

Lesson 1-1



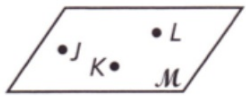
Understanding Points, Lines and Planes

Understanding Points, Lines, and Planes



Going Deeper

Essential question: *How do you use undefined terms as the basic elements of geometry?*

In geometry, the terms *point*, *line*, and *plane* are undefined terms. Although these terms do not have formal definitions, the table shows how mathematicians use these words.

Term	Geometric Figure	Ways to Reference the Figure
<p>A point is a specific location. It has no dimension and is represented by a dot.</p>		<p>Point P</p>
<p>A line is a connected straight path. It has no thickness and it continues forever in both directions.</p>		<p>Line ℓ, line AB, line BA, \overleftrightarrow{AB}, or \overleftrightarrow{BA}</p>
<p>A plane is a flat surface that has no thickness and extends forever.</p>		<p>A script capital letter, or three points on the plane that do not all lie on a line. plane M, or plane JKL</p>

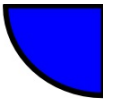
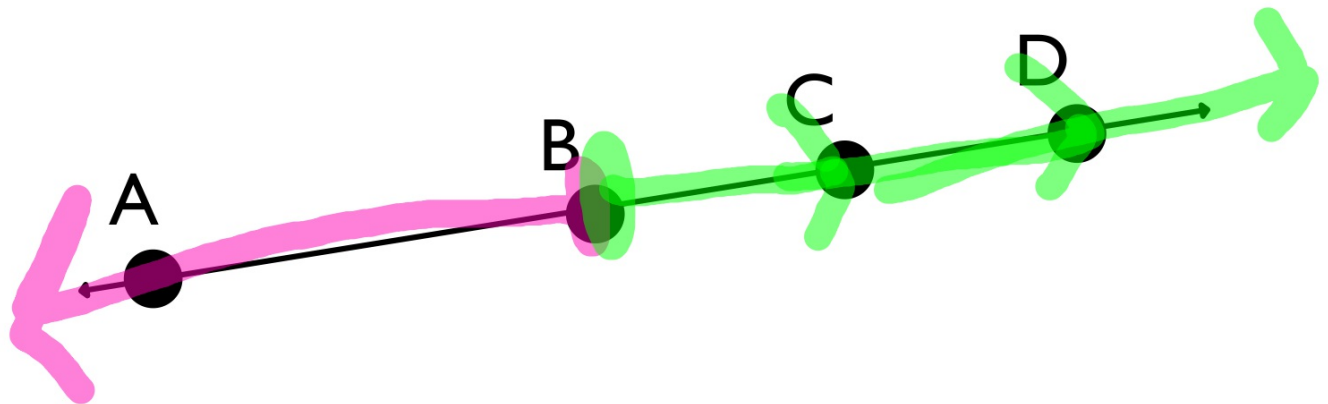
As shown in the following table, other terms can be defined using the above terms as building blocks.

Term	Geometric Figure	Ways to Reference the Figure
A line segment (or <i>segment</i>) is a portion of a line consisting of two points and all points between them.		Line segment CD , line segment DC , \overline{CD} , or \overline{DC}
A ray is a portion of a line that starts at a point and continues forever in one direction.		Ray GH or \overrightarrow{GH}

An **endpoint** is a point at either end of a line segment or the starting point of a ray. In the above examples, C and D are the endpoints of \overline{CD} , and point G is the endpoint of \overrightarrow{GH} .

Opposite Rays

Rays contained in the same _____
which have common _____



1

EXAMPLE

Naming Geometric Figures

Use the figure at the right in Parts A and B.



A One name for the line shown in the figure is \overleftrightarrow{PQ} .

Other names for \overleftrightarrow{PQ} are \overleftrightarrow{QP} line m

B \overline{PQ} is a line segment because it is a portion of a line consisting of two points and all the points between them.

Other names for \overline{PQ} are \overline{QP}

REFLECT

- 1a.** Why does the order in which you name the points when you name a ray matter? Use points P and Q in your answer.

