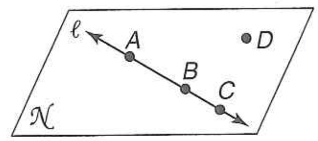
NAME ______________________ DATE __________ PERIOD _____

1-1 Study Guide and Intervention

Points, Lines, and Planes

Name Points, Lines, and Planes In geometry, a **point** is a location, a **line** contains points, and a **plane** is a flat surface that contains points and lines. If points are on the same line, they are **collinear**. If points on are the same plane, they are **coplanar**.

Example **Use the figure to name each of the following.**



a. a line containing point *A*

The line can be named as ℓ. Also, any two of the three points on the line can be used to name it.

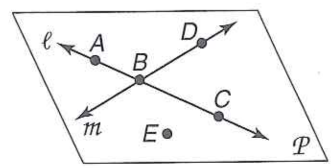
$\overleftrightarrow{AB}$, $\overleftrightarrow{AC}$, or $\overleftrightarrow{BC}$

b. a plane containing point *D*

The plane can be named as plane 𝒩 or can be named using three noncollinear points in the plane, such as plane *ABD*, plane *ACD*, and so on.

Exercises

Refer to the figure.



1. Name a line that contains point *A*.

2. What is another name for line *m*?

3. Name a point not on $\overleftrightarrow{AC}$.

4. Name the intersection of $\overleftrightarrow{AC}$ and $\overleftrightarrow{DB}$.

5. Name a point not on line ℓ or line *m*.

Draw and label a plane *Q* for each relationship.

6. $\overleftrightarrow{AB}$ is in plane *Q*.

7. $\overleftrightarrow{ST}$ intersects $\overleftrightarrow{AB}$ at *P*.

8. Point *X* is collinear with points *A* and *P*.

9. Point *Y* is not collinear with points *T* and *P*.

10. Line ℓ contains points *X* and *Y*.

Lesson 1-1

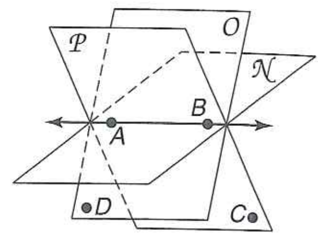
NAME ______________________________ DATE __________ PERIOD ____

1-1 Study Guide and Intervention *(continued)*

Points, Lines, and Planes

Points, Lines, and Planes in Space **Space** is a boundless, three-dimensional set of all points. It contains lines and planes.

Example



a. How many planes appear in the figure?

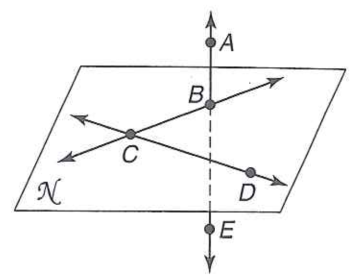
There are three planes: plane 𝒩, plane *O*, and plane 𝒫.

b. Are points *A*, *B*, and *D* coplanar?

Yes. They are contained in plane *O*.

Exercises

Refer to the figure.

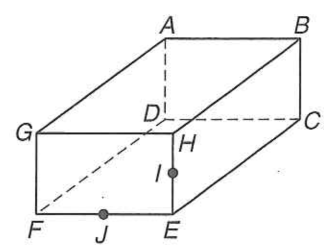


1. Name a line that is not contained in plane 𝒩.

2. Name a plane that contains point *B*.

3. Name three collinear points.

Refer to the figure.



4. How many planes are shown in the figure?

5. Are points *B, E, G,* and *H* coplanar? Explain.

6. Name a point coplanar with *D*, *C,* and *E*.

Draw and label a figure for each relationship.

7. Planes ℳ and 𝒩 intersect in $\overleftrightarrow{HJ}$.

8. Line *r* is in plane 𝒩, line *s* is in plane ℳ, and lines *r* and *s* intersect at point *J*.

9. Line *t* contains point *H* and line *t* does not lie in plane ℳ or plane 𝒩.

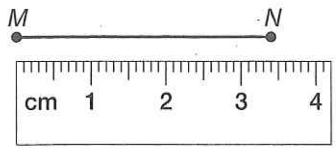
NAME ______________________ DATE ____________ PERIOD ______

1-2 Study Guide and Intervention

Linear Measure and Precision

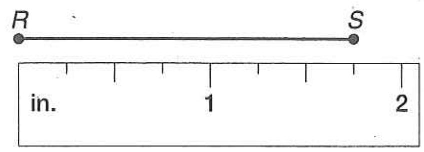
Measure Line Segments A part of a line between two endpoints is called a **line segment**. The lengths of $\overline{MN}$ and $\overline{RS}$ are written as MN and RS. When you measure a segment, the precision of the measurement is half of the smallest unit on the ruler.

