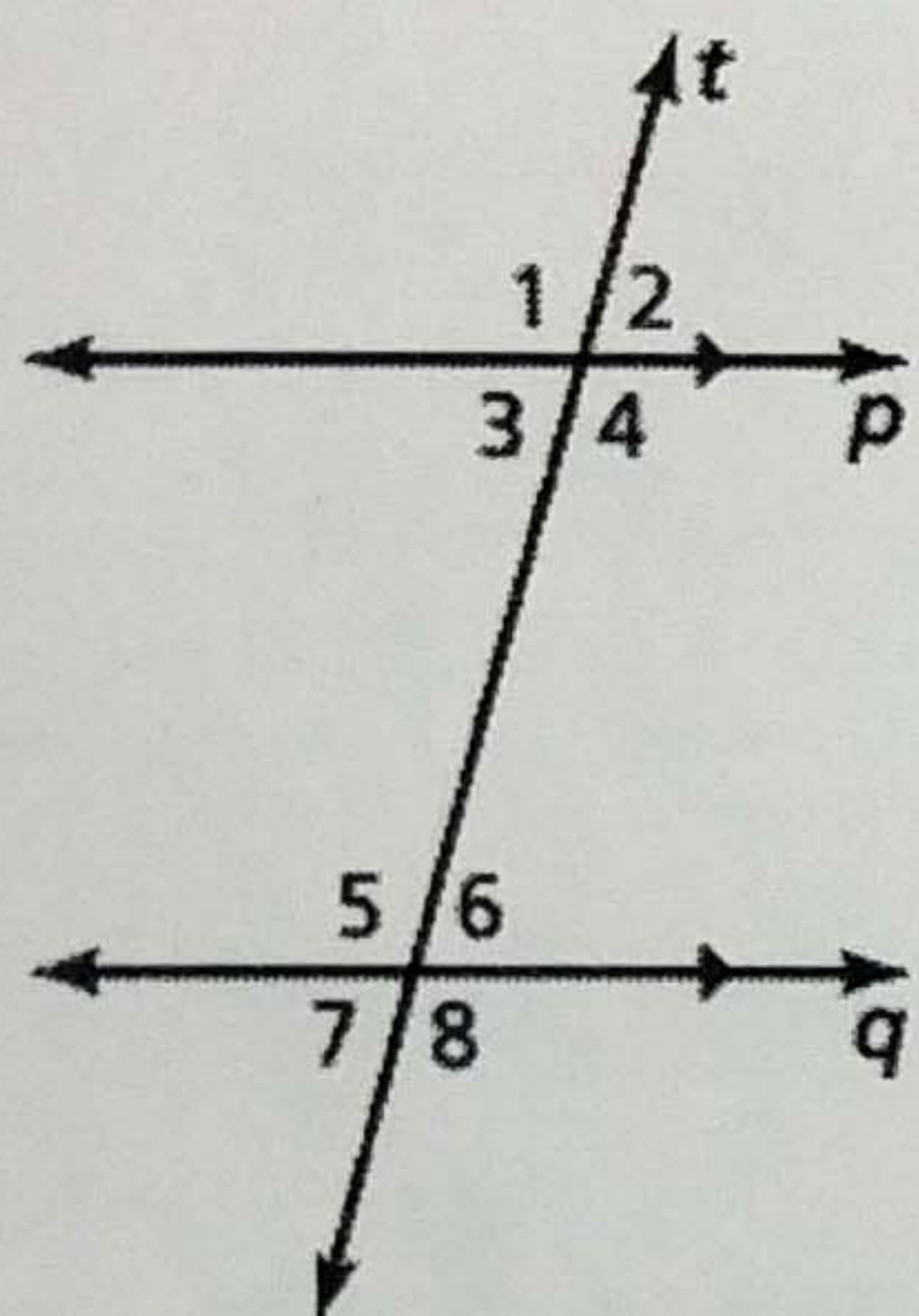


# Properties of Parallel Lines

## Lesson Objective

FIND ANGLE MEASURES USING RELATIONSHIPS OF // LINES & TRANSVERSALS.

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



PROOF: THIS IS A POSTULATE, SO WE DON'T NEED TO PROVE IT!

