

3-2 Angles and Parallel Lines

Main Themes:

- Use the properties of parallel lines to determine congruent angles.
- Use algebra to find angle measures.

What we already know:

- Special angle pairs from section 3-1
- How to solve equations involving one variable

Review: Section 3-1 Terms

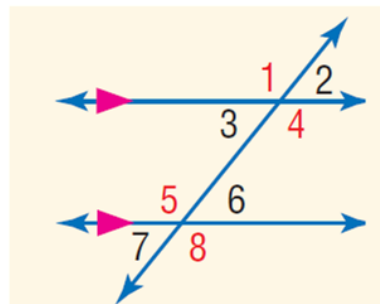
On the worksheet "Practice- Parallel Lines and Transversals," answer #1-10.

When two parallel lines are intersected by a transversal, there are special angle measure relationships created.

Corresponding angle postulate: If two parallel lines are cut by a transversal, then each pair of corresponding angles is congruent.

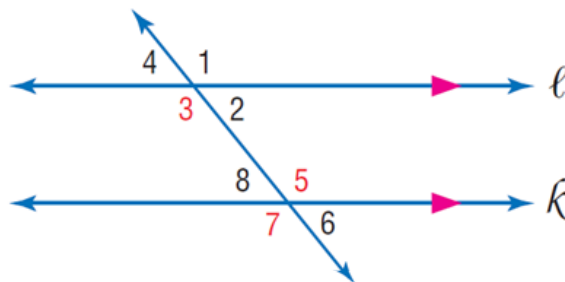
4 pairs of corresponding angles are formed:

$$\begin{aligned} \angle 1 &\cong \angle 5, \angle 2 \cong \angle 6, \\ \angle 3 &\cong \angle 7, \angle 4 \cong \angle 8 \end{aligned}$$



Given: $m\angle 3 = 133$

Prove: $m\angle 5 = 133$



$\angle 3 \cong \angle 7$ Corresponding Angles Postulate

$\angle 7 \cong \angle 5$ Vertical Angles Theorem

$\angle 3 \cong \angle 5$ Transitive Property

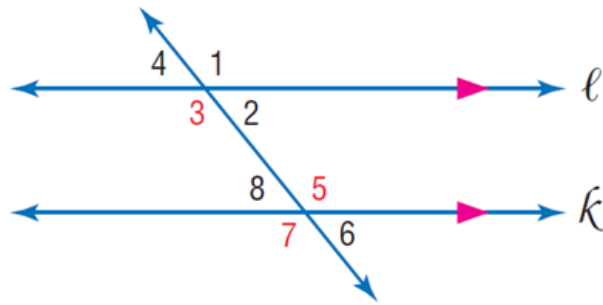
$m\angle 3 = m\angle 5$ Definition of congruent angles

$133 = m\angle 5$ Substitution

Your turn:

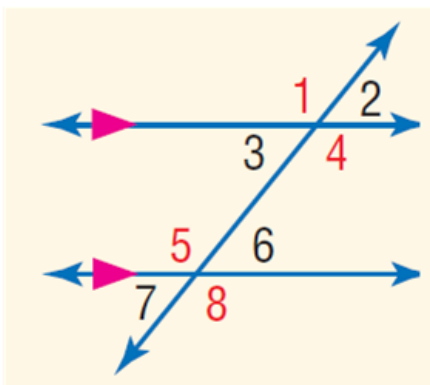
Given: $m\angle 8 = 47$

Prove: $m\angle 4 = 47$



Once we know the corresponding angles postulate, there are 3 theorems that follow from angle relationships that we already know:

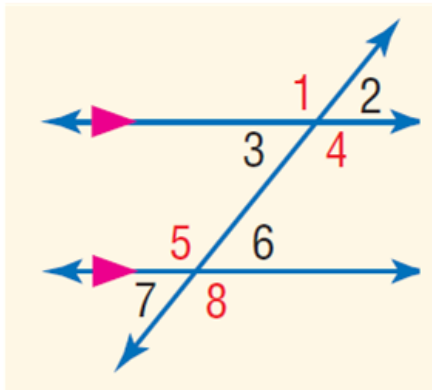
Alternate Interior Angles Theorem: If two parallel lines are cut by a transversal, then each pair of alternate interior angles is congruent.



$$\angle 4 \cong \angle 5$$

$$\angle 3 \cong \angle 6$$

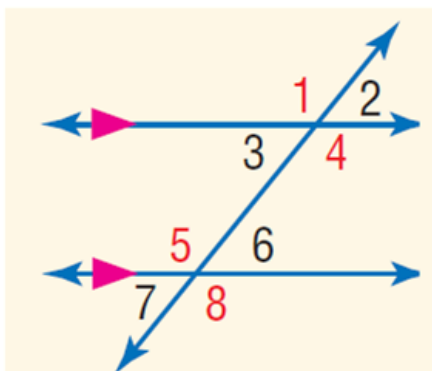
Consecutive Interior Angles Theorem: If two parallel lines are cut by a transversal, then each pair of consecutive interior angles is **supplementary**. *****IMPORTANT: This is the only one that is NOT CONGRUENT!!!*****



$\angle 4$ and $\angle 6$ are supplementary.

$\angle 3$ and $\angle 5$ are supplementary.

Alternate Exterior Angles Theorem: If two parallel lines are cut by a transversal, then each pair of alternate exterior angles is congruent.



$\angle 1 \cong \angle 8$

$\angle 2 \cong \angle 7$

Apply these rules:

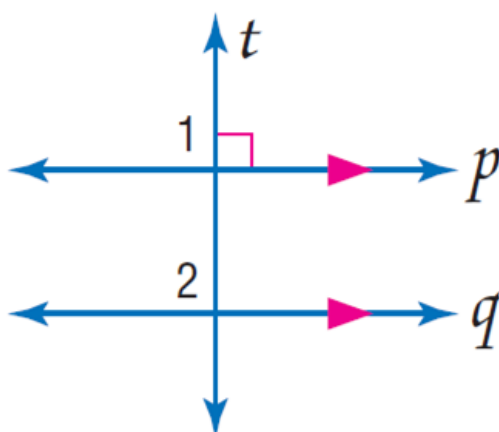
On the worksheet "Practice - Parallel Lines and Transversals," for # 11-20, write the theorem used to find the missing measure, and find the missing angle measure.

Example: # 11

Answer: Corresponding angles postulate; 55°

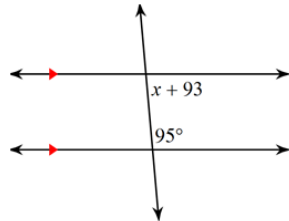
Another nice rule:

Perpendicular Transversal Theorem: In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular to the other.



Since I see that t is perpendicular to p AND q is parallel to p , it is safe to say that t is perpendicular to q , also!

Sometimes, well...often, we are asked to find the value of a variable in the same situation...for example, in #31 on the worksheet "Practice-Parallel Lines and Transversals."



I see that these angles are **consecutive interior angles**, so that means that they are supplementary.

So... $x + 93 + 95 = 180$ by the consecutive interior angles theorem.

Solving the equation:

$$x + 188 = 180$$

$$x = -8$$

Are you surprised to see a negative answer? I hope so!

Is it okay? Yes, it is! But, only because it is a value for a variable, **NOT** an angle measure. Check to make sure the angle measure is still positive: $x + 93 = -8 + 93 = 85$. Still positive, okay!

Your turn:

On the worksheet, "Practice - Parallel Lines and Transversals," #31 - 40, write the angle relationship postulate or theorem that applies, then set up the equation and solve for x .