Example 1 **Find the length of $\overline{MN}$.**



The long marks are centimeters, and the shorter marks are millimeters. The length of $\overline{MN}$ is 3.4 centimeters. The measurement is accurate to within 0.5 millimeter, so $\overline{MN}$ is between 3.35 centimeters and 3.45 centimeters long.

Example 2 **Find the length of $\overline{RS}$.**

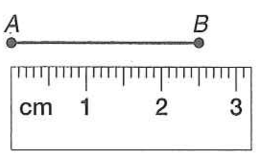


The long marks are inches and the short marks are quarter inches. The length of $\overline{RS}$ is about $1\frac{3}{4}$ inches. The measurement is accurate to within one half of a quarter inch, or $\frac{1}{8}$ inch, so $\overline{RS}$ is between $1\frac{5}{8}$ inches and $1\frac{7}{8}$ inches long.

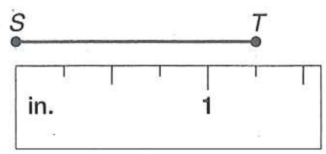
Exercises

Find the length of each line segment or object.

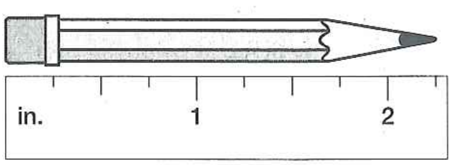
1.



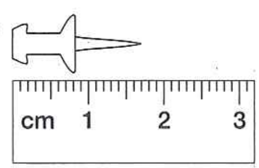
2.



3.



4.



Find the precision for each measurement.

5. 10 in.

6. 32 mm

7. 44 cm

8. 2 ft

9. 3.5 mm

10. $2\frac{1}{2}$ yd

Lesson 1-2

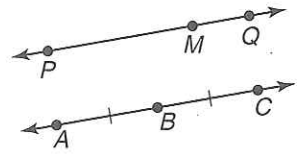
NAME ______________________ DATE __________ PERIOD _____

1-2 Study Guide and Intervention *(continued)*

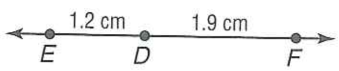
Linear Measure and Precision

Calculate Measures On $\overleftrightarrow{PQ}$, to say that point M is between points P and Q means P, Q, and M are collinear and $PM + MQ = PQ$.

On $\overleftrightarrow{AC}$, $AB = BC = 3$ cm. We can say that the segments are **congruent**, or $\overline{AB} \cong \overline{BC}$. Slashes on the figure indicate which segments are congruent.



Example 1 **Find *EF*.**



Calculate EF by adding ED and DF.

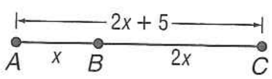
$ED + DF = EF$

$1.2 + 1.9 = EF$

$3.1 = EF$

Therefore, $\overline{EF}$ is 3.1 centimeters long.

Example 2 **Find *x* and *AC*.**



B is between A and C.

$AB + BC = AC$

$x + 2x = 2x + 5$

$3x = 2x + 5$

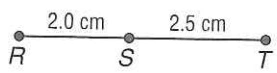
$x = 5$

$AC = 2x + 5 = 2(5) + 5 = 15$

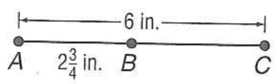
Exercises

Find the measurement of each segment. Assume that the art is not drawn to scale.

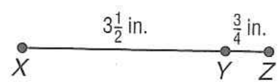
1. $\overline{RT}$



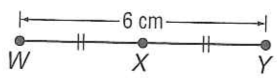
2. $\overline{BC}$



3. $\overline{XZ}$



4. $\overline{WX}$



Find *x* and *RS* if *S* is between *R* and *T*.

5. $RS = 5x$, $ST = 3x$, and $RT = 48$.

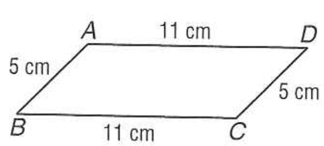
6. $RS = 2x$, $ST = 5x + 4$, and $RT = 32$.

7. $RS = 6x$, $ST = 12$, and $RT = 72$.

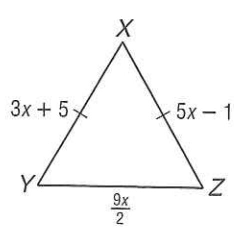
8. $RS = 4x$, $\overline{RS} \cong \overline{ST}$, and $RT = 24$.

Use the figures to determine whether each pair of segments is congruent.