$$\angle 1 \cong \angle 5$$

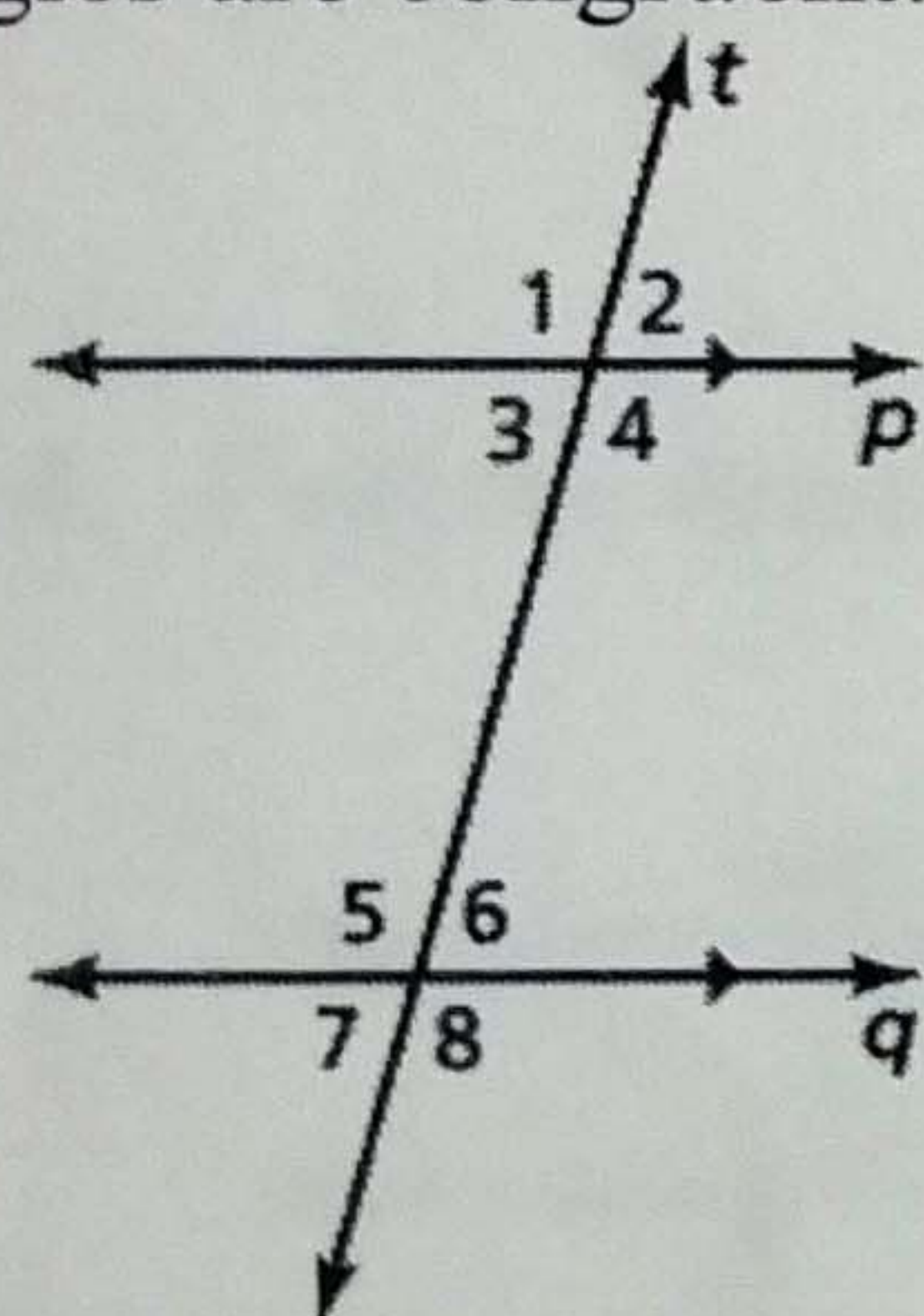
$$\angle 2 \cong \angle 6$$

$$\angle 3 \cong \angle 7$$

$$\angle 4 \cong \angle 8$$

IF LINES ARE PARALLEL,  
THEN CORRESPONDING ANGLES CONGRUENT  
(IF //  $\rightarrow$  CORR.  $\angle \cong$ )

**Alternate Interior Angles Theorem:** If two lines are cut by a transversal, then the pairs of alternate interior angles are congruent.



