Lesson 1.1 Points, Lines, Planes

Tuesday, August 15, 2023 6:56 PM

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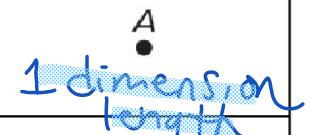
PointsLines Planes

Lesson 1.1 Points, Lines, and Planes

MA.912.GR.1.1
Prove relationships and theorems about lines and angles. Solve mathematical and real-world problems involving postulates, relationships and theorems of lines and angles.

Content Objective
Students will analyze figures to identify points, lines, and planes and identify intersections of lines and planes.

Learn
Points, Lines, and Planes

Undefined Terms	
A **point** is a location. It has neither shape nor size. 0 dimension Named by a capital letter Example point *A*	 1 dimension length
A **line** is made up of points and has no thickness or width. There is exactly one line through any two points. Named by the letters representing two points on the line or a lowercase script letter Example line m, line PQ or $\overleftrightarrow{PQ}$, line QP or $\overleftrightarrow{QP}$	

line or a lowercase script letter

Example line m, line PQ or $\overleftrightarrow{PQ}$, line QP or $\overleftrightarrow{QP}$

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Learn
Points, Lines, and Planes

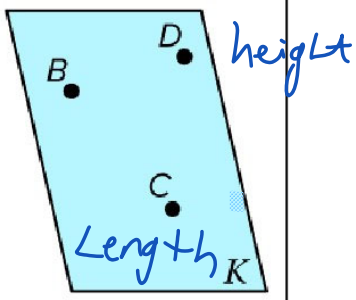
Undefined Terms

2-Dimension

A **plane** is a flat surface made up of points that extends infinitely in all directions. There is exactly one plane through any three points not on the same line.

Named by a capital script letter or by the letters naming three points that are not all on the same line

Example plane $\mathcal{K}$, plane *BCD*, plane *CDB*, plane *DCB*, plane *DBC*, plane *CBD*, plane *BDC*



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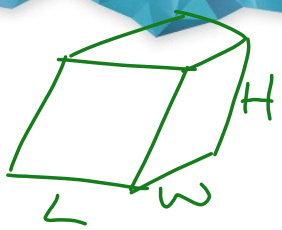
Learn
Points, Lines, and Planes

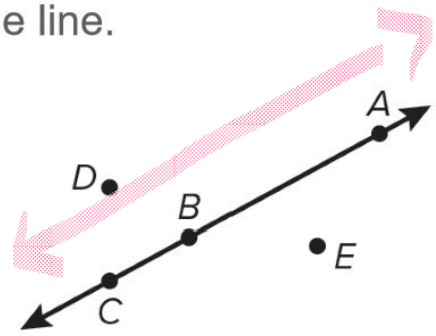


Space is defined as a boundless three-dimensional set of all points. Space can contain lines and planes.

Collinear points are points that lie on the same line.

Noncollinear points do not lie on the same lin

Points *A*, *B*, and *C* are collinear.



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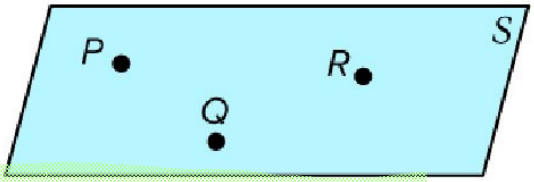
Learn
Points, Lines, and Planes

Coplanar points are points that lie in the same plane.
Noncoplanar points do not lie in the same plane.



Points *P*, *Q*, and *R* are coplanar in plane *S*.

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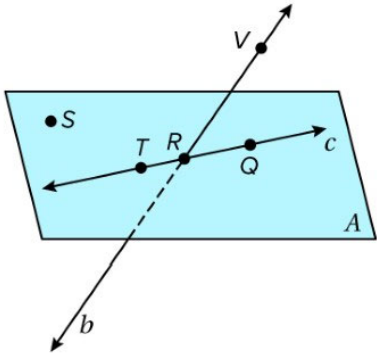
Example 1
Name Lines and Planes

Use the figure to name each of the following.

