

1-1

Understanding Points, Lines, and Planes

Warm Up

Lesson Presentation

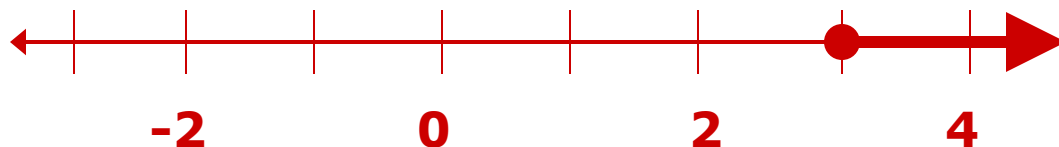
Lesson Quiz

1-1 Understanding Points, Lines, and Planes

Warm Up

Graph each inequality.

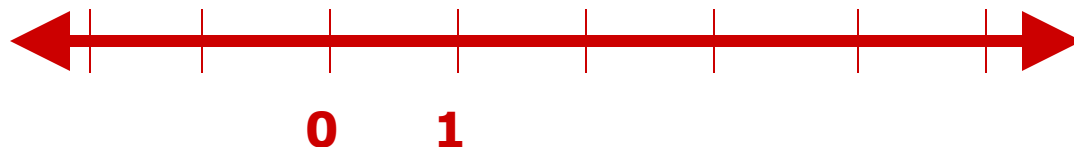
1. $x \geq 3$



2. $2 \leq x \leq 6$



3. $x < 1$ OR $x > 0$



1-1 Understanding Points, Lines, and Planes

Standard U1S1

Identify, name, and draw points, lines, segments, rays, and planes.

Apply basic facts about points, lines, and planes.

1-1 Understanding Points, Lines, and Planes

Vocabulary

undefined term

point

line

plane

collinear

coplanar

segment

endpoint

ray

opposite rays


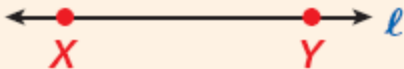

postulate

1-1 Understanding Points, Lines, and Planes

The most basic figures in geometry are **undefined terms**, which cannot be defined by using other figures. The undefined terms *point*, *line*, and *plane* are the building blocks of geometry.

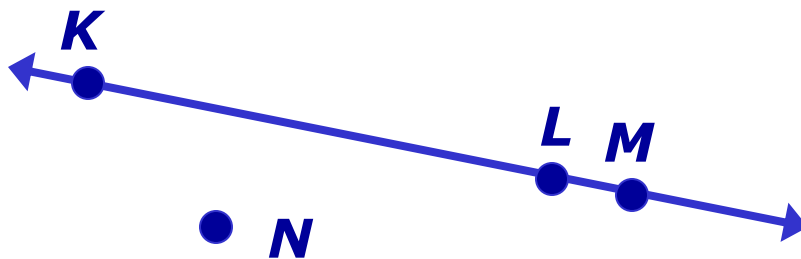
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Undefined Terms

TERM	NAME	DIAGRAM
A point names a location and has no size. It is represented by a dot.	A capital letter point P	
A line is a straight path that has no thickness and extends forever.	A lowercase letter or two points on the line line ℓ , \overleftrightarrow{XY} or \overleftrightarrow{YX}	
A plane is a flat surface that has no thickness and extends forever.	A script capital letter or three points not on a line plane \mathcal{R} or plane ABC	

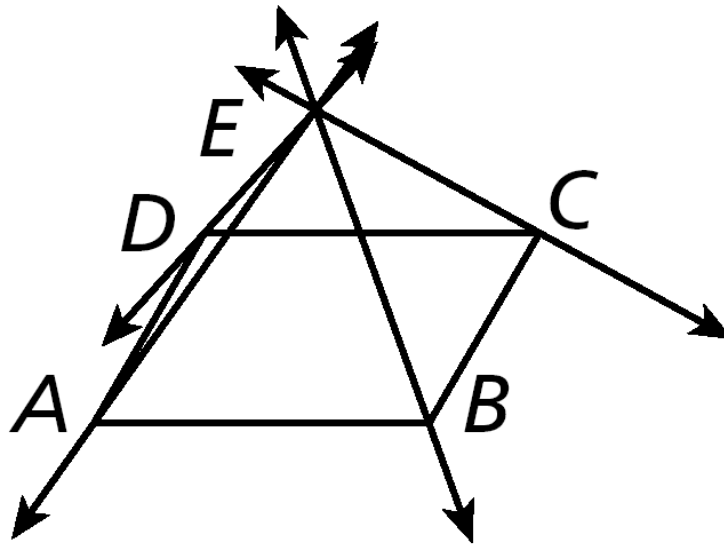
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Points that lie on the same line are **collinear**. K , L , and M are collinear. K , L , and N are *noncollinear*. Points that lie on the same plane are **coplanar**. Otherwise they are *noncoplanar*.