It has an endpoint and direction.

SPACE ★

★ COLLINEAR POINTS

Diagram

★ NONCOLLINEAR POINTS

Diagram



COPLANAR POINTS

Diagram



NONCOPLANAR POINTS

Diagram

NOTE: 

Classify each statement as true or false

1

2

3

4

5

TRUE

FALSE

Classify each statement as true or false

6

7

8

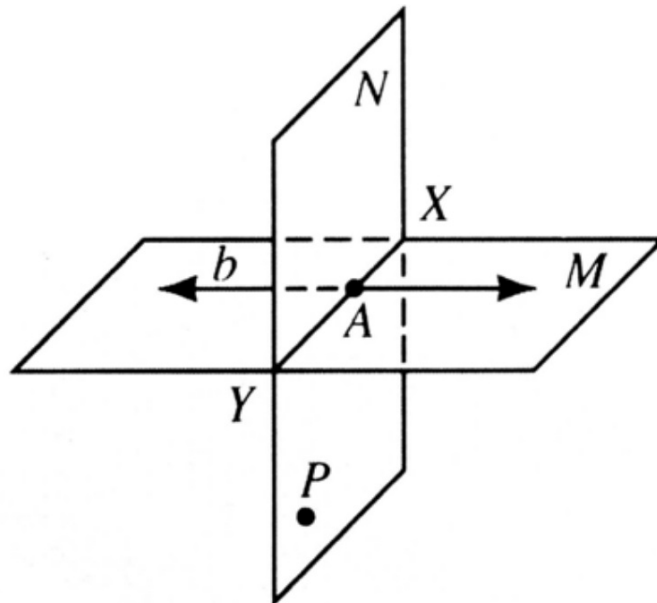
9

TRUE

FALSE

Use the diagram to classify each statement as true or false

I P is in M

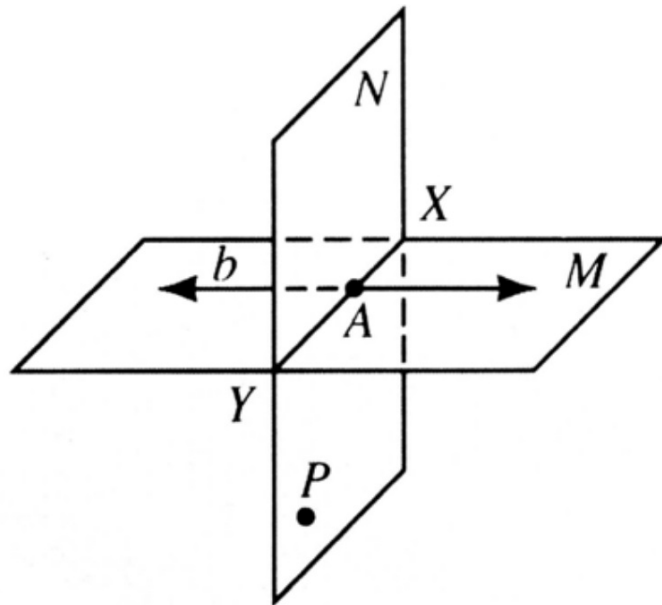


TRUE

FALSE

Use the diagram to classify each statement as true or false

2 b is in M

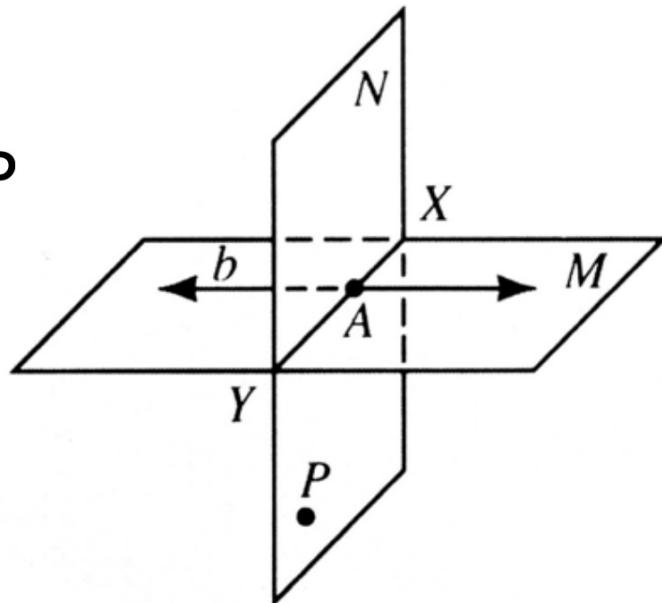


TRUE

FALSE

Use the diagram to classify each statement as true or false

