

# Measuring Segments

# Objectives

- 1 Find the distance between two points on a number line.
- 2 Work with congruent segments
- 3 Use the Segment Addition Postulate
- 4 Use the midpoint of a segment.

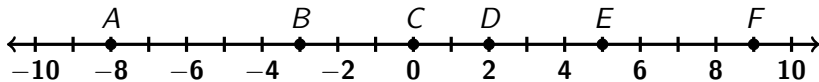
# Measuring Segments

To find the distance between two points  $A$  and  $B$  on a number line, subtract their coordinates and take the absolute value.

$$|A - B|$$

## Example 1

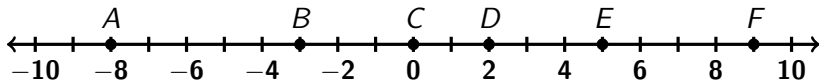
Given the number line below, find each distance.



(a)  $AC$

## Example 1

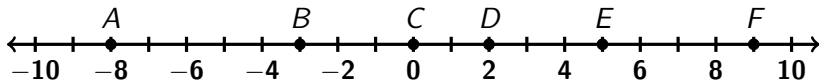
Given the number line below, find each distance.



(a)  $AC$  8

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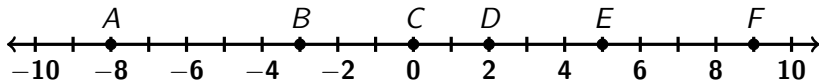


(a)  $AC$  8

(b)  $BE$

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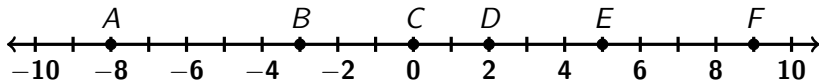


(a)  $AC$  8

(b)  $BE$  8

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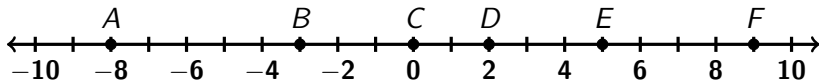
(b)  $BE$  8

(c)  $CF$



## Example 1

Given the number line below, find each distance.



(a)  $AC$  8

(b)  $BE$  8

(c)  $CF$  9

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# Congruent Segments

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Two segments are **congruent** if they have the same length.

The symbol for congruent is  $\cong$      $\overline{AB} \cong \overline{BE}$

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## Congruent Segments

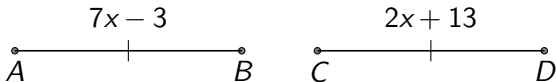
Two segments are **congruent** if they have the same length.

The symbol for congruent is  $\cong$      $\overline{AB} \cong \overline{BE}$

We mark congruent segments using tick marks.

## Example 2

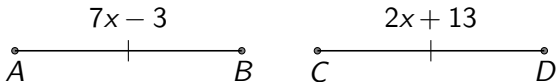
- (a) Find the value of  $x$  if  $\overline{AB} \cong \overline{CD}$ .





## Example 2

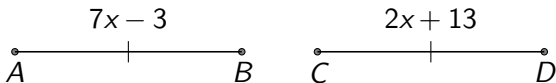
- (a) Find the value of  $x$  if  $\overline{AB} \cong \overline{CD}$ .



$$7x - 3 = 2x + 12$$

## Example 2

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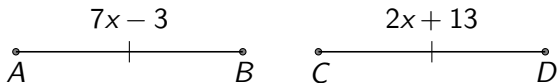


$$7x - 3 = 2x + 12$$

$$5x - 3 = 12$$

## Example 2

- (a) Find the value of  $x$  if  $\overline{AB} \cong \overline{CD}$ .