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Example 1: Naming Points, Lines, and Planes



A. Name four coplanar points.

A, B, C, D

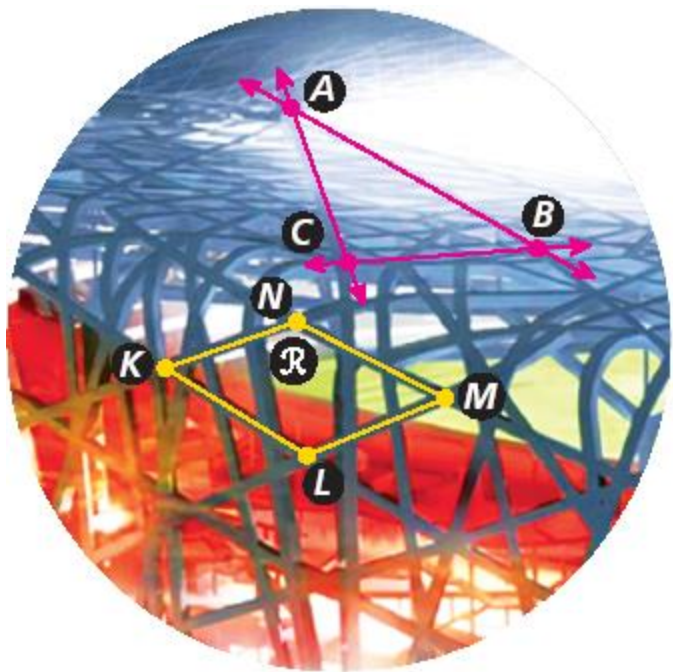
B. Name three lines.

Possible answer: \overleftrightarrow{AE} , \overleftrightarrow{BE} , \overleftrightarrow{CE}

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Check It Out! Example 1

Use the diagram to name two planes.

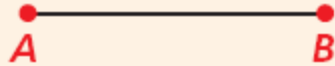





Possible answer:

Plane R and plane ABC .

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Segments and Rays

DEFINITION	NAME	DIAGRAM
A segment , or line segment, is the part of a line consisting of two points and all points between them.	The two endpoints \overline{AB} or \overline{BA}	
An endpoint is a point at one end of a segment or the starting point of a ray.	A capital letter C and D	
A ray is a part of a line that starts at an endpoint and extends forever in one direction.	Its endpoint and any other point on the ray \overrightarrow{RS}	
Opposite rays are two rays that have a common endpoint and form a line.	The common endpoint and any other point on each ray \overrightarrow{EF} and \overrightarrow{EG}	

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Example 2: Drawing Segments and Rays

Draw and label each of the following.

A. a segment with endpoints M and N .



B. opposite rays with a common endpoint T .



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Check It Out! Example 2

Draw and label a ray with endpoint M that contains N .



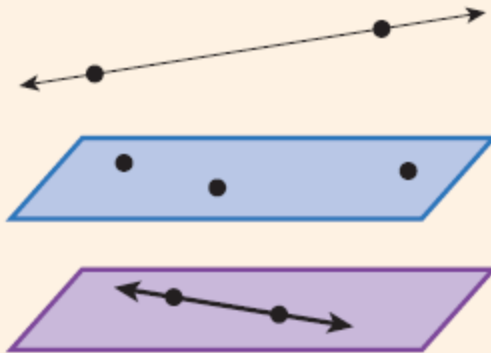
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A **postulate**, or *axiom*, is a statement that is accepted as true without proof. Postulates about points, lines, and planes help describe geometric properties.

