Lesson 2

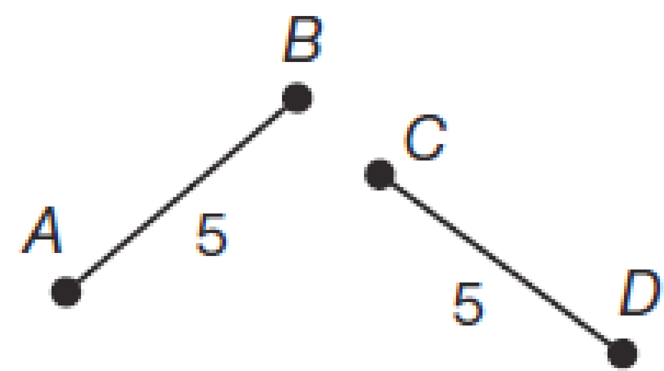
Segments

Line Segment – Part of a line consisting of two endpoints and all points between them.

The diagram above depicts a line segment with endpoints *A* and *B*. A segment is named by its two endpoints in either order with a straight segment drawn over them. This segment could be called either $\overline{AB}$ or $\overline{BA}$.

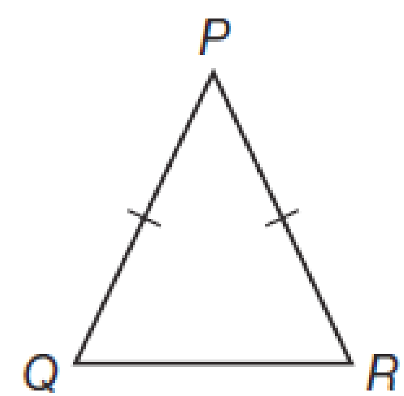
Two geometric objects that have the same size and shape are congruent.

In this figure, $\overline{AB}$ and $\overline{CD}$ are congruent. As shown on the diagram, they both have a length of 5 units.



A congruence statement shows that two segments are congruent. The symbol $\cong$ is read "is congruent to." The congruence statement for the segments above is $\overline{AB} \cong \overline{CD}$.

In a diagram, congruent segments are shown with tick marks. The diagram below shows congruent segments indicated by tick marks.



Caution

When comparing segments or other geometric figures, congruence statements are used. When the length of segments are being compared, or any other measurements that can be expressed as numbers, an equal sign is used.

The following properties apply to all congruent segments.

Reflexive Property of Congruence

$$\overline{AB} \cong \overline{AB}$$

Symmetric Property of Congruence

If $\overline{AB} \cong \overline{CD}$, then $\overline{CD} \cong \overline{AB}$

Transitive Property of Congruence

If $\overline{AB} \cong \overline{CD}$ and $\overline{CD} \cong \overline{EF}$, then $\overline{AB} \cong \overline{EF}$

Example 1 Using Properties of Equality and Congruence

Identify the property that justifies each statement.

a. $\overline{WX} \cong \overline{YZ}$, so $\overline{YZ} \cong \overline{WX}$

SOLUTION

Symmetric Property of Congruence

b. $\overline{PQ} \cong \overline{RS}$ and $\overline{RS} \cong \overline{TU}$, so $\overline{PQ} \cong \overline{TU}$

SOLUTION

Transitive Property of Congruence

c. $\overline{GH} \cong \overline{GH}$

SOLUTION

Reflexive Property of Congruence

A ruler can be used to measure the lengths of segments. The points on a ruler correspond with the points on a line segment. This concept is presented in the Ruler Postulate. A postulate is a statement that is accepted as true without proof.

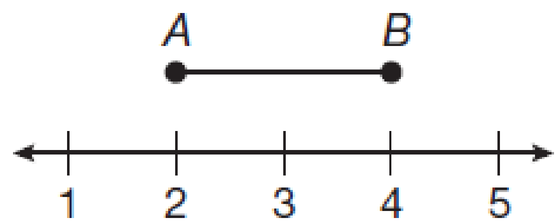
Postulate 1: Ruler Postulate - The points on a line can be paired in a one-to-one correspondence with the real numbers such that:

1. Any two given points can have coordinates 0 and 1.

2. The distance between two points is the absolute value of the difference of their coordinates.

Distance is the measure of the segment connecting two points. The distance between two points can be represented by those two points with no segment symbol. For example, *AB* means “the distance between *A* and *B*.”