a. a line containing point *Q*

b. a plane containing point *S* and point *T*



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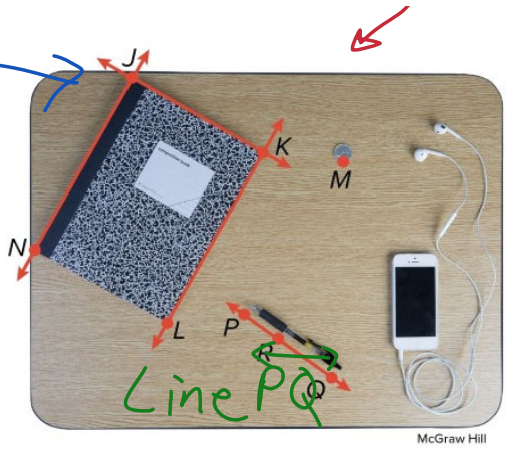
Example 2
Model Points, Lines, and Planes

STUDENT DESK Name the geometric terms modeled by the objects in the

STUDENT DESK Name the geometric terms modeled by the objects in the picture.

Plane JKL



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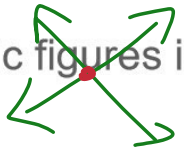
Learn
Intersections of Lines and Planes

The **intersection** of two or more geometric figures is the set of points they have in common.

Point



Two lines intersect in a _____.

point

Lines intersect planes at a _____.

line

Planes intersect each other at a _____.

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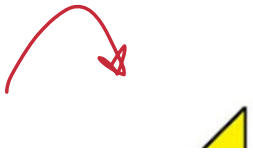
Learn
Intersections of Lines and Planes

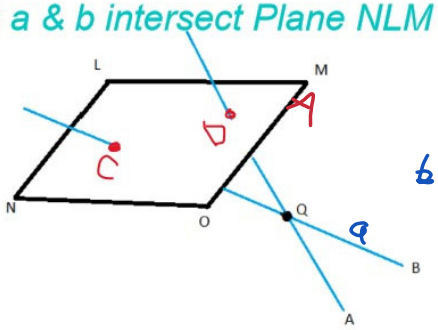
Two lines intersect in a _point_. Lines intersect planes at a _point_. Planes intersect each other at a _line_.

*line a & b intersect at Point Q.

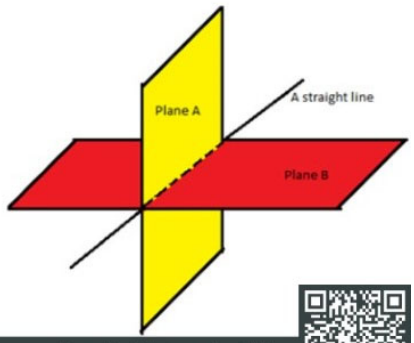
*lines a & b intersect Plane NLM at a point C & D .



*lines a & b intersect Plane NLM at a point C & D .



*Plane A & Plane B intersect at line a



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Example 4
Interpret Drawings

Refer to the figure.

a. How many planes appear in this figure?

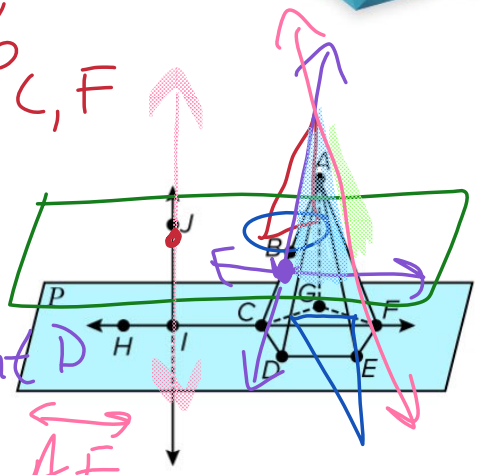
b. Name four points that ~~are collinear~~.

c. Name the intersection of plane *GAC* and plane $\mathcal{P}$.

d. Where does line JI intersect Plane P?

e. Where does line AD intersect line DE?

f. Where does Plane AFE intersect Plane ADE?



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Lesson 1.2 Line Segments

Sunday, August 20, 2023 10:00 PM

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Lesson 1.2 Line Segm...

Lesson 1.2 Line Segments

MA.912.GR.5.1

Construct a copy of a segment or an angle.

