

Points, Lines, and Planes

Undefined Terms

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They are considered undefined because we can not give a definition for them without using other geometric terms. We can, at best, describe them.

Points

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We name a point using a dot with a capital letter.

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•A

Lines

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or as a single lowercase letter such as m .



Planes

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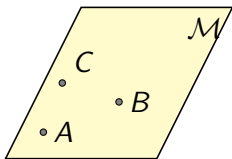
A plane contains infinitely many lines.

Planes

Description: Flat surface that extends without end.

A plane contains infinitely many lines.

We name a plane either by using a capital scripted letter such as \mathcal{M} , or by at least 3 points not on the same line such as ABC .



Defined Terms Based on Undefined Terms

Now that we have the undefined terms above, we can define other geometry vocabulary in terms of them.

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Collinear Points

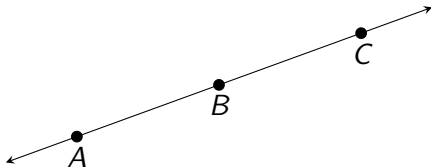
Collinear points are points that lie on the same line.

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Collinear Points

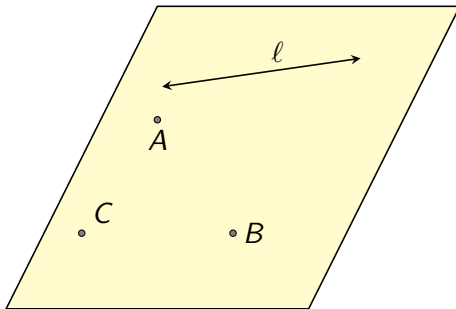
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Coplanar Points

Coplanar Points

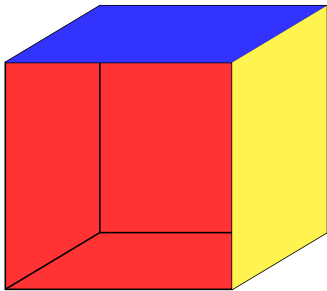
Coplanar points are points and lines that lie on the same plane.



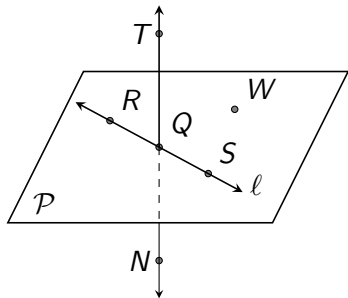
Space

Space

Space is the set of all points in 3 dimensions.

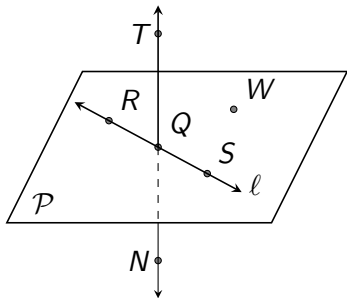


Example 1



- (a) What are two other ways to name \overleftrightarrow{QT} ?

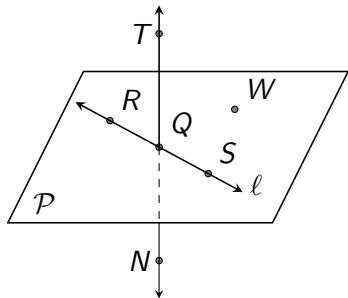
Example 1



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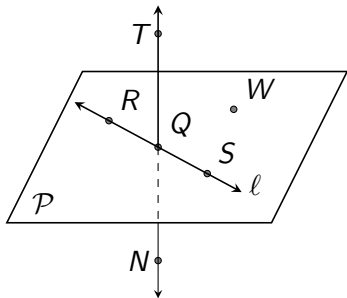
\overleftrightarrow{QN} and \overleftrightarrow{TN}

Example 1



(b) What are two other ways to name P ?