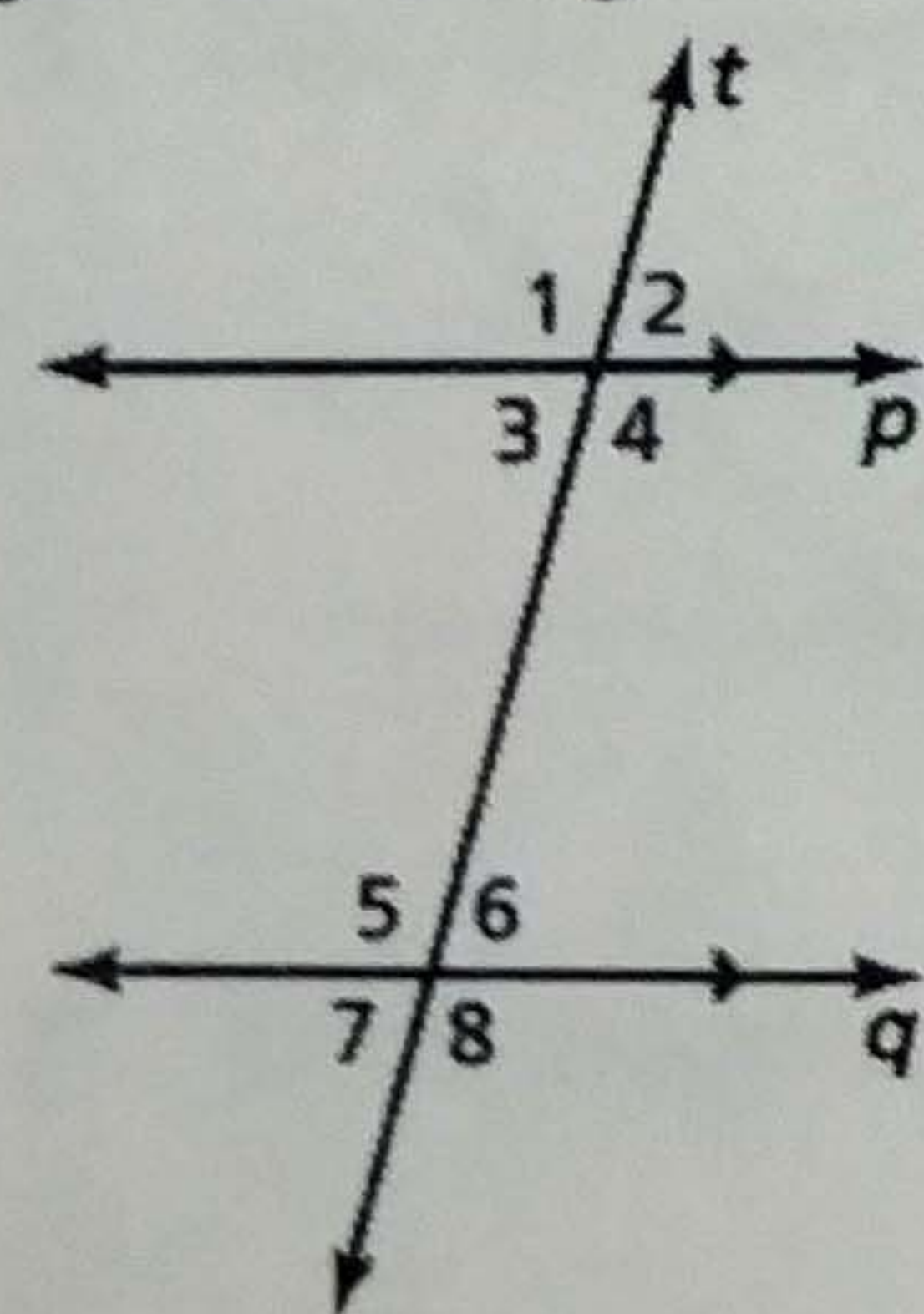
PROOF: p. 134 EXAMPLE #4

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

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

IF LINES PARALLEL,  
THEN ALTERNATE INTERIOR ANGLES CONGRUENT  
(IF //  $\rightarrow$  ALT. INT.  $\angle \cong$ )

**Alternate Exterior Angles Theorem:** If two lines are cut by a transversal, then the pairs of alternate exterior angles are congruent.



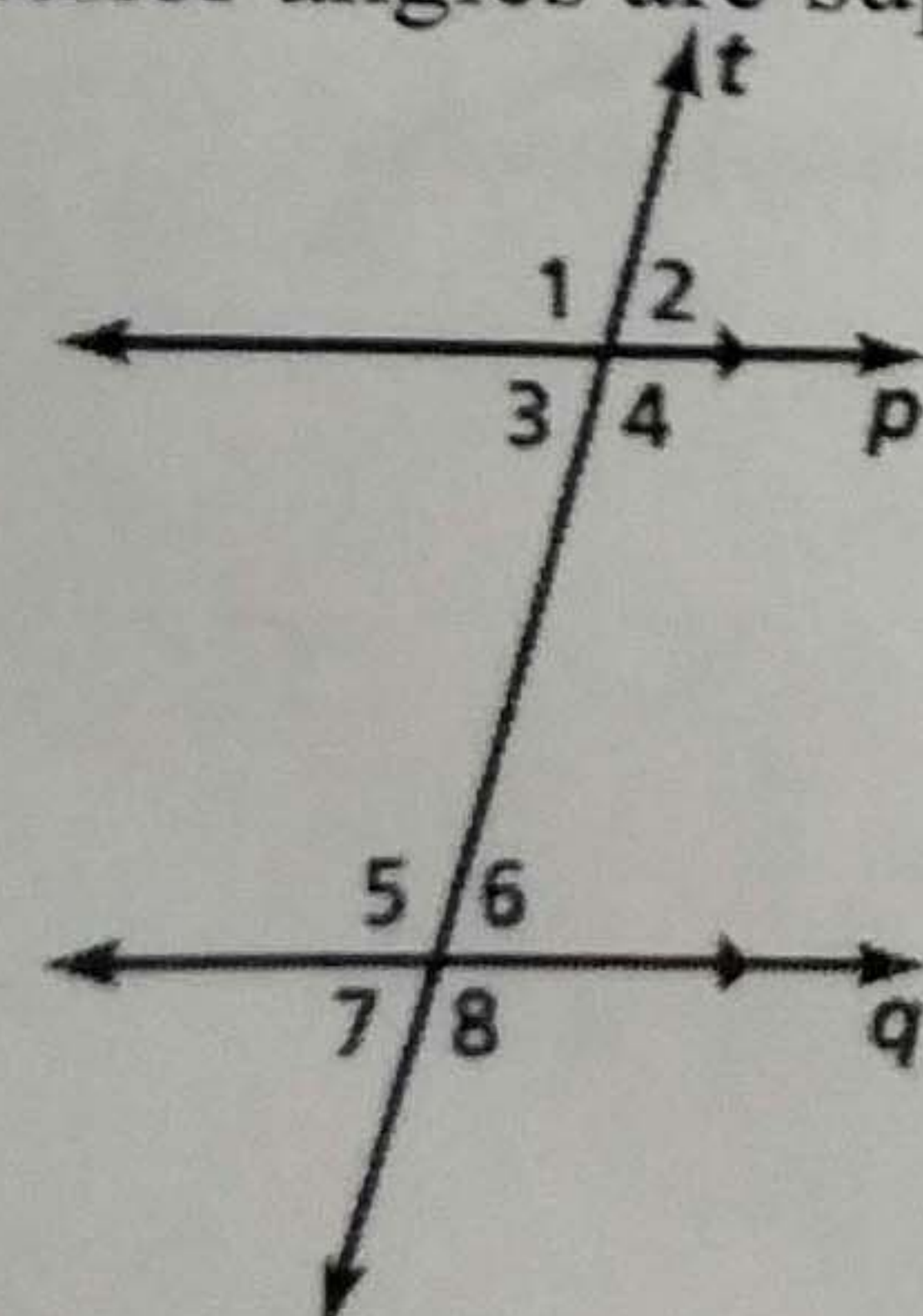
PROOF: YOU WILL PROVE THIS FOR HW LATER !!