3 \leftrightarrow YX contains P

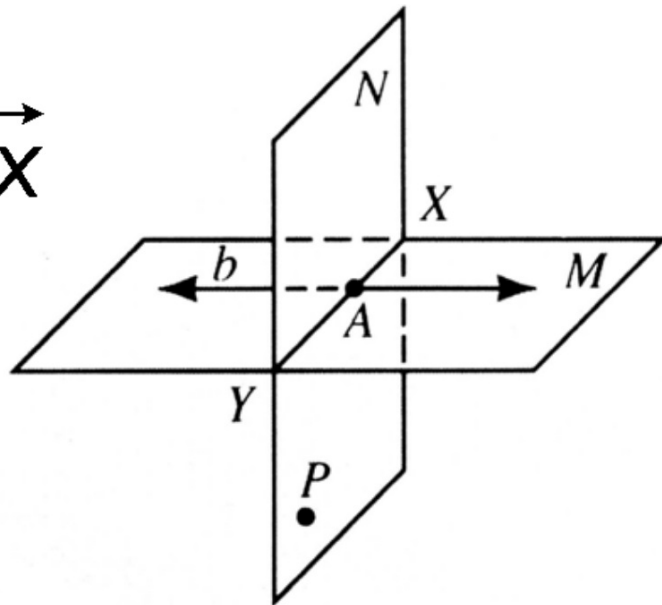


TRUE

FALSE

Use the diagram to classify each statement as true or false

4 M contains \overleftrightarrow{YX}

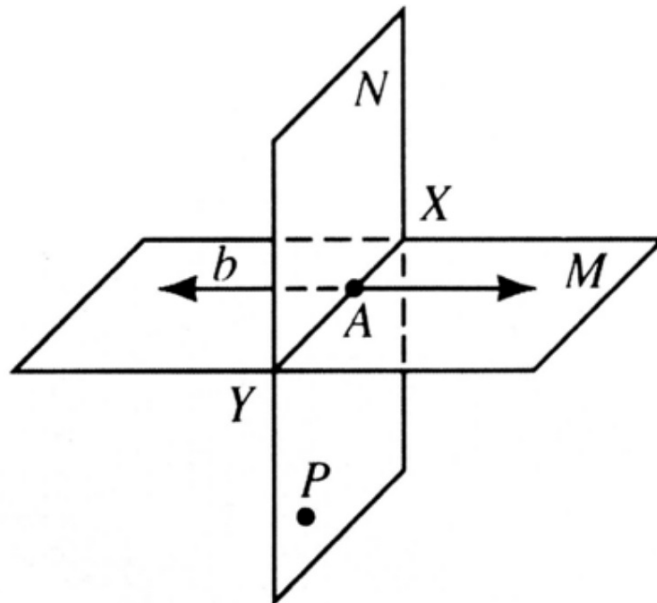


TRUE

FALSE

Use the diagram to classify each statement as true or false

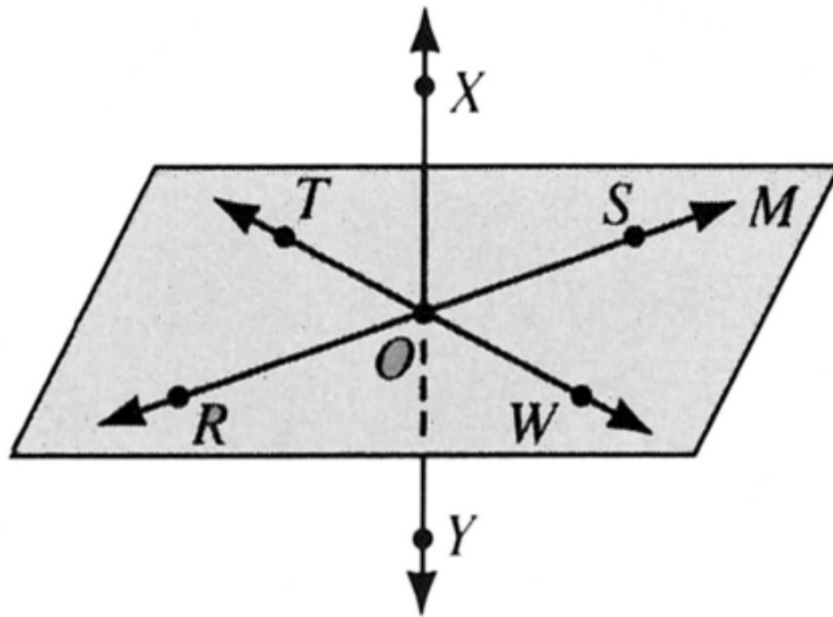
5 A is on b



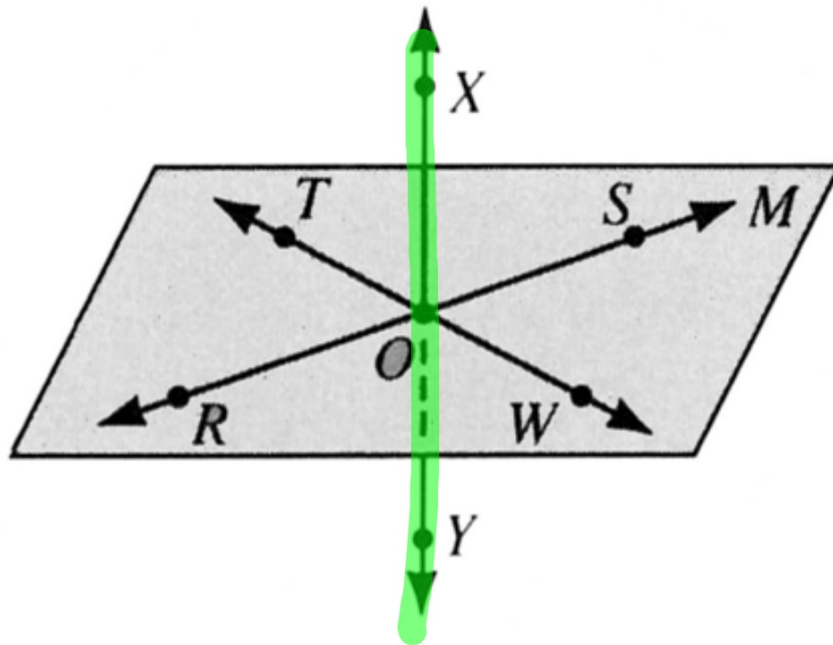
TRUE

FALSE

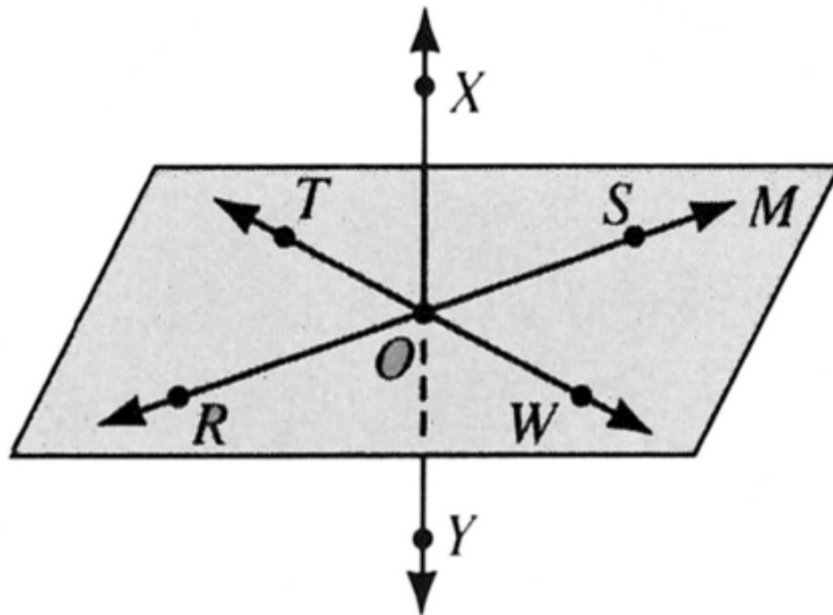
Is line TW contained in plane M ?



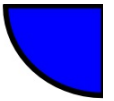
Is line XY contained in plane M ?



Name the intersection of plane M and line XY