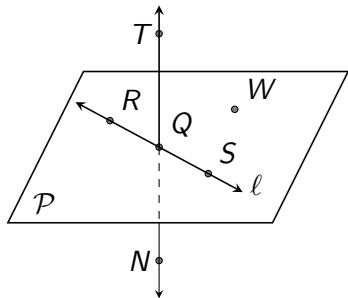
Example 1



(b) What are two other ways to name P ?

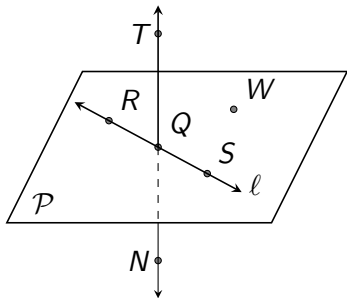
plane RQW , plane RSW , and plane QSW

Example 1



(c) What are the names of 3 collinear points?

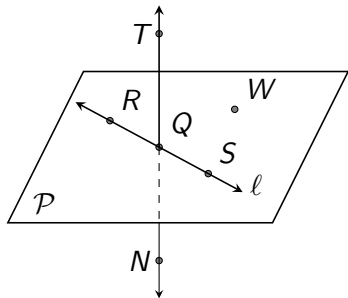
Example 1



(c) What are the names of 3 collinear points?

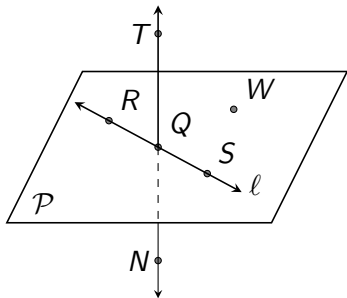
R , Q , and S as **well as** T , Q , and N

Example 1



(d) What are the names of 4 coplanar points?

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R , Q , S , and W

Segments

Segment

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We name segments by the 2 endpoints such as \overline{AB} or \overline{BA} .



Rays

Ray

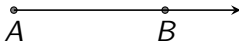
A **ray** is part of a line that consists of 1 endpoint and all the points on the line on one side of the endpoint.

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We name a ray by its endpoint and any point on the ray, such as \overrightarrow{AB} .



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Note: \overrightarrow{AB} is not the same as \overrightarrow{BA}

Opposite Rays

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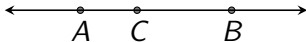
Opposite rays are two rays that share an endpoint and form a line.

Opposite Rays

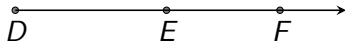
Opposite Rays

Opposite rays are two rays that share an endpoint and form a line.

We name opposite rays by their shared endpoint and any point on each ray such as \overrightarrow{CA} or \overrightarrow{CB} .

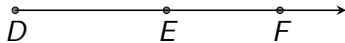


Example 2



- (a) What are the names of the segments in the figure?

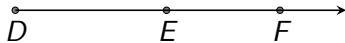
Example 2



(a) What are the names of the segments in the figure?

\overline{DE} , \overline{ED} , \overline{DF} , \overline{FD} , \overline{EF} , \overline{FE}

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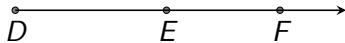


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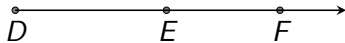
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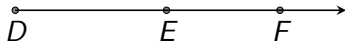
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There aren't any

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- If 2 different lines intersect, they intersect at a point.
- If 2 different planes intersect, they intersect at a line.

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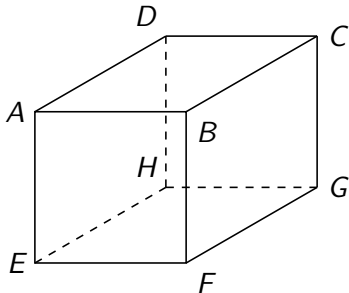
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Some Geometry Postulates:

- Through any two points there is a line.
- If 2 different lines intersect, they intersect at a point.
- If 2 different planes intersect, they intersect at a line.
- You can draw a plane through any 3 noncollinear points.