$$\angle 1 \cong \angle 8$$

$$\angle 2 \cong \angle 7$$

IF LINES PARALLEL,  
THEN ALTERNATE EXTERIOR ANGLES CONGRUENT  
(IF //  $\rightarrow$  ALT. EXT.  $\angle \cong$ )

**Consecutive Interior Angles Theorem:** If two lines are cut by a transversal, then the pairs of consecutive interior angles are supplementary.



PROOF: YOU WILL PROVE THIS FOR HW LATER !!

$\angle 4$  &  $\angle 6$  ARE  
SUPPLEMENTARY

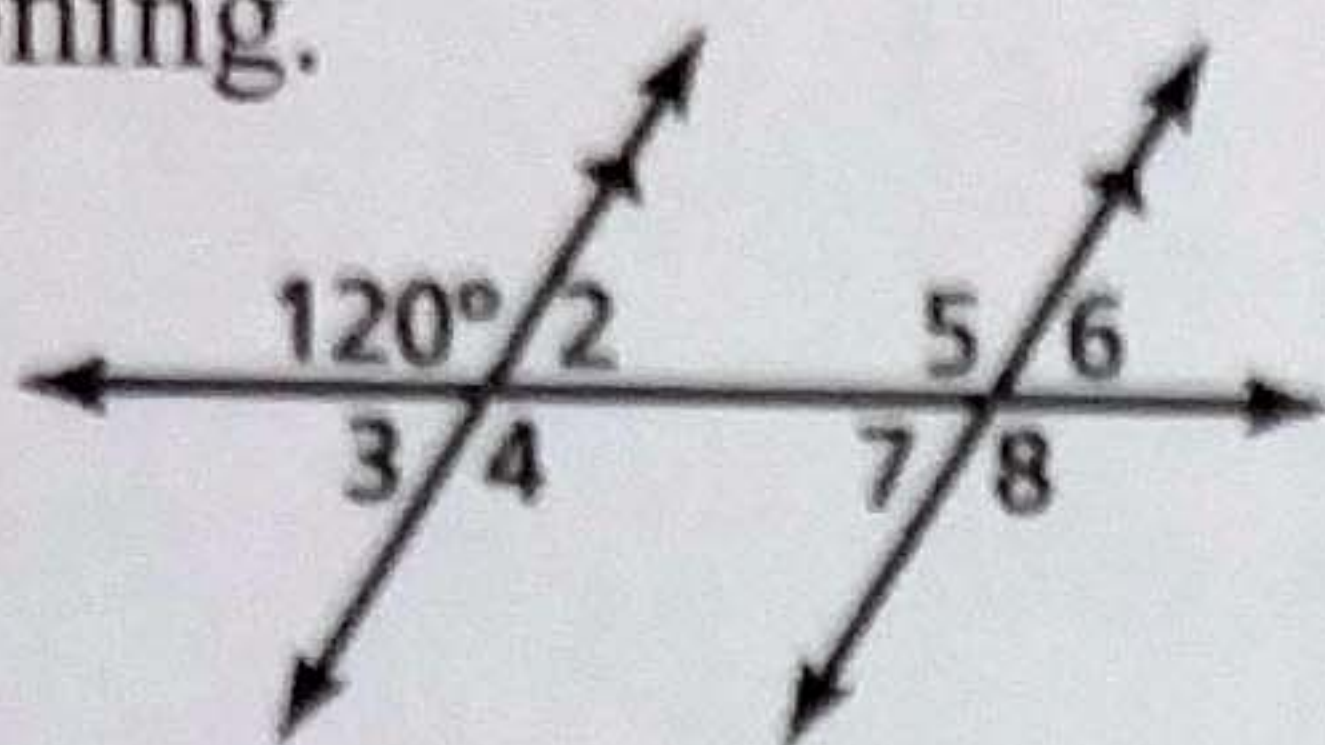
$\angle 3$  &  $\angle 5$  ARE  
SUPPLEMENTARY