Distance is always positive, so absolute values are used to calculate distances.



$|\text{Point } A - \text{Point } B| = |2 - 4| = |-2| = 2$

The distance from point *A* to point *B* is 2.

Example 2 Finding Distance on a Number Line

Find each distance.

a. AB

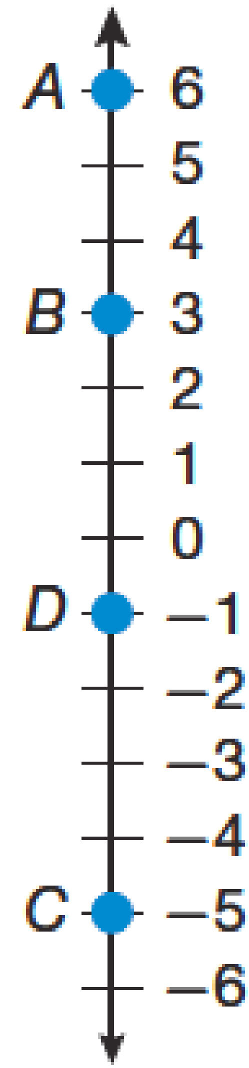
SOLUTION

$AB = |6 - 3|$
$= |3|$
$= 3$

b. BC

SOLUTION

$BC = |3 - (-5)|$
$= |8|$
$= 8$



Example 2 Finding Distance on a Number Line

Find each distance.

c. *CD*

SOLUTION

$CD = |(-5) - (-1)|$

$= |-4|$

$= 4$

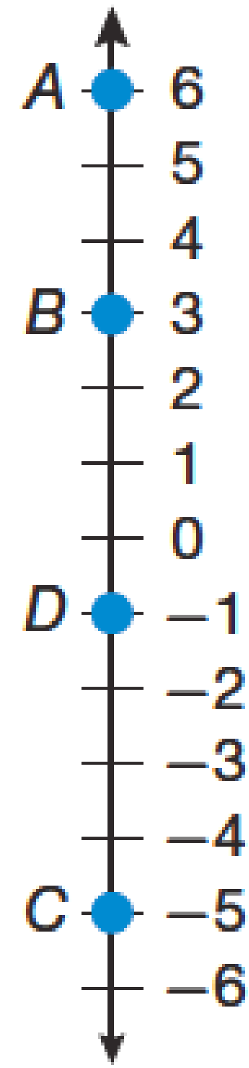
d. *AC*

SOLUTION

$AC = |6 - (-5)|$

$= |11|$

$= 11$



In the example above, notice that $AC = AB + BC$. This is not a coincidence.

Postulate 2: Segment Addition Postulate – If B is between A and C, then $AB + BC = AC$.

Hint

Postulates are statements that are accepted as true without proof. See the Postulates and Theorems section in the back of this book for a complete list of postulates in this program.

Example 3 Using the Segment Addition Postulate

a. Point S lies on $\overline{RT}$ between R and T. $RS = 12$ and $RT = 31$. Find ST.

SOLUTION

$RT = RS + ST$	Segment Add Postulate
$31 = 12 + ST$	Substitute.
$19 = ST$	Sub 12 from both sides.

Example 3 Using the Segment Addition Postulate

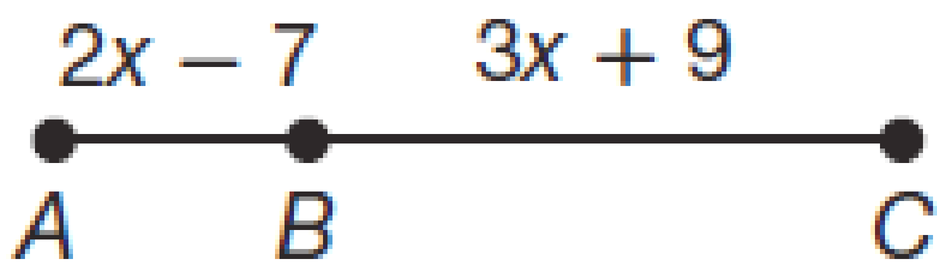
b. Find AC in terms of x.

