Name ______________________ Date ____________

LESSON 1.1

Study Guide

For use with pages 2–8

GOAL **Name and sketch geometric figures.**

Vocabulary

A **point** has no dimension, a **line** has one dimension, and a **plane** has two dimensions.

Collinear points are points that lie on the same line.

Coplanar points are points that lie in the same plane.

Line *AB* (written as $\overleftrightarrow{AB}$) passes through points *A* and *B*.

The **line segment** *AB*, or **segment** *AB* (written as $\overline{AB}$), consists of the **endpoints** *A* and *B* and all points on $\overleftrightarrow{AB}$ between *A* and *B*.

The **ray** *AB* (written as $\overrightarrow{AB}$) consists of the endpoint *A* and all points on $\overleftrightarrow{AB}$ that lie on the same side of *A* as *B*.

If point *C* lies on $\overleftrightarrow{AB}$ between *A* and *B*, then $\overrightarrow{CA}$ and $\overrightarrow{CB}$ are **opposite rays.**

Two or more geometric figures *intersect* if they have one or more points in common. The **intersection** of the figures is the set of points the figures have in common.

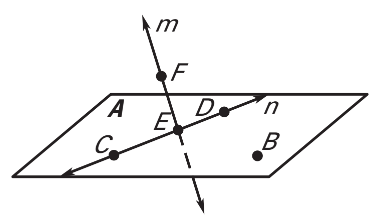
EXAMPLE 1 Name points, lines, planes, segments, and rays

a. Give two other names for $\overleftrightarrow{EF}$. Give another name for plane *A*.

b. Name three points that are collinear. Name four points that are coplanar.

c. Give another name for $\overline{EF}$.

d. Name a ray with endpoint *E* that is an opposite ray of $\overrightarrow{EC}$.



Solution

a. Other names for $\overleftrightarrow{EF}$ are $\overleftrightarrow{FE}$ and line *m*. Other names for plane *A* are plane *BCD* and plane *CDE*.

b. Points *C*, *E*, and *D* lie on the same line, so they are collinear. Points *B*, *C*, *E*, and *D* lie in the same plane, so they are coplanar.

c. Another name for $\overline{EF}$ is $\overline{FE}$.

d. $\overrightarrow{ED}$ is a ray with endpoint *E* that is an opposite ray of $\overrightarrow{EC}$.

Name ______________________________ Date ______________

LESSON 1.1

Study Guide *continued*

For use with pages 2–8

Exercises for Example 1

Use the diagram in Example 1.

1. Give two other names for $\overleftrightarrow{CD}$.

2. Give another name for $\overline{CE}$.

3. Name a ray with endpoint F.

4. Name a point that is *not* collinear with C, E, and D.

5. Name a point that is *not* coplanar with B, C, E, and D.

6. Give another name for $\overrightarrow{DE}$.

EXAMPLE 2 Sketch intersections of lines and planes

Perform the indicated operations.

a. Sketch a plane and a line that is in the plane.

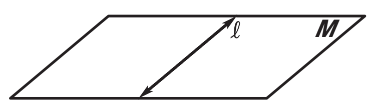
b. Sketch a plane and a line that does not intersect the plane.

c. Sketch a plane and a line that intersects the plane at a point.

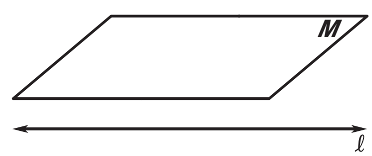
d. Sketch two planes that intersect in a line.

Solution

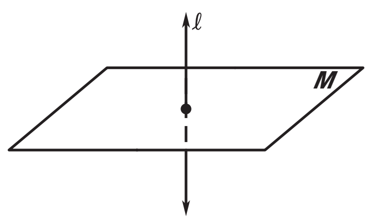
a.



b.



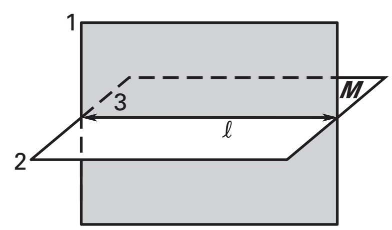
c.



d. **STEP 1** **Draw** one plane as if you are facing it. Shade the plane.

STEP 2 **Draw** a second plane that is horizontal. Shade this plane a different color. Use dashed lines to show where one plane is hidden.

STEP 3 **Draw** the line of intersection.



Exercises for Example 2

Sketch the figure described.

7. Two lines that lie in a plane and intersect at one point

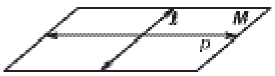
8. One line that lies in a plane, and two lines that do not lie in the plane

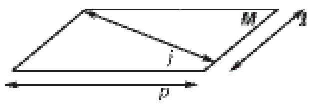
LESSON 1.1

Answer Key

Lesson 1.1

Study Guide

1. *Sample answer*: $\overleftrightarrow{DC}$ and line n
2. $\overline{EC}$
3. $\overrightarrow{FE}$
4. B
5. F
6. $\overrightarrow{DC}$
7. 

8. 