IF LINES PARALLEL,  
THEN SAME-SIDE INTERIOR ANGLES SUPPLEMENTARY  
(IF //  $\rightarrow$  SS-INT.  $\angle$  SUPP.)



examples:

1. The measures of three of the numbered angles are  $120^\circ$ . Identify the angles. Briefly explain your reasoning.

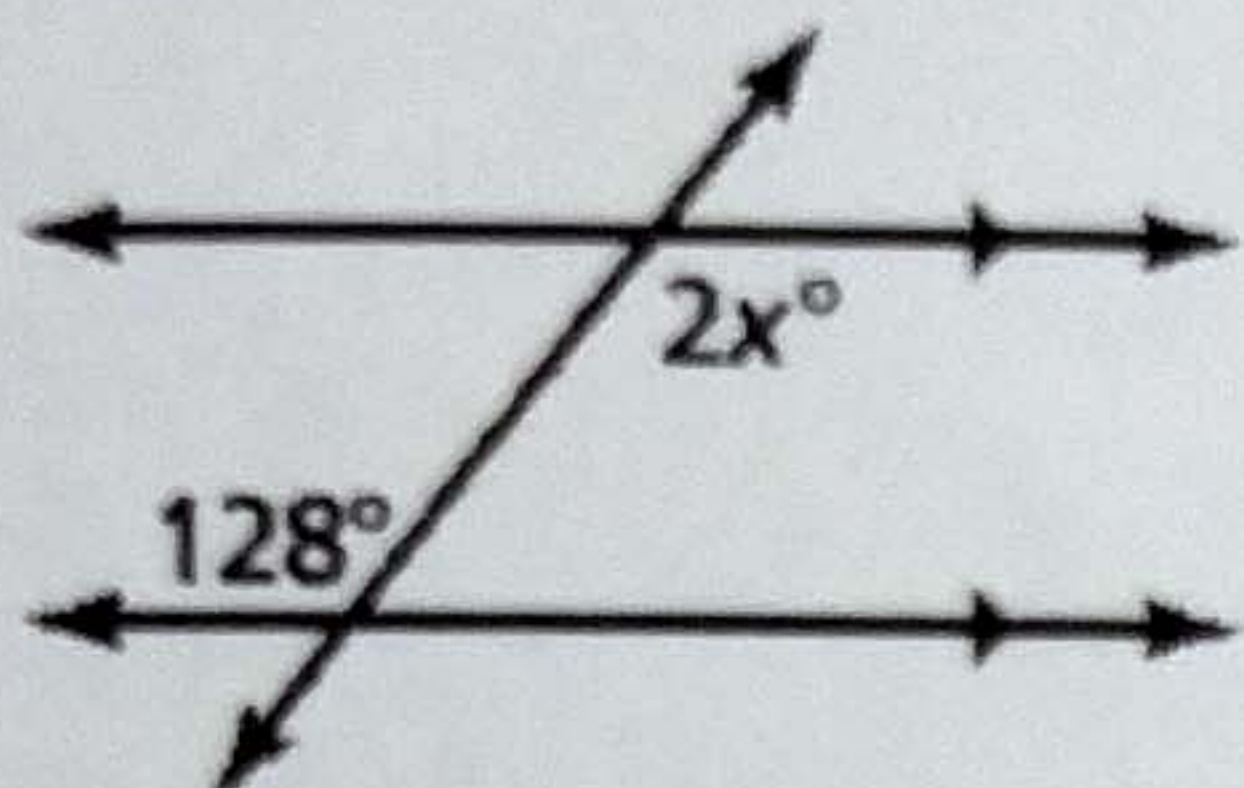


$\angle 5$ : CORRESPONDING  $\angle$  TO GIVEN

$\angle 4$ : VERTICAL  $\angle$  TO GIVEN

