Geometry: 1.1-1.3 Notes

NAME______________________

1.1 Exploring points, lines, planes, segment, and rays_______________ **Date:**____________________

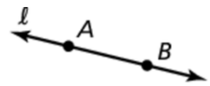
Undefined Terms: Point, Line, and Plane

Point A **point** has no dimension.
A dot represents a point.

point *A*

Line A **line** has one dimension. It is represented by a line with two arrowheads, but it extends without end.

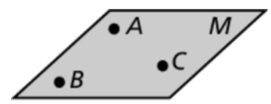
Through any two points, there is exactly one line.
You can use any two points on a line to name it.



line ℓ, line *AB* ($\overleftrightarrow{AB}$), or line *BA* ($\overleftrightarrow{BA}$)

Plane A **plane** has two dimensions. It is represented by a shape that looks like a floor or a wall, but it extends without end.

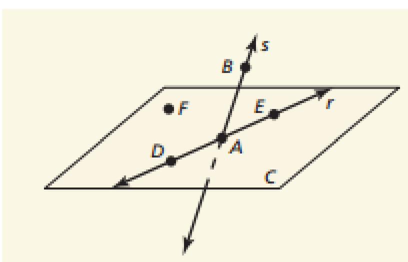
Through any three points not on the same line, there is exactly one plane. You can use three points that are not all on the same line to name a plane.



plane *M*, or plane *ABC*

Examples:

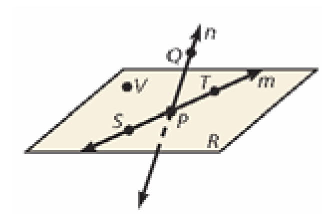
WE DO



1a. Give two other names for $\overleftrightarrow{DE}$ and plane *C*.

1b. Name three points that are collinear. Name four points that are coplanar.

YOU DO

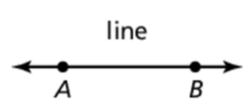


2a. Give two other names for $\overleftrightarrow{ST}$.

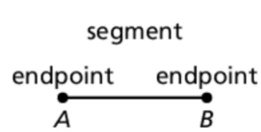
2b. Name a point that is not coplanar with points *Q*, *S*, *T*.

Defined Terms: Segment and Ray

The definitions below use line *AB* (written as $\overleftrightarrow{AB}$) and points *A* and *B*.

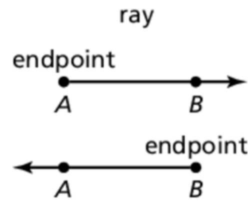


Segment The **line segment** *AB*, or **segment** *AB* (written as $\overline{AB}$) consists of the **endpoints** *A* and *B* and all points on $\overleftrightarrow{AB}$ that are between *A* and *B*. Note that $\overline{AB}$ can also be named $\overline{BA}$.

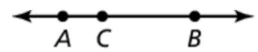


Ray The **ray** *AB* (written as $\overrightarrow{AB}$) consists of the endpoint *A* and all points on $\overleftrightarrow{AB}$ that lie on the same side of *A* as *B*.

Note that $\overrightarrow{AB}$ and $\overrightarrow{BA}$ are different rays.



Opposite Rays If point C lies on $\overleftrightarrow{AB}$ between *A* and *B*, then $\overrightarrow{CA}$ and $\overrightarrow{CB}$

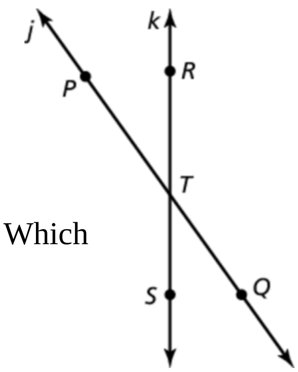


Examples:

<u>WE DO</u>

3a. What is another name for $\overline{PQ}$?

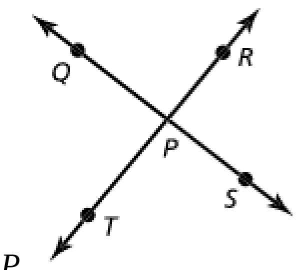
3b. Name all rays with endpoint *T*. Which of these rays are opposite rays?