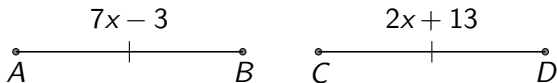
$$7x - 3 = 2x + 12$$

$$5x - 3 = 12$$

$$5x = 15$$

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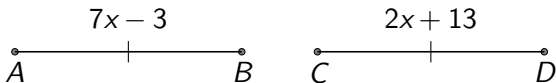
$$5x - 3 = 12$$

$$5x = 15$$

$$x = 3$$

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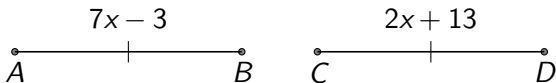
$$5x = 15$$

$$x = 3$$

Check:

## Example 2

- (a) Find the value of  $x$  if  $\overline{AB} \cong \overline{CD}$ .



$$7x - 3 = 2x + 12$$

$$5x - 3 = 12$$

$$5x = 15$$

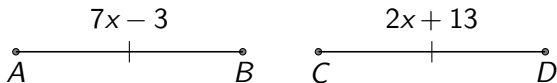
$$x = 3$$

Check:

$$7(3) - 3 = 2(3) + 12?$$

## Example 2

- (a) Find the value of  $x$  if  $\overline{AB} \cong \overline{CD}$ .



$$7x - 3 = 2x + 12$$

$$5x - 3 = 12$$

$$5x = 15$$

$$x = 3$$

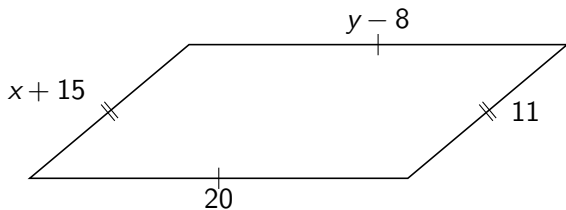
Check:

$$7(3) - 3 = 2(3) + 12?$$

$$18 = 18$$

## Example 2

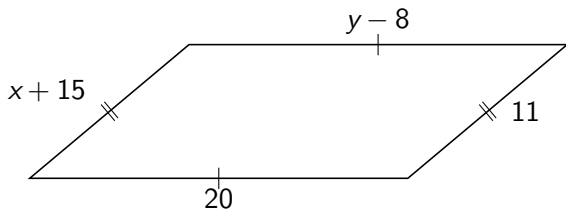
(b) Find the values of  $x$  and  $y$





## Example 2

(b) Find the values of  $x$  and  $y$

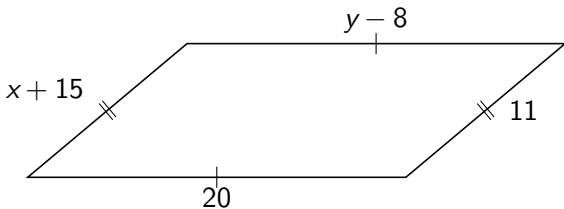


$$x + 15 = 11$$

$$y - 8 = 20$$

## Example 2

(b) Find the values of  $x$  and  $y$



$$x + 15 = 11$$

$$x = -4$$

$$y - 8 = 20$$

$$y = 28$$

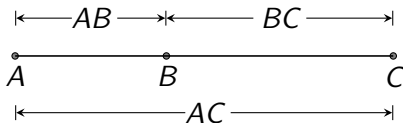
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# Segment Addition Postulate

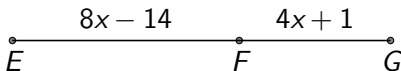
If 3 points  $A$ ,  $B$ , and  $C$  are collinear and  $B$  is between  $A$  and  $C$ , then

$$AB + BC = AC$$



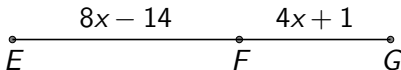
## Example 3

- (a) If  $EG = 59$ , what are  $EF$  and  $FG$ ?