PRACTICE



Use the figure to name each of the following.

1. a line

\overleftrightarrow{KL} \overleftrightarrow{LK}

2. two line segments

\overline{JK} \overline{KJ} \overline{KL} \overline{LK}

3. three rays

\overrightarrow{KJ}



Imagine four different points, A , B , C , and D , all lie on a line in that order.

4. Name two rays contained in the line that have no points in common.

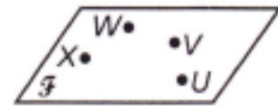
5. Name two rays contained in the line that have exactly one point in common.

6. Name two rays contained in the line that have more than one point in common.
Describe the points that the rays have in common.

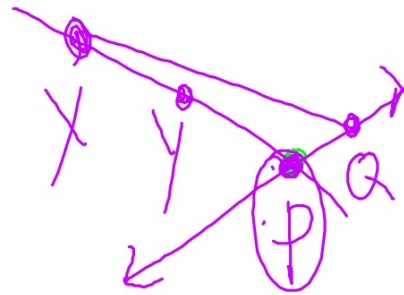


The figure at the right shows plane F containing points U , V , W , and X .

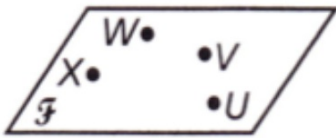
7. What are some ways to name plane F using the points?



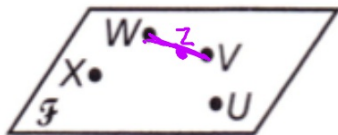
noncollinear



8. What are the names of some lines that are contained in the plane?



9. Suppose point Z is placed somewhere along \overleftrightarrow{VW} . Why is “plane VZW ” not used as another name for plane F ?

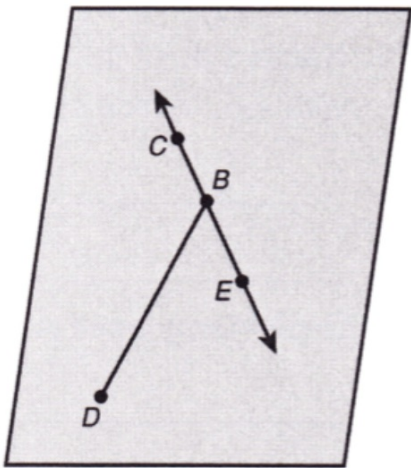


Additional Practice

(Page 7) HW

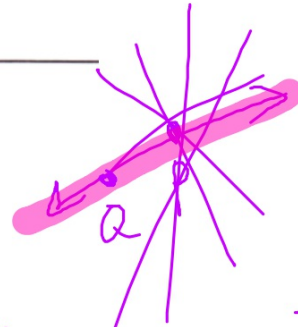
Use the figure for Exercises 1–7.