Name ______________________ Date ____________

LESSON 1.2

Study Guide

For use with pages 9–14

GOAL **Use segment postulates to identify congruent segments.**

Vocabulary

In Geometry, a rule that is accepted without proof is called a **postulate** or **axiom.**

Postulate 1 Ruler Postulate: The **points** on a line can be matched one to one with the real numbers. The real number that corresponds to a point is the **coordinate** of the point. The **distance** between points A and B, written as AB, is the absolute value of the difference of the coordinates of A and B.

When three points are collinear, you can say that one point is **between** the other two.

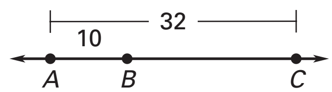
Postulate 2 Segment Addition Postulate: If B is between A and C, then $AB + BC = AC$. If $AB + BC = AC$, then B is between A and C.

Line segments that have the same length are called **congruent segments.**

EXAMPLE 1

Find a length

Use the diagram to find *BC*.



Solution

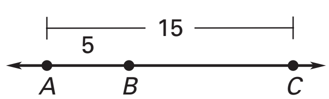
Use the Segment Addition Postulate to write an equation. Then solve the equation to find BC.

$AC = AB + BC$	Segment Addition Postulate
$32 = 10 + BC$	Substitute 32 for AC and 10 for AB.
$22 = BC$	Subtract 10 from each side.

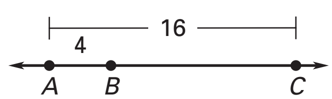
Exercises for Example 1

Use the diagram to find *BC*.

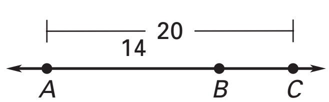
1.



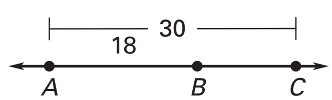
2.



3.



4.



LESSON 1.2

Name ____________________ Date ____________

LESSON 1.2

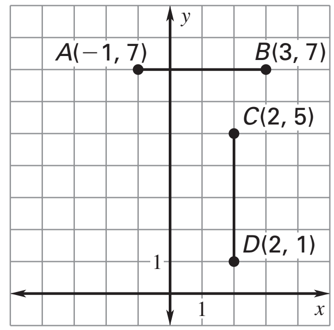
Study Guide *continued*

For use with pages 9–14

EXAMPLE 2 Compare segments for congruence

Use the diagram to determine whether $\overline{AB}$ and $\overline{CD}$ are congruent.

Solution



To find the length of a horizontal segment find the absolute value of the difference of the x-coordinates of the endpoints.

$AB = |-1 - 3| = |-4| = 4$ Use Ruler Postulate.

To find the length of a vertical segment, find the absolute value of the difference of the y-coordinates of the endpoints.

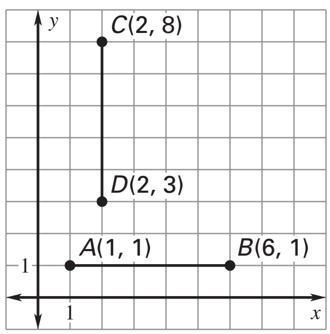
$CD = |5 - 1| = 4$ Use Ruler Postulate.

$\overline{AB}$ and $\overline{CD}$ have the same length. So, $\overline{AB} \cong \overline{CD}$.

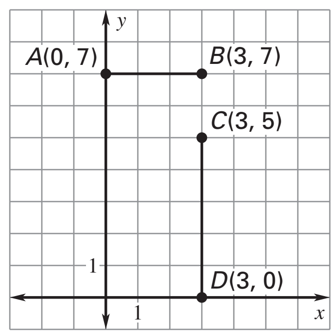
Exercises for Example 2

Use the diagram to determine whether $\overline{AB}$ and $\overline{CD}$ are congruent.

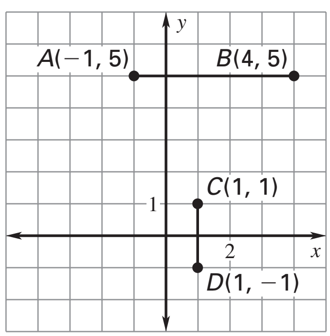
5.



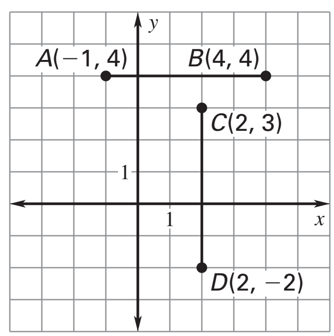
6.



7.



8.



LESSON 1.2

Answer Key

Lesson 1.2

Study Guide

1. 10
2. 12
3. 6
4. 12
5. congruent
6. not congruent
7. not congruent
8. congruent

Name ______________________________ Date ______________

LESSON 1.3

Study Guide

For use with pages 15–22

GOAL **Find lengths of segments in the coordinate plane.**

Vocabulary

The **midpoint** of a segment is the point that divides the segment into two congruent segments.

A **segment bisector** is a point, ray, line, line segment, or plane that intersects the segment at its midpoint.