<u>YOU DO</u>

4a. Give another name for $\overline{TR}$.

4b. Name all rays with endpoint *P*. Which of these rays are opposite rays?



Examples: Sketch the figure described.

<u>WE DO</u>

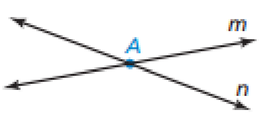
5. $\overline{AB}$ *and* $\overrightarrow{BC}$

<u>YOU DO</u>

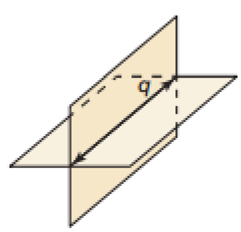
6. line *k* in plane *M*

Sketching Intersections

Two or more geometric figures *intersect* when they have one or more points in common. The **intersection** of the figures is the set of points the figures have in common. Some examples of intersections are shown below.



The intersection of two different lines is a point.



The intersection of two different planes is a line.

<u>WE DO</u>

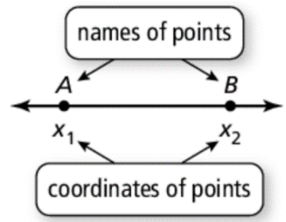
7. Sketch two planes *R* and *S* that intersect in line $\overleftrightarrow{AB}$.

<u>YOU DO</u>

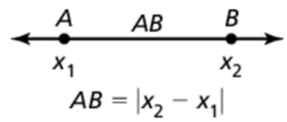
8. Sketch two different lines that intersect a plane at the same point.

1.2 Use the ruler and segment addition postulate.______________________ Date:____________________

Postulate 1.1 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.

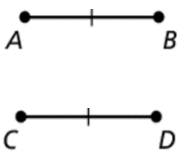


The **distance** between points *A* and *B*, written as *AB*, is the absolute value of the difference of the coordinates of *A* and *B*.

Core Concepts

Congruent Segments

Line segments that have the same length are called **congruent segments**. You can say "the length of $\overline{AB}$ is equal to the length of $\overline{CD}$," or you can say "$\overline{AB}$ *is congruent to* $\overline{CD}$." The symbol $\cong$ means "is congruent to."

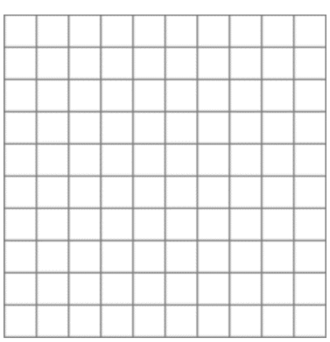


Lengths are equal.	**Segments are congruent.**
$AB = CD$	$\overline{AB} \cong \overline{CD}$
"is equal to"	"is congruent to"

Examples: Plot the points in the coordinate plane. Then determine whether $\overline{AB}$ and $\overline{CD}$ are congruent.

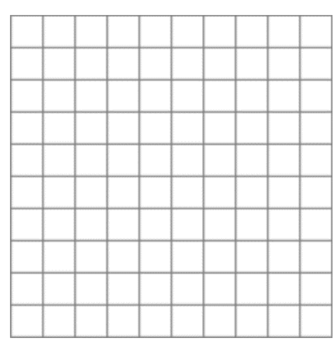
<u>WE DO</u>

1. $A(-5, 5)$, $B(-2, 5)$
   $C(2, -4)$, $D(-1, -4)$



<u>YOU DO</u>

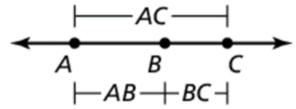
2. $A(4, 0)$, $B(4, 3)$
   $C(-4, -4)$, $D(-4, 1)$



Postulate 1.2 Segment Addition Postulate

If *B* is between *A* and *C*, then $AB + BC = AC$.

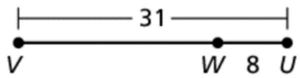
If $AB + BC = AC$, then *B* is between *A* and *C*.