1. Name a plane. _____

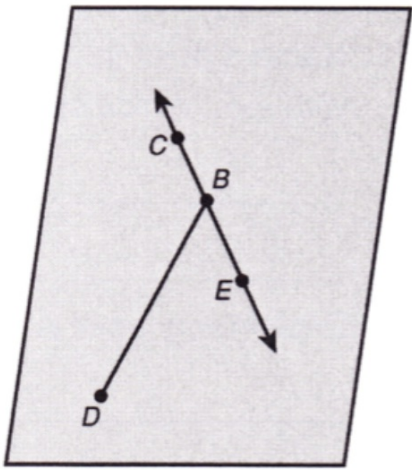


3

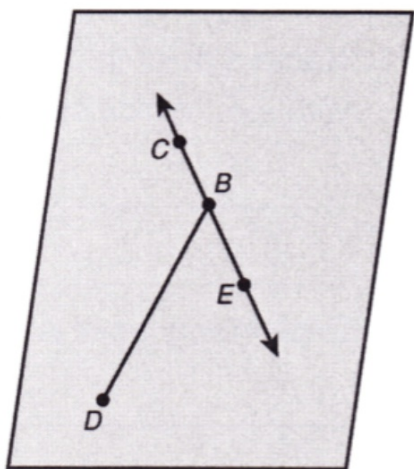
NON collinear points



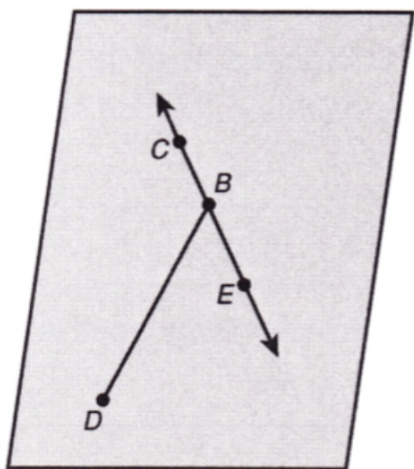
2. Name a segment. _____



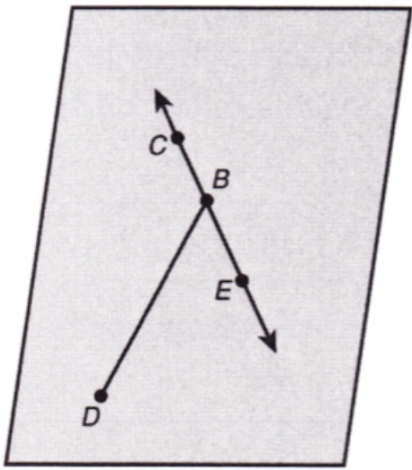
3. Name a line. _____



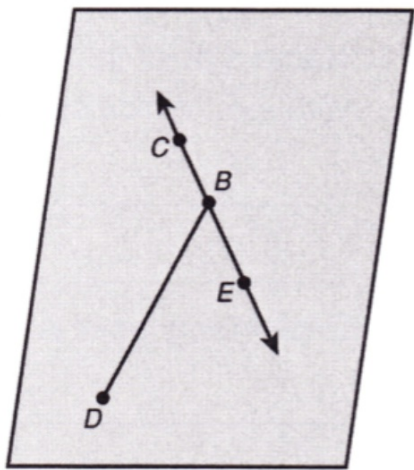
4. Name three collinear points.



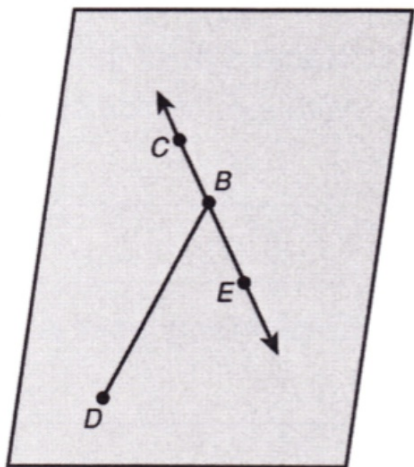
5. Name three noncollinear points.



