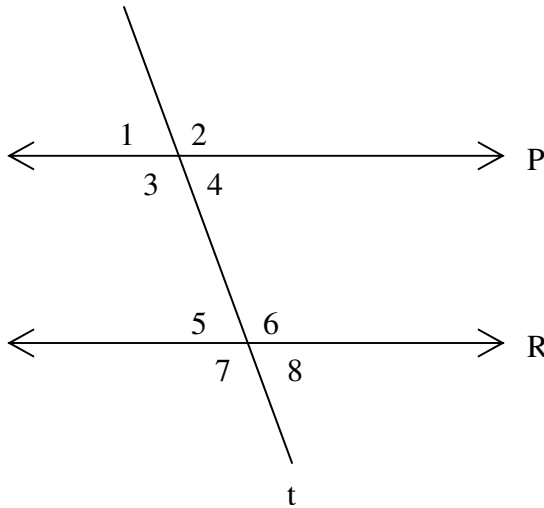


Parallel Lines and Transversal

When two lines are cut by a transversal, there are (8) angles formed. There are relationships formed by these angles and transversal as stated below.



$(//)$ means the lines are parallel

$P // R$

(t) is the transversal

Vertical Angles → Vertical angles are across from each other where two lines intersect. Vertical angles are equal to each other →

$$\angle 1 = \angle 4$$

$$\angle 3 = \angle 2$$

$$\angle 5 = \angle 8$$

$$\angle 6 = \angle 7$$

Linear Pairs → Linear pairs are two adjacent angles that sum to 180°

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

$$\angle 2 + \angle 4 = 180$$

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

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

$$\angle 5 + \angle 6 = 180$$

$$\angle 6 + \angle 8 = 180$$

$$\angle 8 + \angle 7 = 180$$

$$\angle 7 + \angle 5 = 180$$

Interior Angles → Angles that are between the two lines → $\angle 3, \angle 4, \angle 5, \angle 6$

Exterior Angles → Angles that are on the outside of the two lines → $\angle 1, \angle 2, \angle 7, \angle 8$

Alternate Interior Angles → Interior angles that are opposite sides of the line and transversal. These angles are equal.

$$\angle 3 = \angle 6$$

$$\angle 4 = \angle 5$$

Alternate Exterior Angles → Exterior angles that are on opposite sides of the line and transversal. These angles are equal.

$$\angle 1 = \angle 8$$

$$\angle 2 = \angle 7$$

Corresponding Angles → Angles that are on the same side of the line and transversal. These angles are equal.

$$\angle 1 = \angle 5$$

$$\angle 3 = \angle 7$$

$$\angle 2 = \angle 6$$

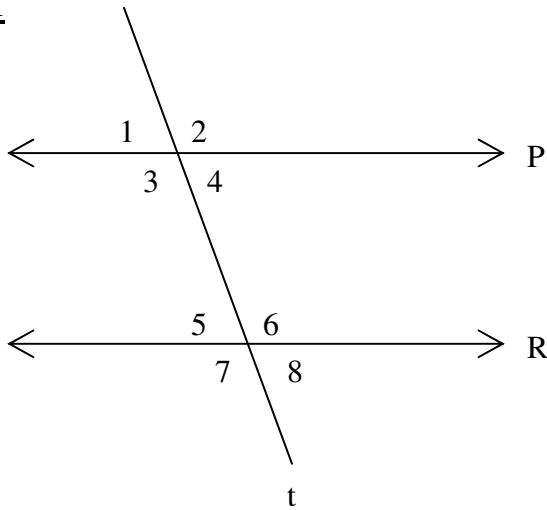
$$\angle 4 = \angle 8$$

Consecutive Interior Angles → Interior angles that are on opposite sides of the line and same side of transversal. These angles are supplementary.

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

$$\angle 4 + \angle 6 = 180$$

Example 1



P // R
(t) is the transversal

Given the measure of one angle, find the value of the other (7) angles.

$\angle 1 = 56^\circ$ $\angle 2 = ?$ $\angle 3 = ?$ $\angle 4 = ?$

$\angle 5 = ?$ $\angle 6 = ?$ $\angle 7 = ?$ $\angle 8 = ?$

$\angle 1 = \angle 4$ Vertical Angles $\angle 4 = 56^\circ$

$\angle 1 = \angle 5$ Corresponding Angles $\angle 5 = 56^\circ$

$\angle 1 = \angle 8$ Alternate Exterior Angles $\angle 8 = 56^\circ$

$\angle 1 + \angle 3 = 180^\circ$ Linear Pair
 $56^\circ + \angle 3 = 180^\circ$
 $\angle 3 = 124^\circ$

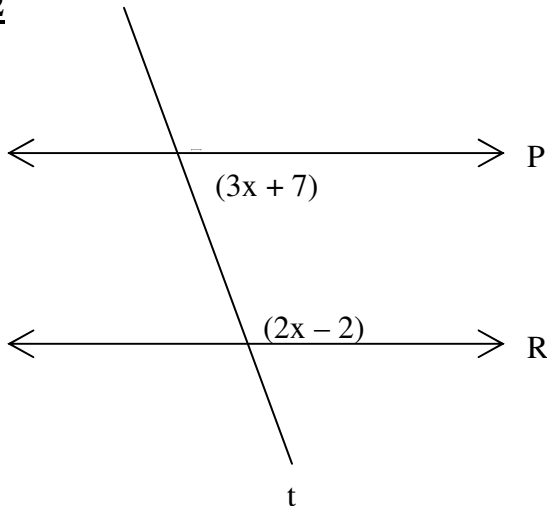
$\angle 3 = \angle 2$ Vertical Angles $\angle 2 = 124^\circ$

$\angle 3 = \angle 6$ Alternate Interior Angle $\angle 6 = 124^\circ$

$\angle 3 = \angle 7$ Corresponding Angles $\angle 7 = 124^\circ$

Always justify your answer by using one of the relationships. This will give validity to the answer.