Content Objective

Students will calculate measures of line segments.

Learn
Betweenness of Points

A **line segment** is a measurable part of a line that consists of two points, called endpoints, and all of the points between them. The two endpoints are used to name the segment.

Line

Line segment

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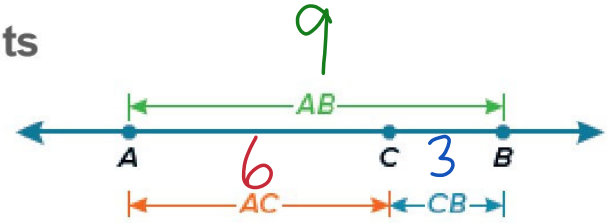
Learn
Betweenness of Points

Key Concept: Betweenness of Points

Point *C* is between *A* and *B* if and only if *A*, *B*, and *C* are collinear and $AC + CB = AB$.



$AC + CB = AB$

$6 + 3 = 9$

In the example above, line segment *AB*, also written $\overline{AB}$, has endpoints *A* and *B* and contains point *C*. *AB* is the measure of $\overline{AB}$, *AC* is the measure of $\overline{AC}$, and *CB* is the measure of $\overline{CB}$.

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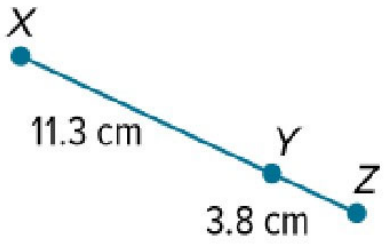
Example 1
Find Measurements by Adding

Find the measure of $\overline{XZ}$.

$$\begin{array}{r} {\scriptstyle 1\ \ \ \ \ } \\ 11.3 \\ +\ \ 3.8 \\ \hline 15.1 \end{array}$$



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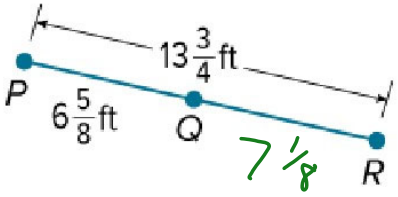
Example 2
Find Measurements by Subtracting

Find the measure of $\overline{QR}$.

4, 8, 12
8, 16

$$\begin{array}{r} 13\ \tfrac{3}{4} \\ -\ 6\ \tfrac{5}{8} \\ \hline 7\ \tfrac{1}{8} \end{array} \qquad \begin{array}{l} \times\tfrac{2}{2} \\ \tfrac{6}{8} \\ \tfrac{5}{8} \end{array}$$



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Example 3
Write and Solve Equations to Find Measurements

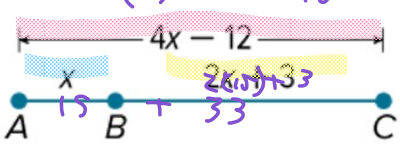
Find the value of *x* and *BC* if *B* is between *A* and *C*, $AC = 4x - 12$, $AB = x$, and $BC = 2x + 3$.

Find the value of x and BC if B is between A and C, $AC = 4x - 12$, $AB = x$, and $BC = 2x + 3$.

Step 1 Sketch two points and label them A and C. Connect the points.

Step 2 Sketch point B between points A and C.

Step 3 Label segments AB, BC, and AC with their given measures.



$x + 2x + 3 = 4x - 12$

$3x + 3 = 4x - 12$

$-3 \quad -3$

$3x = 4x - 15$

$-4x \quad -4x$

$-1x = -15$

$-1 \quad -1$

$x = 15$

$4(15) - 12 = 48$

$15 + 33 = 48$

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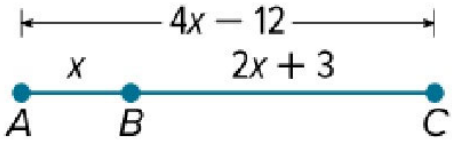
Example 3

Write and Solve Equations to Find Measurements

Step 4 Use betweenness of points to write an equation and solve for x.