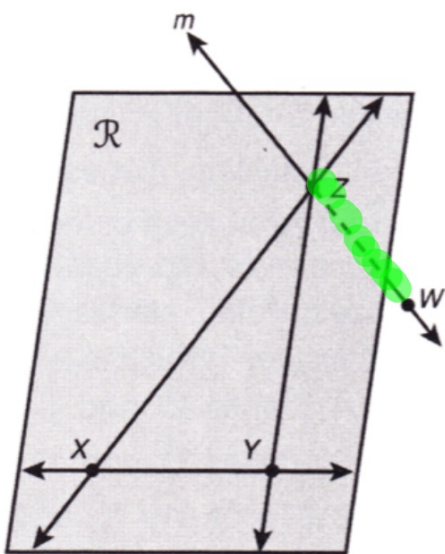
6. Name the intersection of a line and a segment not on the line.



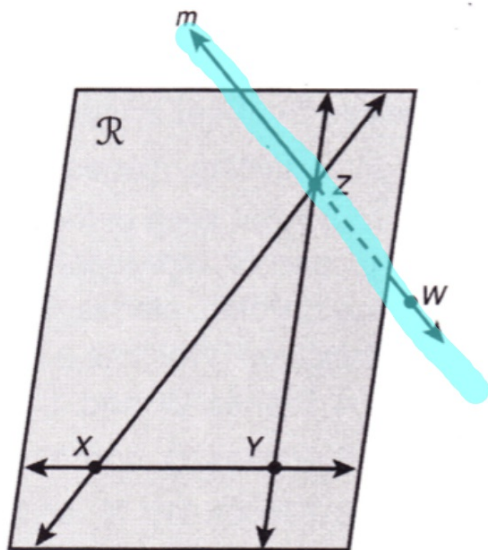
7. Name a pair of opposite rays. _____



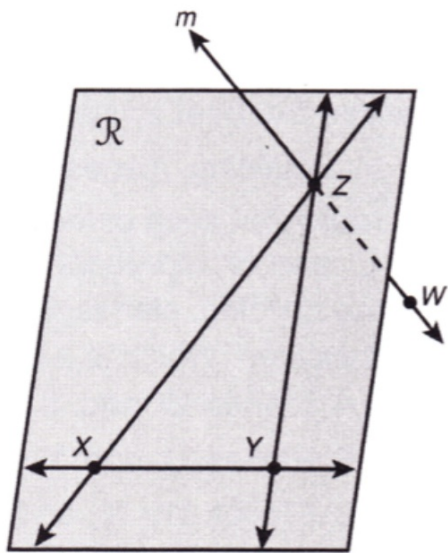
8. Name the points that determine plane \mathcal{R} .



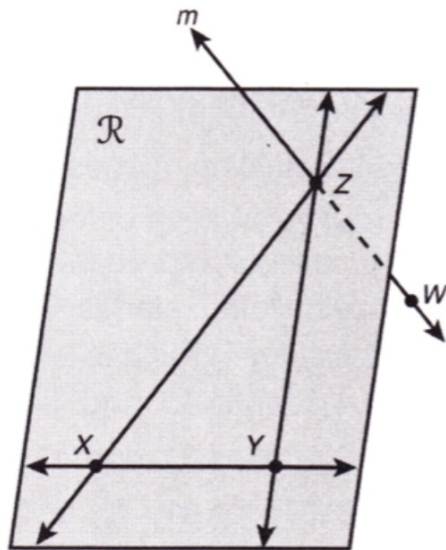
9. Name the point at which line m intersects plane R . _____



10. Name two lines in plane \mathcal{R} that intersect line m .



11. Name a line in plane \mathcal{R} that does not intersect line m . _____



Draw your answers in the space provided.

Michelle Kwan won a bronze medal in figure skating at the 2002 Salt Lake City Winter Olympic Games.

- Michelle skates straight ahead from point *L* and stops at point *M*. Draw her path.