$\angle 8$ : ALTERNATE EXTERIOR TO GIVEN

2. Find the value of  $x$ . State the Postulate or Theorem you used to make your first equation.

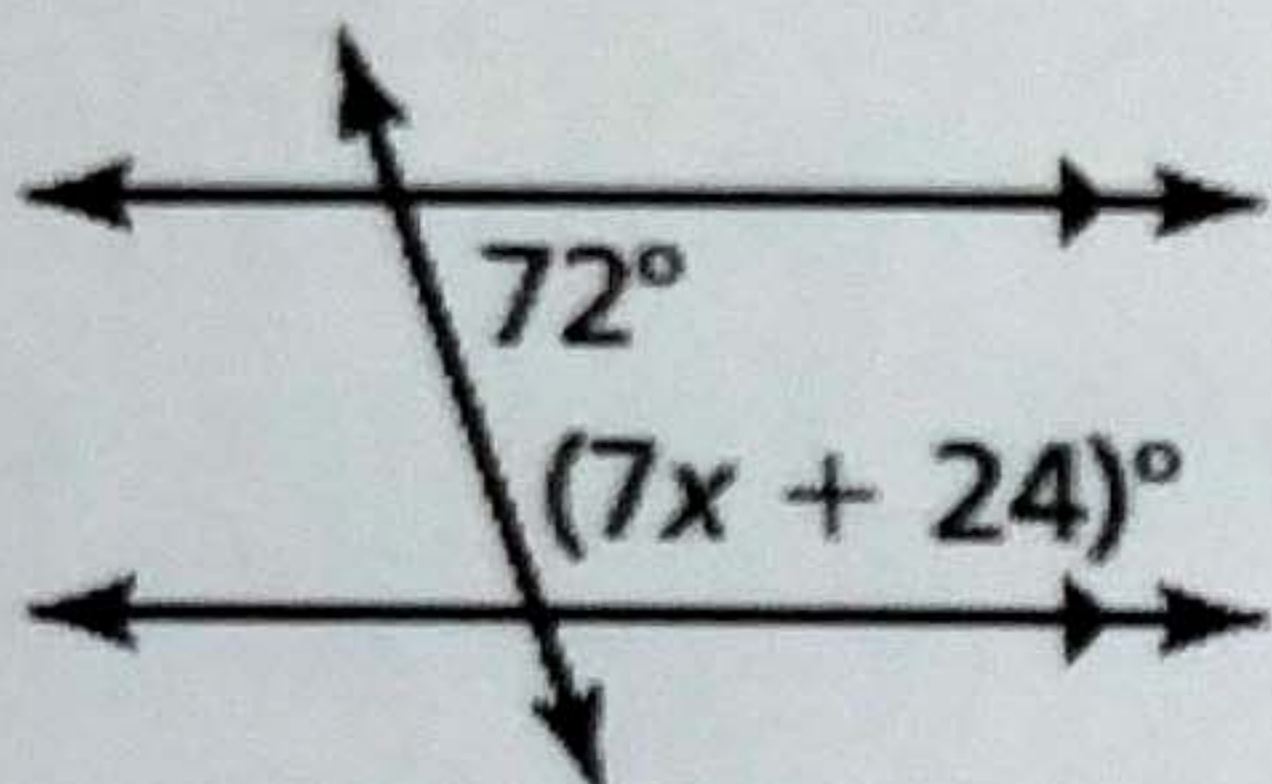


$$128 = 2x$$

$$64 = x$$

IF  $\parallel \rightarrow$  ALT. INT.  $\angle$ s  $\cong$

3. Find the value of  $x$ . State the Postulate or Theorem you used to make your first equation.



$$72 + 7x + 24 = 180$$