Betweenness of points

$AC = AB + BC$



Step 5 Find *all the lengths to prove:*

$AB =$ **$BC =$** **$AC =$**

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Learn

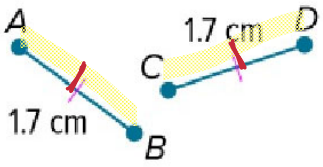
Line Segment Congruence

If two geometric figures have exactly the same shape and size, then they are **congruent**. Two segments that have the same measure are **congruent segments**.

Key Concept: Congruent Segments

$\cong$ is read *is congruent to*. Tick marks

Key Concept: Congruent Segments



≅ is read *is congruent to*. Tick marks on the figure also indicate congruence. Use a consecutive number of tick marks for each new pair of congruent segments in a figure.

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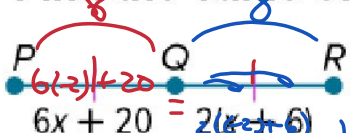
Example 5

Write and Solve Equations by Using Congruence

Find the value of *x*.



$6x + 20 = 2x + 12$

$-2x \quad -2x$

$4x + 20 = 12$

$-20 \quad -20$

$\frac{4x}{4} = \frac{-8}{4}$

$x = -2$

$6(-2) + 20 =$

$-12 + 20 = 8$

$2(-2 + 6)$

$2(4) = 8$

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Lesson 1.3 Locating Points Using Ratios (Partitioning)

Wednesday, August 23, 2023 8:51 PM

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1.3
Locating ...

Lesson 1.3 Locating Points Using Ratios

Workbook pages 23-30

Florida's B.E.S.T. Standards for Mathematics

MA.912.GR.3.3

Use coordinate geometry to solve mathematical and real-world geometric problems involving lines, circles, triangles and quadrilaterals.

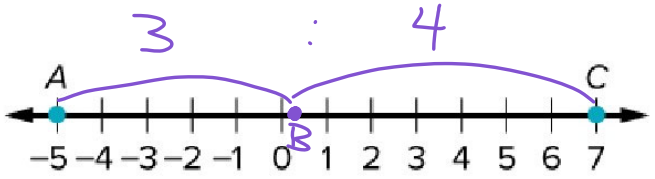
Content Objective

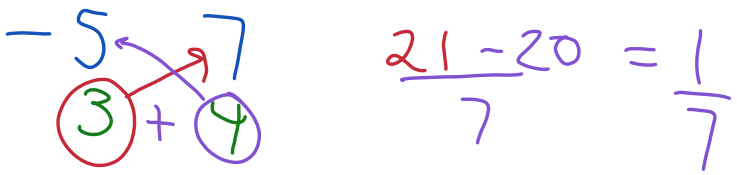
Students will find points that partition line segments on number lines and determine the coordinates of a point on a line segment that partitions the segment in a given ratio on the coordinate plane.

Example 1

Locate a Point on a Number Line When Given a Ratio

Find *B* on $\overline{AC}$ such that the ratio of *AB* to *BC* is 3:4.





Example 1
Locate a Point on a Number Line When Given a Ratio

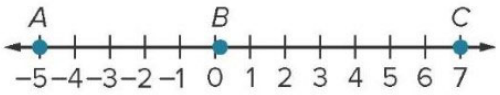
Use the Section Formula to determine the coordinate of point *B*.

$$B = \frac{nx_1 + mx_2}{m + n}$$

Section Formula

$$= \frac{4(-5)+3(7)}{3+4} = \frac{1}{7}$$

$m = 3$, $n = 4$, $x_1 = -5$, and $x_2 = 7$



So, *B* is located at $\frac{1}{7}$ on the number line.

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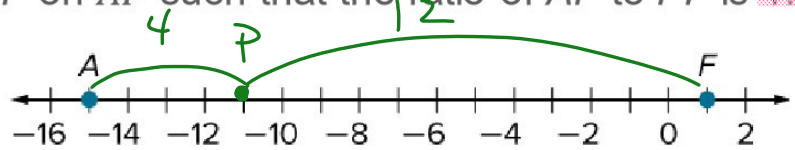
Example 1
Locate a Point on a Number Line When Given a Ratio

Check

Find *P* on $\overline{AF}$ such that the ratio of *AP* to *PF* is 1:3.