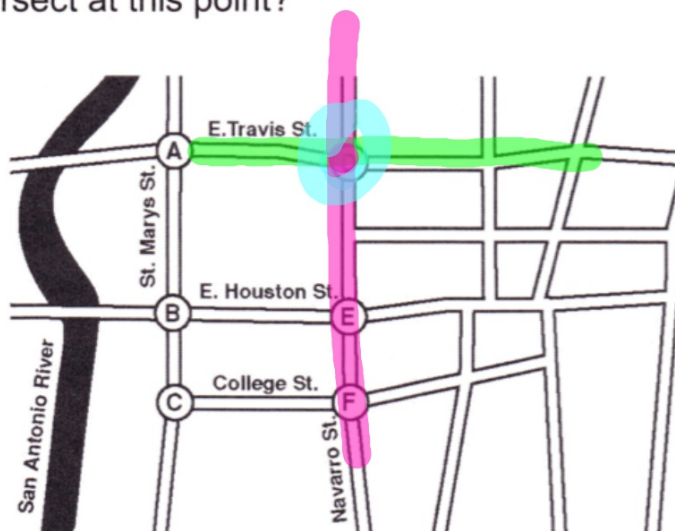
13. Michelle skates straight ahead from point L and continues through point M . Name a figure that represents her path.
Draw her path.

14. Michelle and her friend Alexei start back to back at point L and skate in opposite directions. Michelle skates through point M , and Alexei skates through point K . Draw their paths.

Problem Solving (page 8)

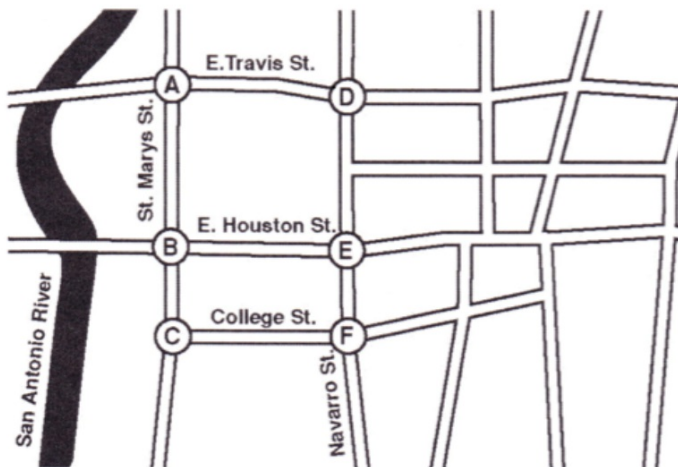
Use the map of part of San Antonio for Exercises 1 and 2.

1. Name a point that appears to be collinear with \overline{EF} . Which streets intersect at this point?



Use the map of part of San Antonio for Exercises 1 and 2.

2. Explain why point A is NOT collinear with \overline{BE} .



3. Suppose \overline{UV} represents the pencil that you are using to do your homework and plane P represents the paper that you are writing on. Describe the relationship between \overline{UV} and plane P .

4. Two cyclists start at the same point, but travel along two straight streets in different directions. If they continue, how many times will their paths cross again? Explain.

Choose the best answer.

5. In a building, planes W, X, and Y represent each of the three floors; planes Q and R represent the front and back of the building; planes S and T represent the sides. Which is a true statement?
- A Planes W and Y intersect in a line.
 - B Planes Q and X intersect in a line.
 - C Planes W, X, and T intersect in a point.
 - D Planes Q, R, and S intersect in a point.

6. Suppose point G represents a duck flying over a lake, points H and J represent two ducks swimming on the lake, and plane L represents the lake. Which is a true statement?

F There are two lines through G and J .

G The line containing G and H lies in plane L .

H G , H , and J are noncoplanar.

J There is exactly one plane containing points G , H , and J .

Use the figure for Exercise 7.

7. A frame holding two pictures sits on a table. Which is NOT a true statement?

- A \overline{PN} and \overline{NM} lie in plane T.
- B \overline{PN} and \overline{NM} intersect in a point.
- C \overline{LM} and N intersect in a line.
- D P and \overline{NM} are coplanar.