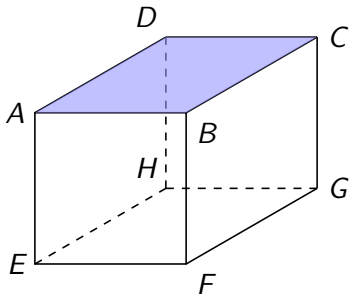
Example 3

Each surface of the box represents a plane. What is the intersection of plane ADC and plane BFG ?



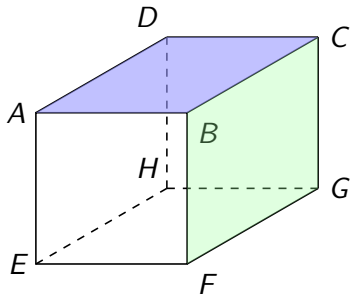
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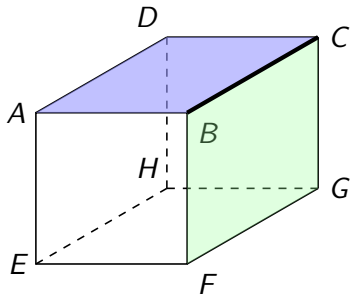
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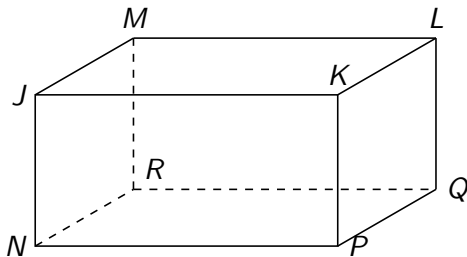
\overleftrightarrow{BC}

Naming Planes

When naming planes with 4 or more points, list the points in order either clockwise or counterclockwise.

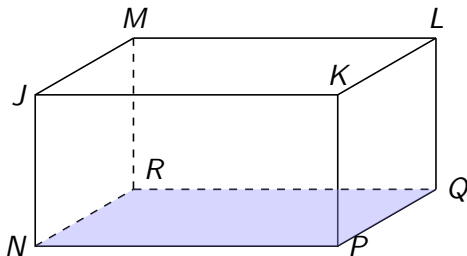
Example 4

(a) What plane contains N , P , and Q ?



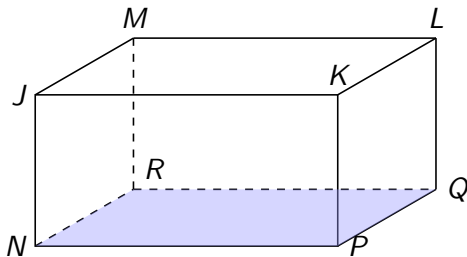
Example 4

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Example 4

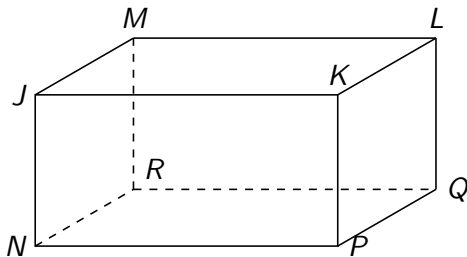
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plane NPR

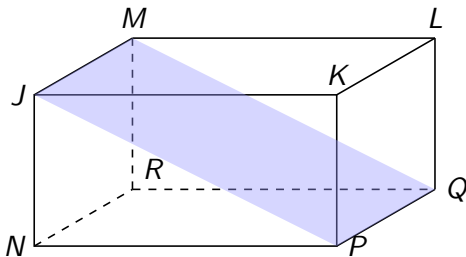
Example 4

(b) What plane contains J , M , and Q ?



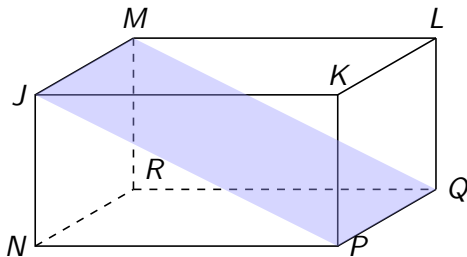
Example 4

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plane JMQ