9. $\overline{AB}$ and $\overline{CD}$



10. $\overline{XY}$ and $\overline{YZ}$

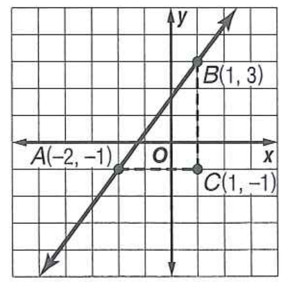


NAME ______________________________ DATE ____________ PERIOD _____

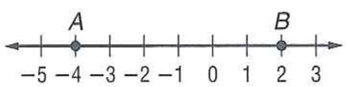
1-3 Study Guide and Intervention

Distance and Midpoints

Distance Between Two Points

Distance on a Number Line	Distance in the Coordinate Plane
 $AB = \lvert b - a \rvert$ or $\lvert a - b \rvert$	Pythagorean Theorem: $a^2 + b^2 = c^2$ Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ 

Example 1 **Find *AB*.**



$AB = \lvert(-4) - 2\rvert$
$= \lvert -6 \rvert$
$= 6$

Example 2 **Find the distance between $A(-2, -1)$ and $B(1, 3)$.**

Pythagorean Theorem

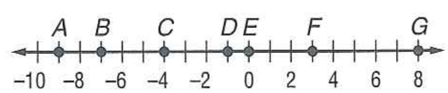
$(AB)^2 = (AC)^2 + (BC)^2$
$(AB)^2 = (3)^2 + (4)^2$
$(AB)^2 = 25$
$AB = \sqrt{25}$
$= 5$

Distance Formula

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
$AB = \sqrt{(1 - (-2))^2 + (3 - (-1))^2}$
$AB = \sqrt{(3)^2 + (4)^2}$
$= \sqrt{25}$
$= 5$

Exercises

Use the number line to find each measure.



1. *BD* **2.** *DG*

3. *AF* **4.** *EF*

5. *BG* **6.** *AG*

7. *BE* **8.** *DE*

Use the Pythagorean Theorem to find the distance between each pair of points.

9. $A(0, 0)$, $B(6, 8)$ **10.** $R(-2, 3)$, $S(3, 15)$

11. $M(1, -2)$, $N(9, 13)$ **12.** $E(-12, 2)$, $F(-9, 6)$

Use the Distance Formula to find the distance between each pair of points.

13. $A(0, 0)$, $B(15, 20)$ **14.** $O(-12, 0)$, $P(-8, 3)$

15. $C(11, -12)$, $D(6, 2)$ **16.** $E(-2, 10)$, $F(-4, 3)$

Lesson 1-3

NAME ____________________ DATE __________ PERIOD _____

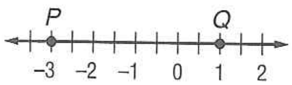
1-3 Study Guide and Intervention *(continued)*

Distance and Midpoints

Midpoint of a Segment

Midpoint on a Number Line	If the coordinates of the endpoints of a segment are *a* and *b*, then the coordinate of the midpoint of the segment is $\frac{a+b}{2}$.
Midpoint on a Coordinate Plane	If a segment has endpoints with coordinates (x_1, y_1) and (x_2, y_2), then the coordinates of the midpoint of the segment are $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$.

Example 1 **Find the coordinate of the midpoint of $\overline{PQ}$.**



The coordinates of *P* and *Q* are −3 and 1.

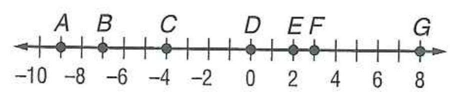
If *M* is the midpoint of $\overline{PQ}$, then the coordinate of *M* is $\frac{-3+1}{2} = \frac{-2}{2}$ or −1.

Example 2 **M is the midpoint of $\overline{PQ}$ for $P(-2, 4)$ and $Q(4, 1)$. Find the coordinates of M.**

$$M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = \left(\frac{-2+4}{2}, \frac{4+1}{2}\right) \text{ or } (1, 2.5)$$

Exercises

Use the number line to find the coordinate of the midpoint of each segment.



1. $\overline{CE}$
2. $\overline{DG}$
3. $\overline{AF}$
4. $\overline{EG}$
5. $\overline{AB}$
6. $\overline{BG}$
7. $\overline{BD}$
8. $\overline{DE}$

Find the coordinates of the midpoint of a segment having the given endpoints.

9. $A(0, 0), B(12, 8)$
10. $R(-12, 8), S(6, 12)$
11. $M(11, -2), N(-9, 13)$
12. $E(-2, 6), F(-9, 3)$
13. $S(10, -22), T(9, 10)$
14. $M(-11, 2), N(-19, 6)$