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Postulates Points, Lines, and Planes

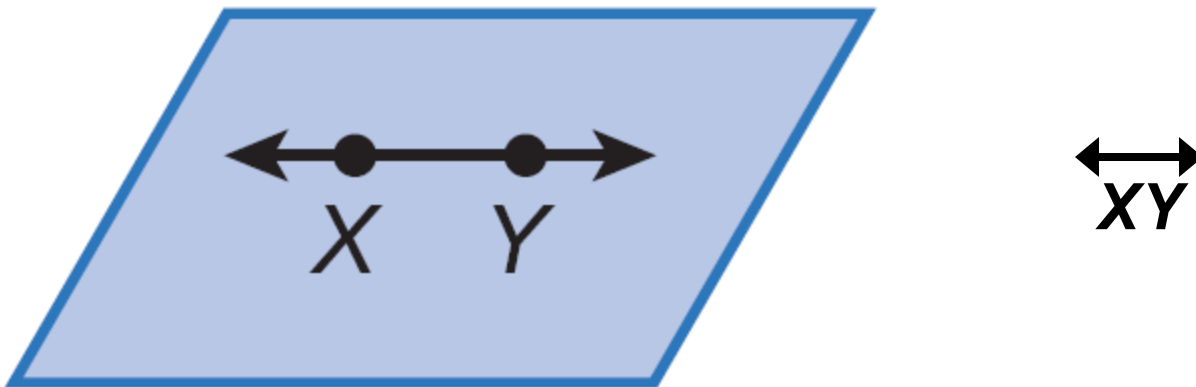
- 1-1-1** Through any two points there is exactly one line.
- 1-1-2** Through any three noncollinear points there is exactly one plane containing them.
- 1-1-3** If two points lie in a plane, then the line containing those points lies in the plane.



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Example 3: Identifying Points and Lines in a Plane

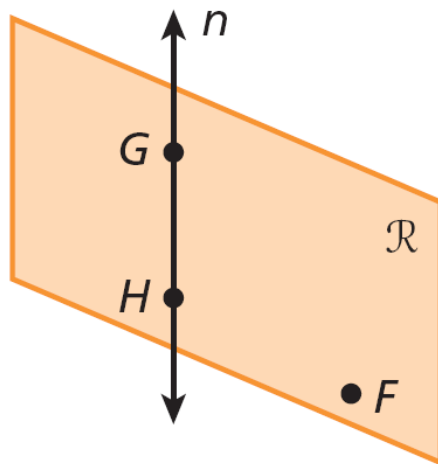
Name a line that passes through two points.



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Check It Out! Example 3

Name a plane that contains three noncollinear points.



Possible answer: plane GHF

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Recall that a system of equations is a set of two or more equations containing two or more of the same variables. The coordinates of the solution of the system satisfy all equations in the system. These coordinates also locate the point where all the graphs of the equations in the system *intersect*.

An intersection is the set of all points that two or more figures have in common. The next two postulates describe intersections involving lines and planes.

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Postulates

Intersection of Lines and Planes

- 1-1-4** If two lines intersect, then they intersect in exactly one point.
- 1-1-5** If two planes intersect, then they intersect in exactly one line.

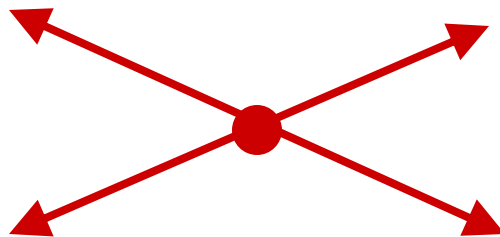
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Use a dashed line to show the hidden parts of any figure that you are drawing. A dashed line will indicate the part of the figure that is not seen.

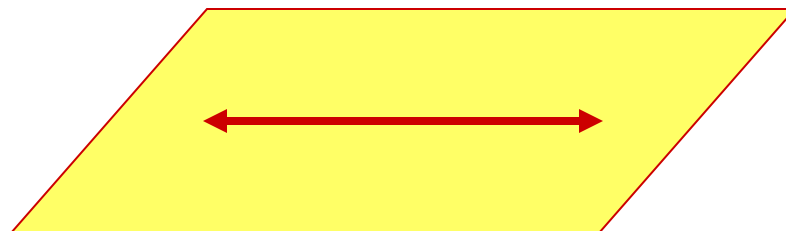
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Example 4: Representing Intersections