Example 2



$P \parallel R$
Find the value of (x) .

These two angles are consecutive interior angles, so they are supplementary.

$$(3x + 7) + (2x - 2) = 180$$

$$5x + 5 = 180$$

$$5x + 5 - 5 = 180 - 5$$

$$5x = 175$$

$$x = 35$$

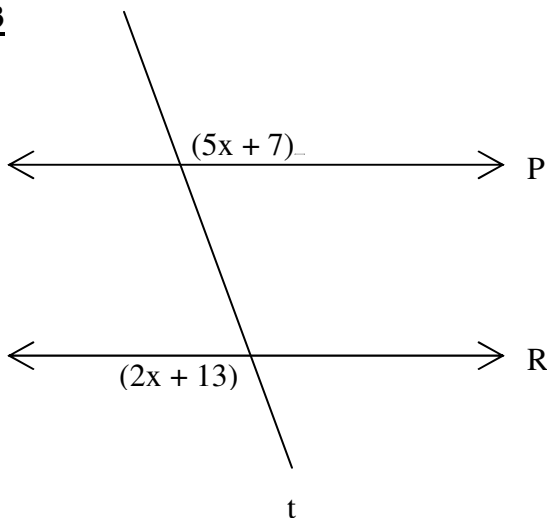
Definition of supplementary angles

Combine like terms

Subtract (5) from both sides.

Divide both sides by (5).

Example 3



$P \parallel R$
Find the value of (x) .

These two angles are alternate exterior angles so they are equal.

$$5x + 7 = 2x + 13$$

$$5x + 7 - 7 = 2x + 13 - 7$$

$$5x = 2x + 6$$

$$5x - 2x = 2x + 6 - 2x$$

$$3x = 6$$

$$x = 2$$

Definition of equal elements

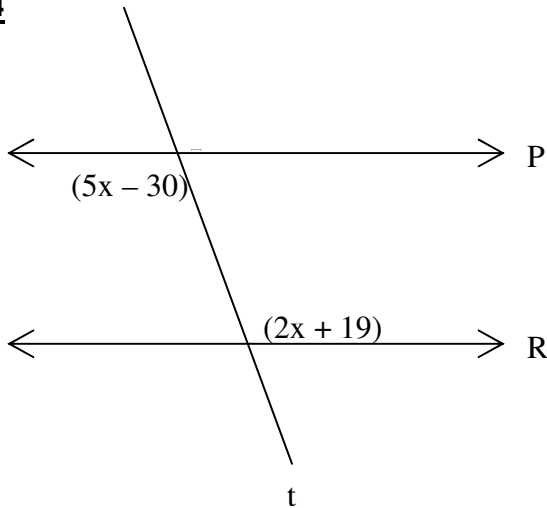
Subtract (7) from both sides

Combine like terms

Subtract (2x) from both sides

Divide both sides by (3)

Example 4



(//) means the lines are parallel

$P // R$

Find the value of (x).

These two angles are alternate interior angle so they are equal.

$$5x - 30 = 2x + 19$$

$$5x - 30 + 30 = 2x + 19 + 30$$

$$5x = 2x + 49$$

$$5x - 2x = 2x + 49 - 2x$$

$$3x = 49$$

$$x = \frac{49}{3}$$

Definition of equal parts

Add (30) to both sides

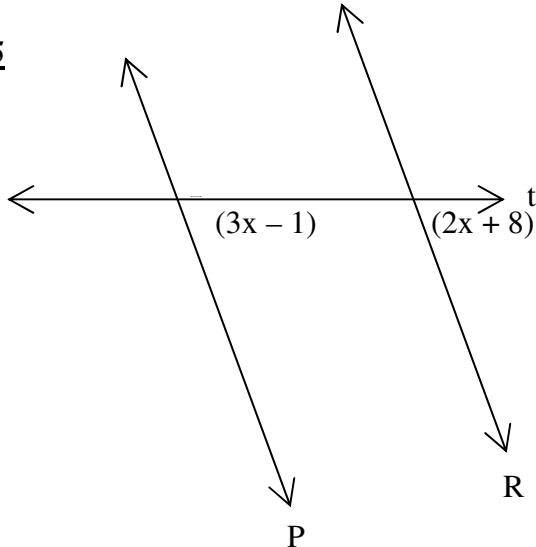
Combine like terms

Subtract (2x) from both sides

Combine like terms

Divide both sides by three

Example 5



(//) means the lines are parallel

$P // R$

Find the value of (x).

These two angles are corresponding so they are equal.

$$3x - 1 = 2x + 8$$

$$3x - 1 + 1 = 2x + 8 + 1$$

$$3x = 2x + 9$$

$$3x - 2x = 2x + 9 - 2x$$

$$x = 9$$

Definition of equal elements

Add (1) to both sides

Combine like terms

Subtract (2x) from both sides

Combine like terms.