q$.</p>
<p>Consecutive Interior Angles Converse</p> <p>If two lines in a plane are cut by a transversal so that a pair of consecutive interior angles is supplementary, then the two lines are parallel.</p>	 <p>If $m\angle 4 + m\angle 5 = 180$, then $p \parallel q$.</p>
<p>Alternate Interior Angles Converse</p> <p>If two lines in a plane are cut by a transversal so that a pair of alternate interior angles is congruent, then the two lines are parallel.</p>	 <p>If $\angle 6 \cong \angle 8$, then $p \parallel q$.</p>
<p>Perpendicular Transversal Converse</p> <p>In a plane, if two lines are perpendicular to the same line, then they are parallel.</p>	 <p>If $p \perp r$ and $q \perp r$, then $p \parallel q$.</p>

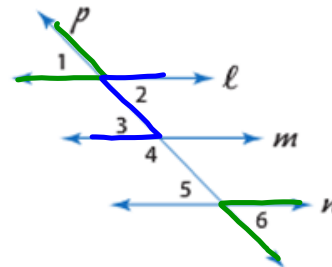
Given the following information, determine which lines, if any, are parallel. State the postulate or theorem that justifies your answer.

- a. $\angle 1 \cong \angle 6 \rightarrow$ alt. ext. angles

$\ell \parallel n$ by the
alt. ext. \angle converse

- b. $\angle 2 \cong \angle 3 \rightarrow$ alt. int. angles

$\ell \parallel m$ by the
alt. int. \angle converse



c. Find the value of x so that $a \parallel b$. Show your work.

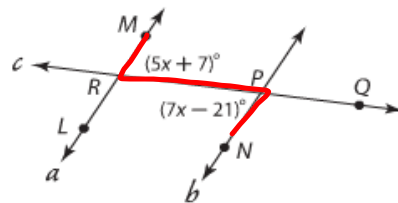
$$\begin{array}{l} m\angle MRP = 5x + 7 \\ m\angle RPN = 7x - 21 \end{array} \left. \begin{array}{l} \\ \end{array} \right\} \begin{array}{l} \text{alt. int.} \\ \text{angles} \end{array}$$

By the alt. int. \angle converse,
 $\angle MRP \cong \angle RPN$ in order
 for $a \parallel b$.

How? set $m\angle MRP = m\angle RPN$.

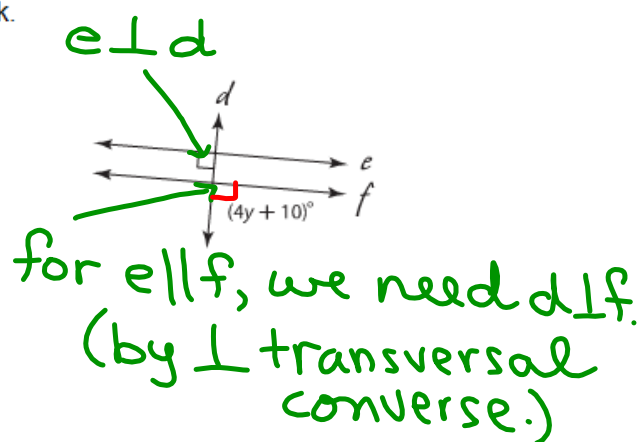
$$\begin{array}{r} 5x + 7 = 7x - 21 \\ -5x \quad -5x \\ \hline 7 = 2x - 21 \\ +21 \quad +21 \\ \hline 28 = 2x \\ \frac{28}{2} = \frac{2x}{2} \end{array}$$

$$\rightarrow x = 14$$

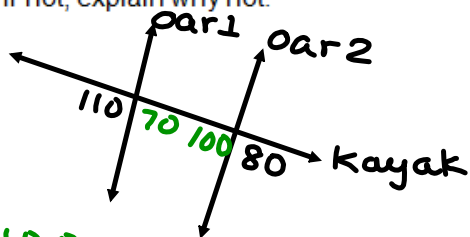


- d. Find the value of y so that $e \parallel f$. Show your work.

$$\begin{array}{r} 4y + 10 = 90 \\ -10 \quad | -10 \\ \hline 4y = 80 \\ \frac{4}{4} \quad \frac{80}{4} \\ y = 20 \end{array}$$



- e. In order to move in a straight line with maximum efficiency, rower's oars should be parallel. Refer to the photo below. Is it possible to prove that any of the oars are parallel? If so, explain how. If not, explain why not.



$$\begin{array}{l} 110 \neq 100 \\ 70 \neq 80 \end{array} \left. \vphantom{\begin{array}{l} 110 \neq 100 \\ 70 \neq 80 \end{array}} \right\} \text{corresponding} \\ \text{angles not } \cong$$



→ lines (oars)
not parallel
by converse of
the corresponding
angles post.