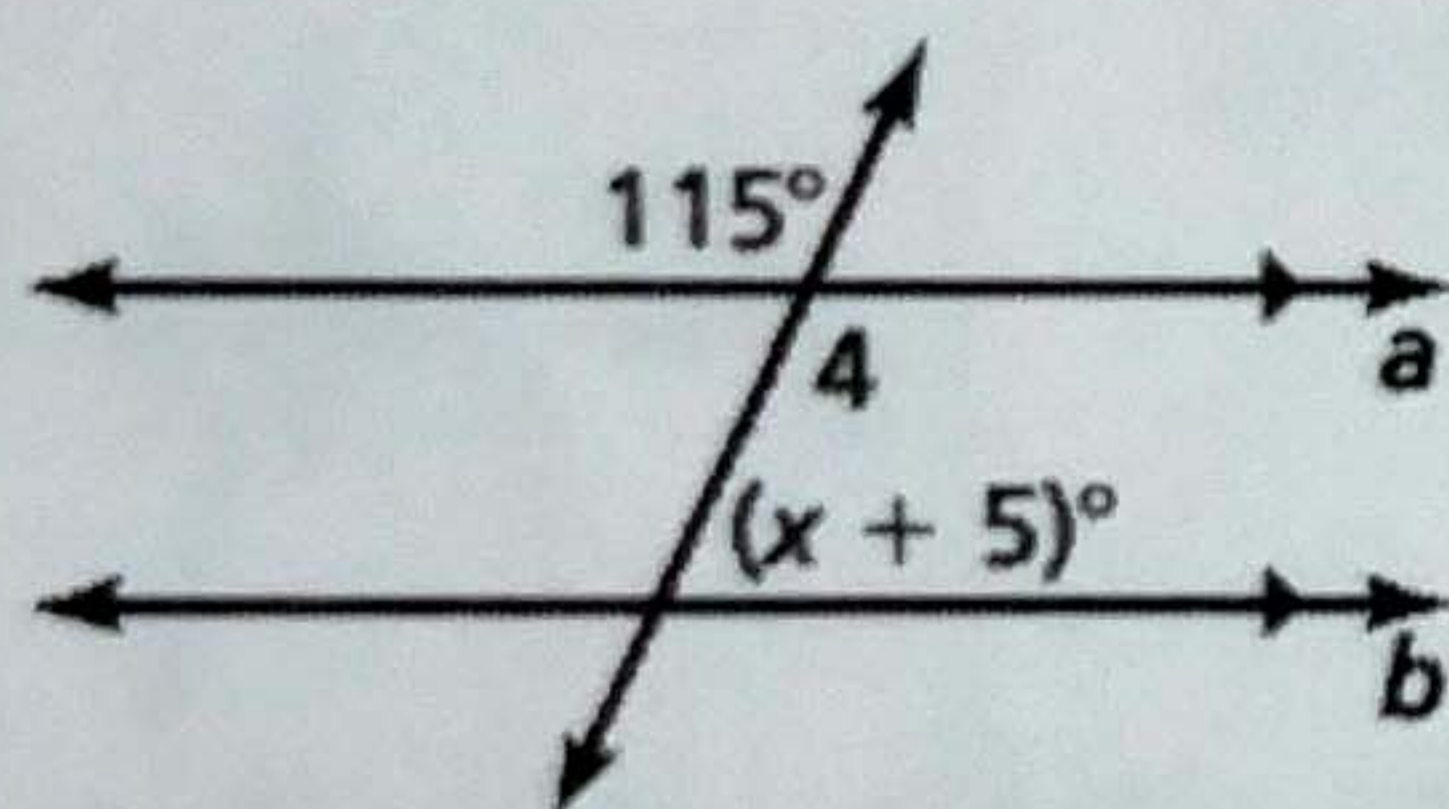
$$7x + 96 = 180$$

$$7x = 84$$

$$x = 12$$

IF  $\parallel \rightarrow$  SS-INT  $\angle$ s SUPP.

4. Find the value of  $x$ .



$\angle 4 = 115^\circ$  VERTICAL  $\angle$ s  $\cong$

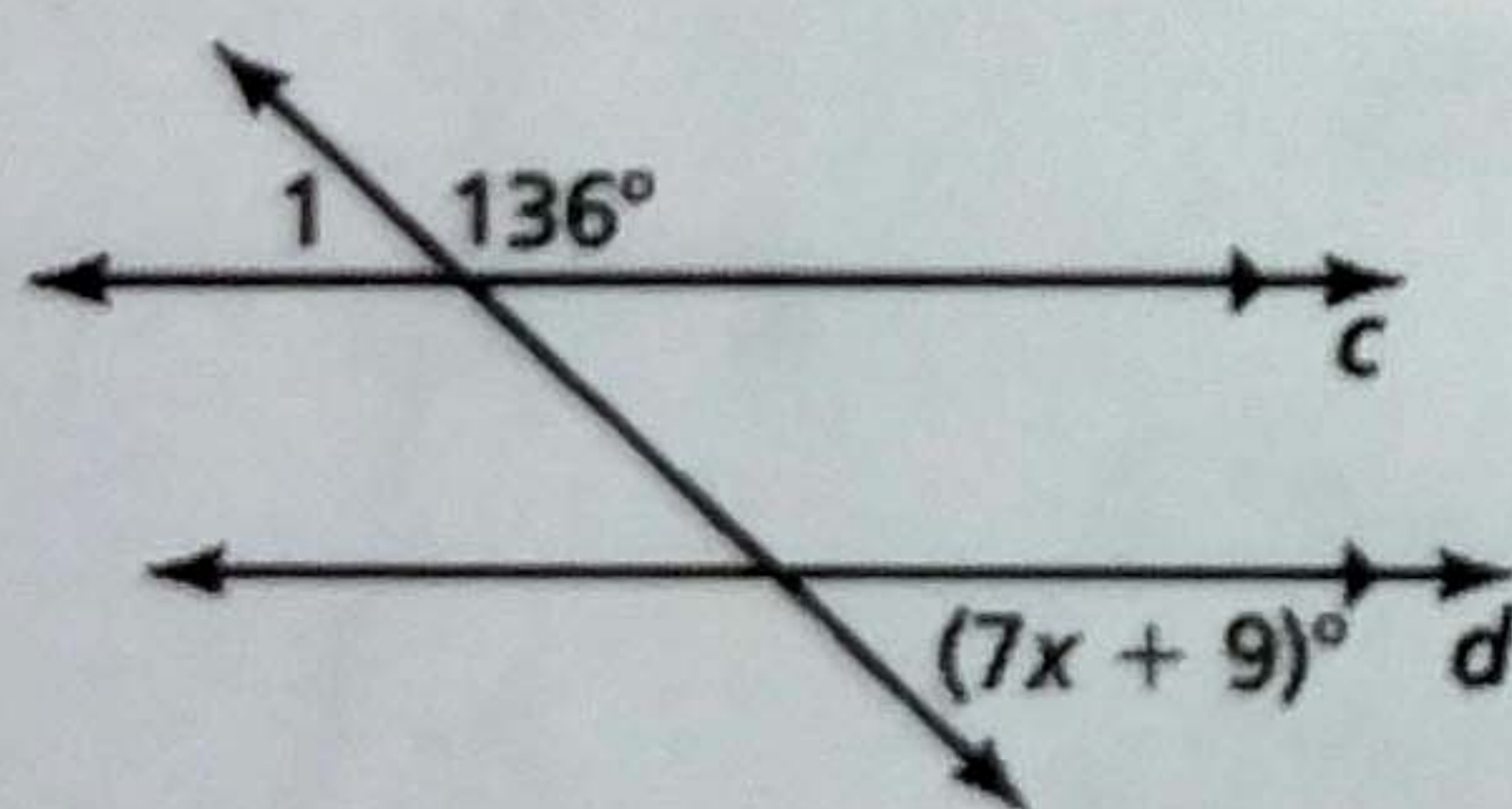
$$115 + x + 5 = 180$$

$$x + 120 = 180$$

$$x = 60$$

IF  $\parallel \rightarrow$  SS-INT  $\angle$ s SUPP.