Examples: Find *VW*.

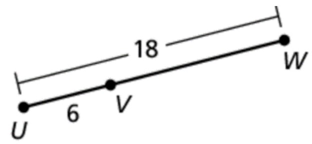
<u>WE DO</u>

3.

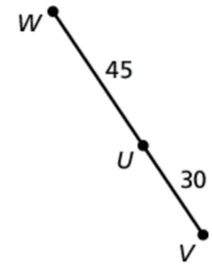


<u>YOU DO</u>

4.



5.



Examples:

<u>WE DO</u>

6. A bookstore and a movie theater are 6 kilometers apart along the same street. A florist is located between the bookstore and the theater on the same street. The florist is 2.5 kilometers from the theater. How far is the florist from the bookstore?

<u>YOU DO</u>

7. The cities on the map lie approximately in a straight line. Find the distance from Sacramento to San Bernardino.

Assignment	

Core Concepts

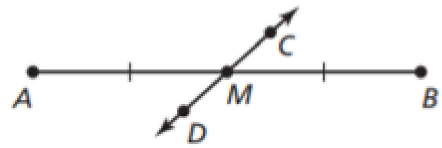
Midpoints and Segment Bisectors

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

M is the midpoint of $\overline{AB}$.
So, $\overline{AM} \cong \overline{MB}$ and $AM = MB$.

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.

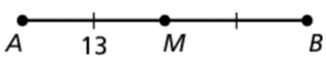
$\overleftrightarrow{CD}$ is a segment bisector of $\overline{AB}$.
So, $\overline{AM} \cong \overline{MB}$ and $AM = MB$.



Examples: Identify the segment bisector. Then find the length of the segment $\overline{AB}$.

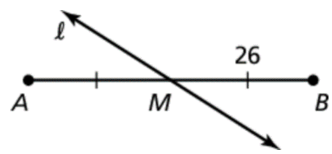
<u>WE DO</u>

1.



<u>YOU DO</u>

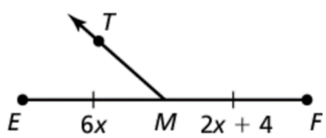
2.



Examples: Identify the segment bisector of $\overline{EF}$. Then find EF.

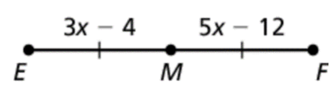
<u>WE DO</u>

3.



<u>YOU DO</u>

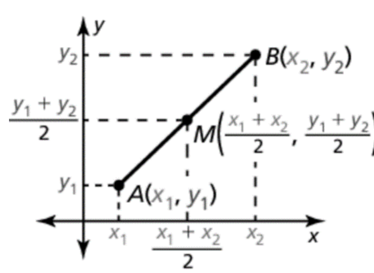
4.



The Midpoint Formula

The coordinates of the midpoint of a segment are the averages of the x-coordinates and of the y-coordinates of the endpoints.

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 $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.



Examples: The endpoints of $\overline{PQ}$ are given. Find the coordinates of the midpoint M.

WE DO

5. $P(-2,\ 7)$ and $Q(10,\ -3)$

YOU DO

6. $P(3,\ -15)$ and $Q(9,\ -3)$

Examples: The midpoint M and one endpoint of $\overline{JK}$ are given. Find the coordinates of the other endpoint.

WE DO

7. $J(2,\ 16)$ and $M\left(-\frac{9}{2},\ 7\right)$

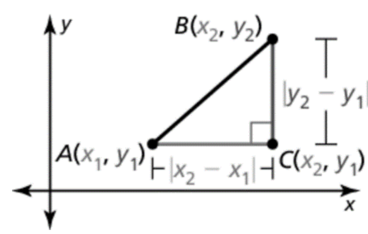
YOU DO

8. $J(7,\ 2)$ and $M(1,\ -2)$

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

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



Examples: Find the distance between each pair of points. Write in simplest radical form.

WE DO

9. (2, 3), (4, -1)

YOU DO

10. (-2, 0), (-8, 3)

Assignment	