A. Sketch two lines intersecting in exactly one point.



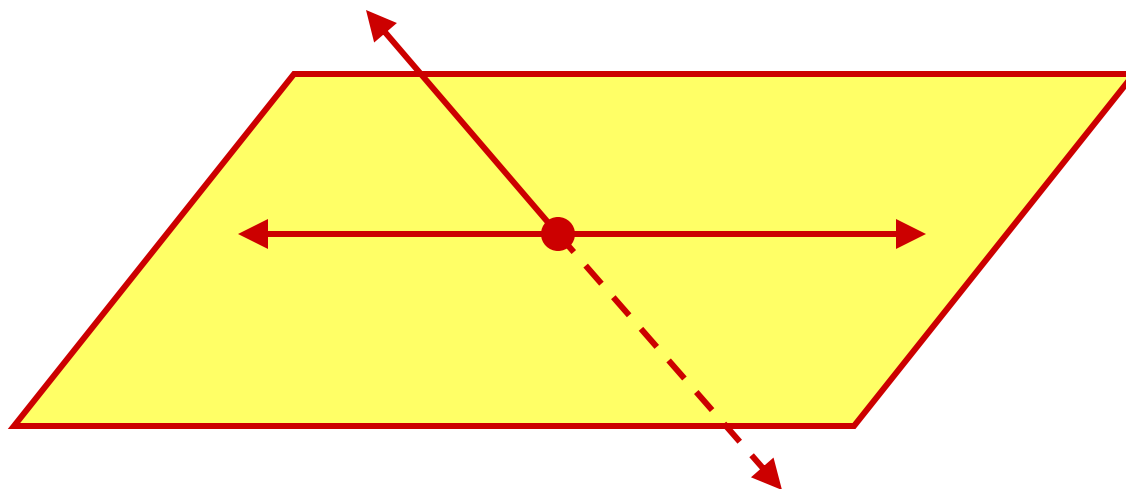
B. Sketch a figure that shows a line that lies in a plane.



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Check It Out! Example 4

Sketch a figure that shows two lines intersect in one point in a plane, but only one of the lines lies in the plane.



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Lesson Quiz: Part I

1. Two opposite rays.

\overrightarrow{CB} and \overrightarrow{CD}

2. A point on \overrightarrow{BC} .

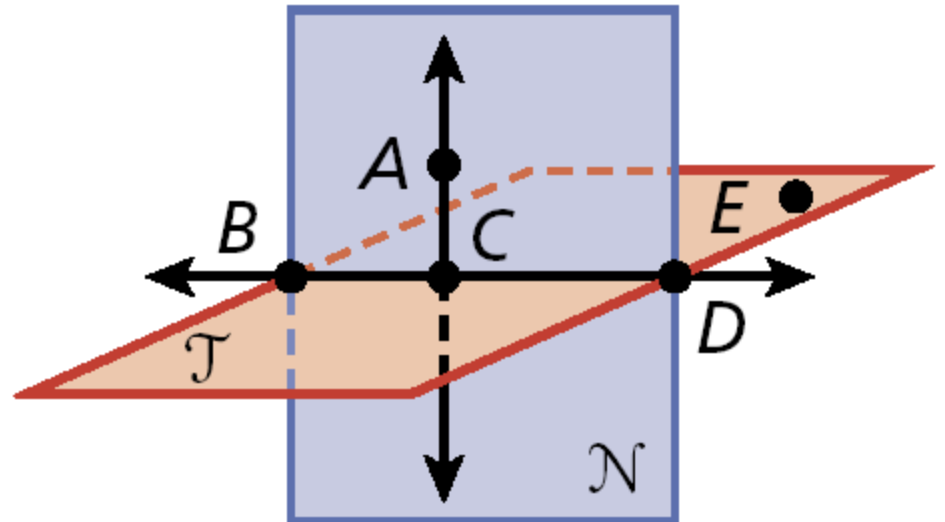
Possible answer: D

3. The intersection of plane \mathcal{N} and plane \mathcal{T} .

Possible answer: \overleftrightarrow{BD}

4. A plane containing E , D , and B .

Plane \mathcal{T}

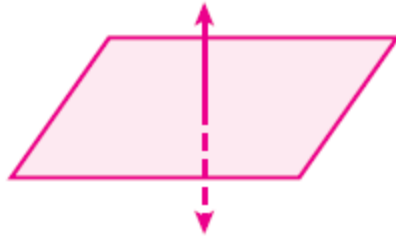


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Lesson Quiz: Part II

Draw each of the following.

5. a line intersecting a plane at one point



6. a ray with endpoint P that passes through Q