5. Find the value of  $x$ .



$\angle 1 = 44^\circ$  LINEAR PAIRS SUPP.

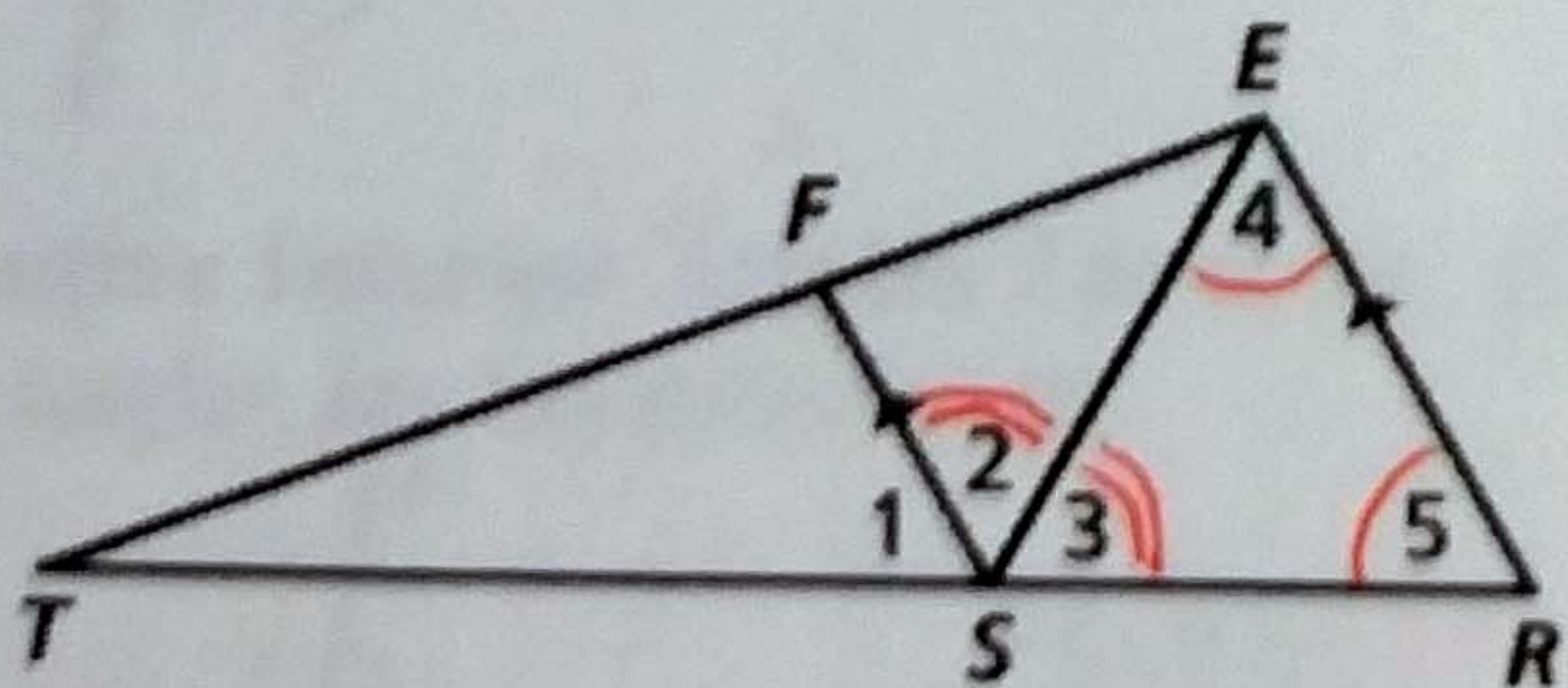
$$7x + 9 = 44$$

$$7x = 35$$

$$x = 5$$

IF  $\parallel \rightarrow$  ALT. EXT.  $\angle$ s  $\cong$

6. In the diagram,  $\angle 4 \cong \angle 5$  and  $\overline{SE}$  bisects  $\angle RSF$ . Find  $m\angle 1$ .



$\angle 2 \cong \angle 4$  IF  $\parallel \rightarrow$  ALT. INT.  $\angle$ s  $\cong$

SO  $\angle 2, \angle 3, \angle 4, \angle 5$  ALL  $\cong$

$$\angle 3 + \angle 4 + \angle 5 = 180$$

$$3x = 180 \leftarrow \text{THEY ARE ALL } \cong$$

$$x = 60^\circ$$

$$\text{SO } \angle 2 = 60^\circ, \angle 3 = 60^\circ$$

$$m\angle 1 + m\angle 2 + m\angle 3 = 180$$

$$m\angle 1 + 60 + 60 = 180$$

$$m\angle 1 = 60^\circ$$