## Example 3

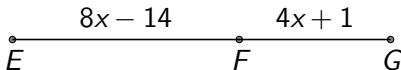
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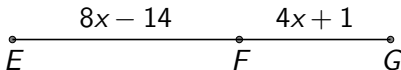


$$EF + FG = EG$$

$$8x - 14 + 4x + 1 = 59$$

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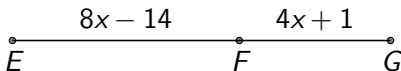
$$8x - 14 + 4x + 1 = 59$$

$$12x - 13 = 59$$



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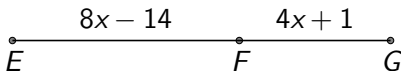
$$8x - 14 + 4x + 1 = 59$$

$$12x - 13 = 59$$

$$12x = 72$$

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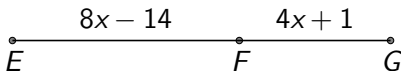
$$12x - 13 = 59$$

$$12x = 72$$

$$x = 6$$

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(a) If  $EG = 59$ , what are  $EF$  and  $FG$ ?



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$$8x - 14 + 4x + 1 = 59$$

$$12x - 13 = 59$$

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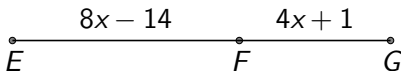
$$x = 6$$

$$EF = 8(6) - 14$$

$$FG = 4(6) + 1$$

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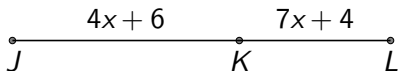
$$EF = 34$$

$$FG = 4(6) + 1$$

$$FG = 25$$

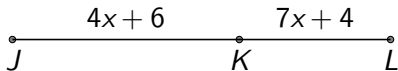
## Example 3

(b) If  $JL = 120$ , what are  $JK$  and  $KL$ ?



## Example 3

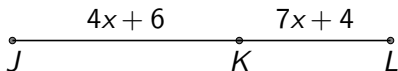
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$$JK + KL = JL$$

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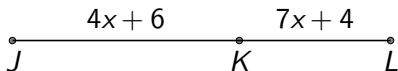


$$JK + KL = JL$$

$$4x + 6 + 7x + 4 = 120$$

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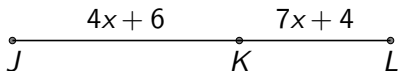
$$4x + 6 + 7x + 4 = 120$$

$$11x + 10 = 120$$



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(b) If  $JL = 120$ , what are  $JK$  and  $KL$ ?



$$JK + KL = JL$$

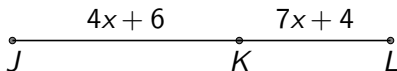
$$4x + 6 + 7x + 4 = 120$$

$$11x + 10 = 120$$

$$11x = 110$$

## Example 3

(b) If  $JL = 120$ , what are  $JK$  and  $KL$ ?



$$JK + KL = JL$$

$$4x + 6 + 7x + 4 = 120$$

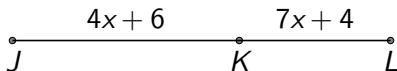
$$11x + 10 = 120$$

$$11x = 110$$

$$x = 10$$

## Example 3

(b) If  $JL = 120$ , what are  $JK$  and  $KL$ ?



$$JK + KL = JL$$

$$4x + 6 + 7x + 4 = 120$$

$$11x + 10 = 120$$

$$11x = 110$$

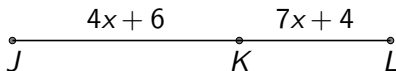
$$x = 10$$

$$JK = 4(10) + 6$$

$$KL = 7(10) + 4$$

## Example 3

(b) If  $JL = 120$ , what are  $JK$  and  $KL$ ?



$$JK + KL = JL$$

$$4x + 6 + 7x + 4 = 120$$

$$11x + 10 = 120$$

$$11x = 110$$

$$x = 10$$

$$JK = 4(10) + 6$$

$$JK = 46$$

$$KL = 7(10) + 4$$

$$KL = 74$$

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# Midpoint

## Midpoint

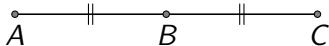
A **midpoint** divides a segment into 2 congruent segments.