$\frac{4}{12}$ $\frac{1}{3}$



−15 → 1 + 3

$$\frac{1-45}{4} = \frac{-44}{4} = -11$$

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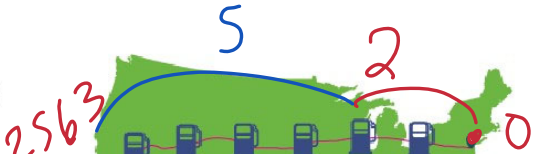
Example 2
Partition a Line Segment

ROAD TRIP Jorge is traveling 2563 miles from New York City to San Francisco by



ROAD TRIP Jorge is traveling 2563 miles from New York City to San Francisco by car. His next stop for gas will be when the ratio of the distance he has already traveled to the distance he still has to travel is 2:5. How far has Jorge traveled the next time he stops for gas?

$\frac{5126}{7} = 732.29$ miles

0 — 2563

2 + 5

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Example 2
Partition a Line Segment

Use the Section Formula to determine how far Jorge will have traveled when he stops for gas.

$B = \frac{nx_1 + mx_2}{m + n}$ Section Formula

$\frac{5(0) + 2(2563)}{2 + 5} \approx 732.3$ $m = 2$, $n = 5$, $x_1 = 0$, and $x_2 = 2563$

When Jorge has traveled approximately 732.3 miles from New York City, the ratio of the distance he has traveled to the distance that he still has to travel is 2:5.

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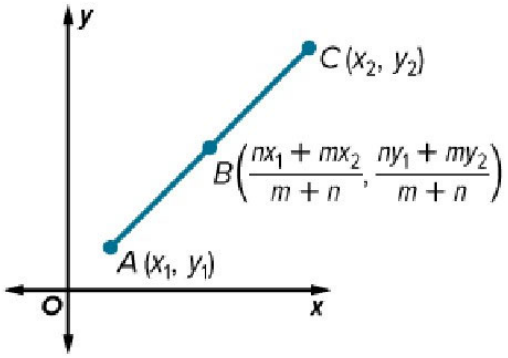
Learn

Locating Points on the Coordinate Plane with a Given Ratio

Key Concept: Section Formula on the Coordinate Plane

If A has coordinates (x_1, y_1) and C has coordinates (x_2, y_2), then a point B that partitions the line segment in a ratio of $m:n$ has coordinates $B\left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n}\right)$, where $m \neq n$.



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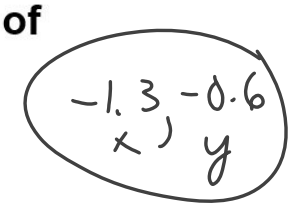
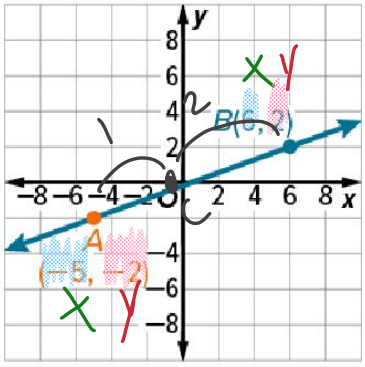
Example 3

Locate a Point on the Coordinate Plane When Given a Ratio

Find C on $\overline{AB}$ such that the ratio of AC to CB is 1:2.





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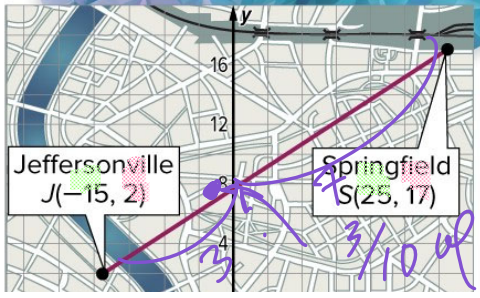
Example 4

Partition a Line Segment on the Coordinate Plane

Check

TRAVEL Andre is traveling from Jeffersonville to Springfield. He plans to



TRAVEL Andre is traveling from Jeffersonville to Springfield. He plans to stop for a break when the distance he has traveled and the distance he has left to travel have a ratio of 3:7. Where should Andre stop for his break?

$(-3, 6.5)$
$x \quad y$

3/10 of the way

2 + 17

3 + 7 total

$\frac{51+14}{3+7} = \frac{65}{10}$

$y = 6.5$

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