SOLUTION

$AC = AB + BC$ Segment Add Postulate

$AC = (2x - 7) + (3x + 9)$ Substitute.

$AC = 5x + 2$ Simplify.

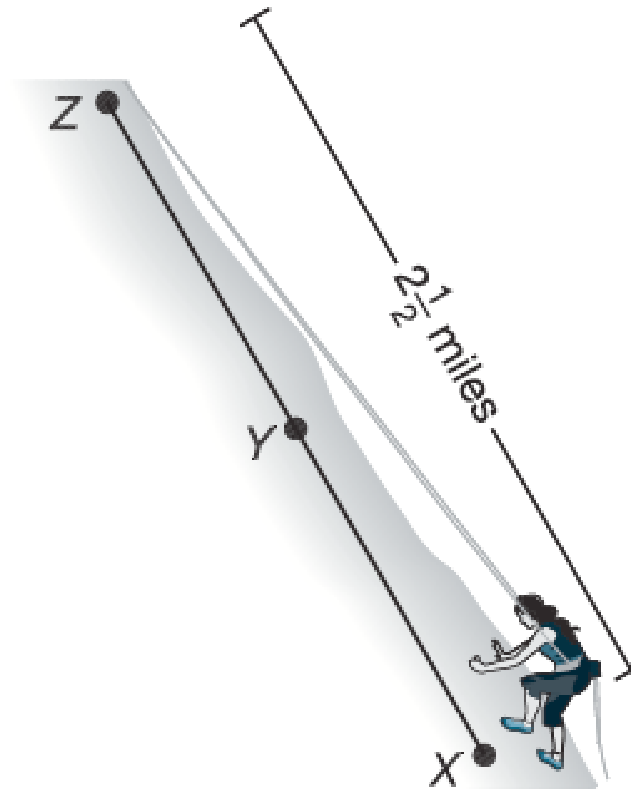


The midpoint of a segment is the point that divides the segment into two congruent parts. If M is the midpoint of $\overline{AB}$, then $AM = MB$.

Example 4 Application: Hiking

A hiker is traveling up a mountain towards the summit. The distance from the base of the mountain to the summit is 2.5 miles, as shown. How far will she have traveled when she reaches the midpoint (Y) of the hike?

SOLUTION



Example 4 Application: Hiking

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SOLUTION

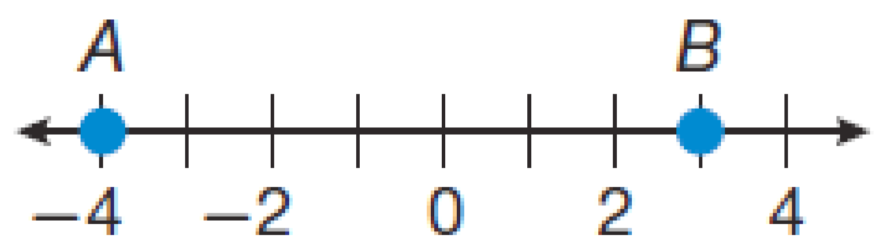
$XZ = XY + YZ$	Segment Addition Property
$XY = YZ$	Definition of midpoint
$XZ = XY + XY$	Substitute XY for YZ.
$2.5 = 2(XY)$	Substitute.
$1.25 = XY$	Divide both sides by 2.

The hiker will have traveled 1.25 miles when she reaches the midpoint.

You Try!!!!

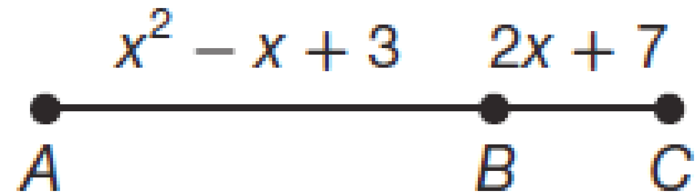
a. Identify the property that justifies the statement, $\overline{KL} \cong \overline{MN}$, so $\overline{MN} \cong \overline{KL}$

b. Find the distance between the points *A* and *B*.



You Try!!!!

c. Find *AC* in terms of *x*.



d.The drive from Seattle to San Francisco is 811 miles. How many miles is the midpoint from either city?

Assignment

Page 10

Lesson Practice a–f (Ask Mr. Heintz)

Page 10

Practice 1–30 (Do the starred ones first)