# Midpoint

## Midpoint

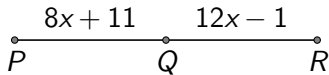
A **midpoint** divides a segment into 2 congruent segments.

In the picture below,  $B$  is the midpoint of  $\overline{AC}$ .



## Example 4

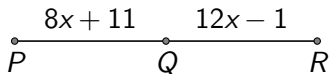
- (a)  $Q$  is the midpoint of  $PR$ . What are  $PQ$ ,  $QR$ , and  $PR$ ?





## Example 4

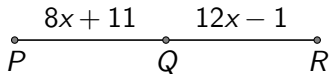
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$$8x + 11 = 12x - 1$$

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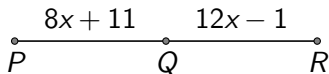


$$8x + 11 = 12x - 1$$

$$11 = 4x - 1$$

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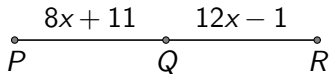
$$8x + 11 = 12x - 1$$

$$11 = 4x - 1$$

$$12 = 4x$$

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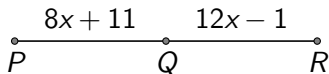
$$11 = 4x - 1$$

$$12 = 4x$$

$$x = 3$$

## Example 4

- (a)  $Q$  is the midpoint of  $PR$ . What are  $PQ$ ,  $QR$ , and  $PR$ ?



$$8x + 11 = 12x - 1$$

$$11 = 4x - 1$$

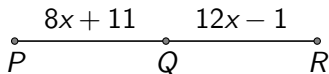
$$12 = 4x$$

$$x = 3$$

$$PQ = 8(3) + 11 \quad QR = 12(3) - 1 \quad PR = PQ + QR$$

## Example 4

- (a)  $Q$  is the midpoint of  $PR$ . What are  $PQ$ ,  $QR$ , and  $PR$ ?



$$8x + 11 = 12x - 1$$

$$11 = 4x - 1$$

$$12 = 4x$$

$$x = 3$$

$$PQ = 8(3) + 11$$

$$PQ = 35$$

$$QR = 12(3) - 1$$

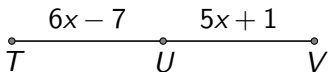
$$QR = 35$$

$$PR = PQ + QR$$

$$PR = 35 + 35 = 70$$

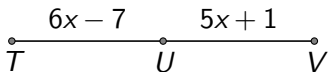
## Example 4

(b)  $U$  is the midpoint of  $TV$ . What are  $TU$ ,  $UV$ , and  $TV$ ?



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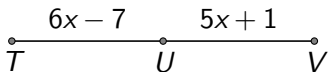


$$6x - 7 = 5x + 1$$



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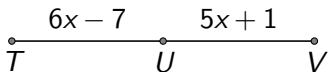


$$6x - 7 = 5x + 1$$

$$x - 7 = 1$$

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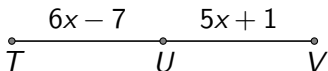
$$6x - 7 = 5x + 1$$

$$x - 7 = 1$$

$$x = 8$$

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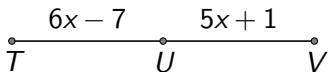
$$x - 7 = 1$$

$$x = 8$$

$$TU = 6(8) - 7 \quad UV = 5(8) + 1 \quad TV = TU + UV$$

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(b)  $U$  is the midpoint of  $TV$ . What are  $TU$ ,  $UV$ , and  $TV$ ?



$$6x - 7 = 5x + 1$$

$$x - 7 = 1$$

$$x = 8$$

$$TU = 6(8) - 7$$

$$TU = 41$$

$$UV = 5(8) + 1$$

$$UV = 41$$

$$TV = TU + UV$$

$$TV = 41 + 41 = 82$$