A midpoint or a segment bisector *bisects* a segment.

The Midpoint Formula: If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the midpoint M of $\overline{AB}$ has coordinates $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

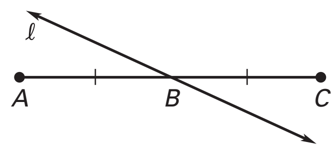
The Distance Formula: If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the distance between A and B is

$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

EXAMPLE 1

Find segment lengths

In the diagram, line ℓ bisects $\overline{AC}$ at point *B*, and *AB* = 8 in. Find *AC*.



Solution

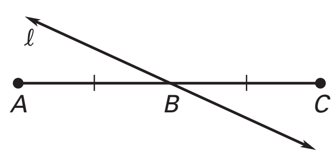
Point B is the midpoint of $\overline{AC}$. So, $AB = BC = 8$ in.

$AC = AB + BC$	Segment Addition Postulate
$= 8 + 8$	Substitute 8 for AB and 8 for BC.
$= 16$ in.	Add.

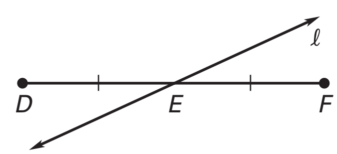
Exercises for Example 1

Line ℓ bisects the segment. Find the indicated length.

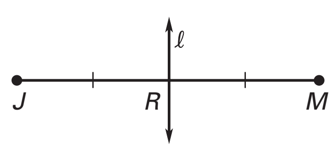
1. Find AC if $AB = 10$ cm.



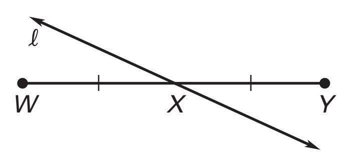
2. Find DF if $EF = 25$ mm.



3. Find JM if $RM = 37$ in.



4. Find WX if $WY = 30$ cm.



Name ______________________ Date ____________

LESSON 1.3

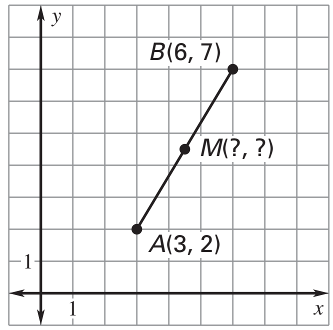
Study Guide *continued*

For use with pages 15–22

EXAMPLE 2 Use the midpoint and distance formulas

a. The endpoints of $\overline{AB}$ are $A(3, 2)$ and $B(6, 7)$. Find the coordinates of the midpoint M.

b. What is the length of $\overline{AB}$?



Solution

a. Use the Midpoint Formula.

$M\left(\frac{3+6}{2}, \frac{2+7}{2}\right) = \left(\frac{9}{2}, \frac{9}{2}\right)$

The coordinates of the midpoint M are $\left(\frac{9}{2}, \frac{9}{2}\right)$.

b. Use the Distance Formula.

$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	Distance Formula
$= \sqrt{(6-3)^2 + (7-2)^2}$	Substitute.
$= \sqrt{3^2 + 5^2}$	Subtract.
$= \sqrt{9 + 25}$	Evaluate powers.
$= \sqrt{34}$	Add.
≈ 5.83	Use a calculator to approximate the square root.

The length of $\overline{AB}$ is approximately equal to 5.83.

Exercises for Example 2

Find the coordinates of the midpoint of the segment with the given endpoints.

5. $A(1, 2)$ and $B(3, 6)$

6. $J(-1, 3)$ and $K(9, 0)$

7. $R(4, -2)$ and $G(12, 8)$

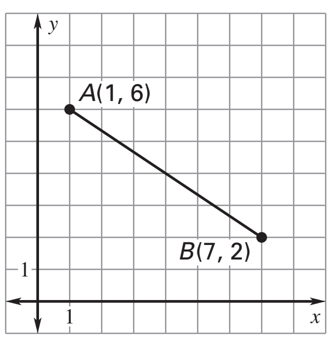
8. $C(-3, -1)$ and $D(9, 5)$

9. $S(5, -2)$ and $T(-3, 4)$

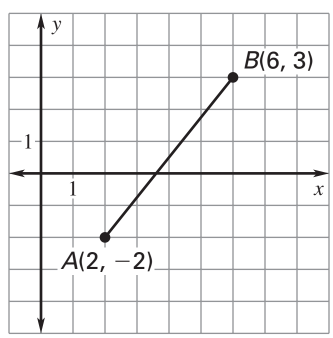
10. $X(7, -4)$ and $Y(-2, -1)$

Find the length of the segment. Round to the nearest tenth of a unit.

11.



12.



LESSON 1.3

Answer Key

Lesson 1.3

Study Guide

1. 20 **2.** 50 **3.** 74 **4.** 15 **5.** (2, 4) **6.** $\left(4, \frac{3}{2}\right)$

7. (8, 3) **8.** (3, 2) **9.** (1, 1) **10.** $\left(\frac{5}{2}, -\frac{5}{2}\right)$

11. 7.2 **12.** 6.4