Geometry Unit 1: Length

Bronx Early College Academy

Christopher J. Huson PhD

9-23 September 2022

Learning Target: I can measure my world

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.1 Thursday 9 Sept

Do Now: Measurement

1. Diagram people closest to you and their distance
2. Early finishers: Calculate diagonal distances
3. (add classroom desk image, diagram, test instructions)

Lesson: Points, line segments, length; Segment addition postulate

Homework: Write for me your "math autobiography"

Take class notes in a composition book

Use this notebook format (required)

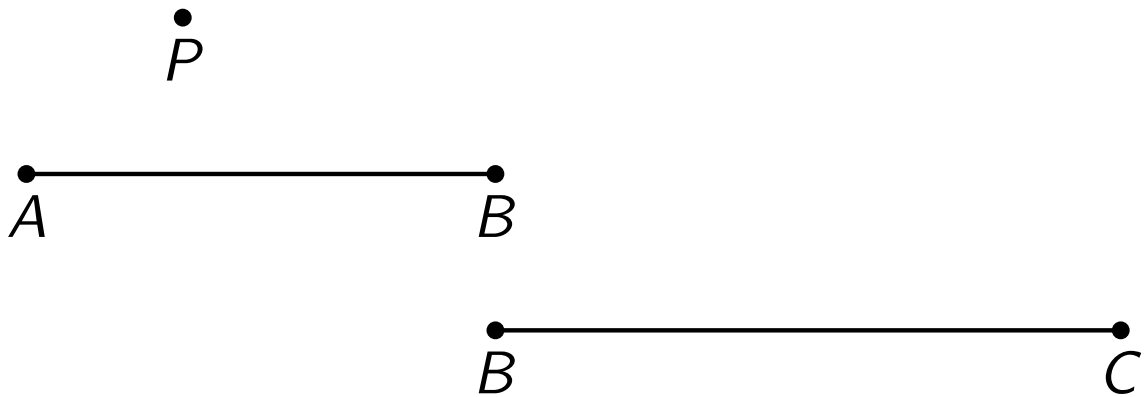
1. Vocabulary and notation
2. Copy definitions using your own words
3. Write down example diagrams and problems

Definitions:
Point: a location, a dot, has no size; label with capital letter, P

Line segment: two points and all the points between them; label with *end points* and a bar, $\overline{AB}$

Example: Points and line segments

Shown points P, A, B, C, line segments $\overline{AB}$, $\overline{BC}$



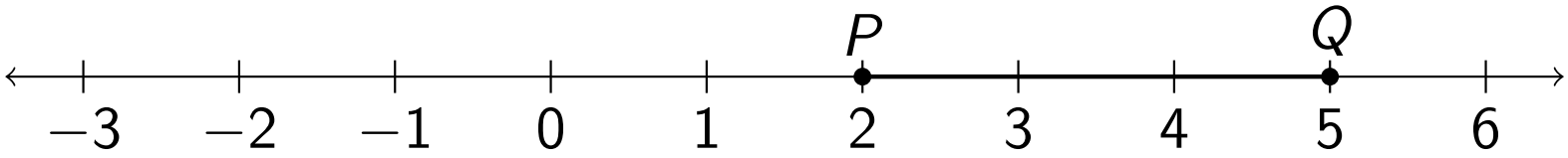
Given $AB = 3$, $BC = 4$.

Notation: the length of a line segment is written as the two end points without a bar over them, AB.

A number line is useful for calculating length or distance

Take the difference in the points' values

Given $\overline{PQ}$ as shown on the number line.

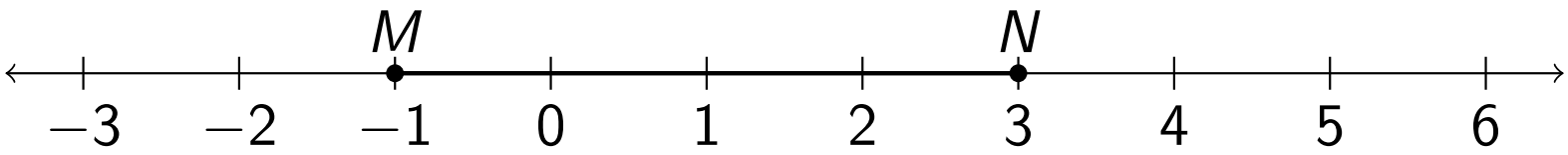


What is the distance on the number line between the points P and Q?

Negative number practice on a number line

Take the difference in the points' values. Check by counting the marks.

Given $\overline{MN}$ with $M(-1)$ and $N(3)$, as shown on the number line.



What is the length of the segment $\overline{MN}$? Show your work as an equation.

Can a length be a negative number?

Decimal practice on a number line

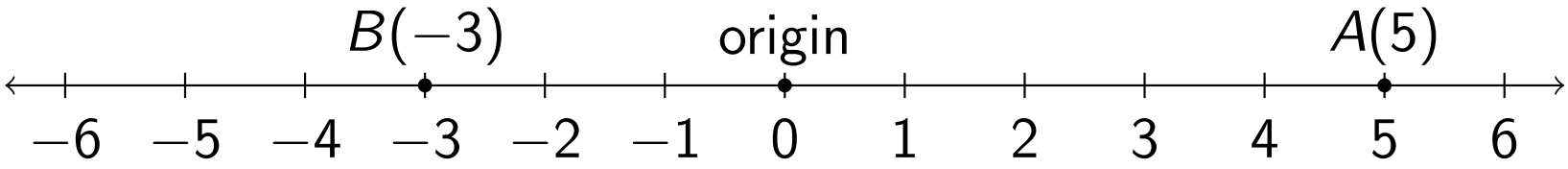
Mark the points then take the difference in the points' values.

Given $\overline{GH}$ with $G(1)$ and $H(4.5)$.

1. Mark and label the points and segment on the number line.
2. What is the length of the segment $\overline{GH}$? Show your work as an equation.

Absolute value: the distance from a point to the origin

Always a positive number (or zero)



The absolute value of 5 is 5. $|5| = 5$

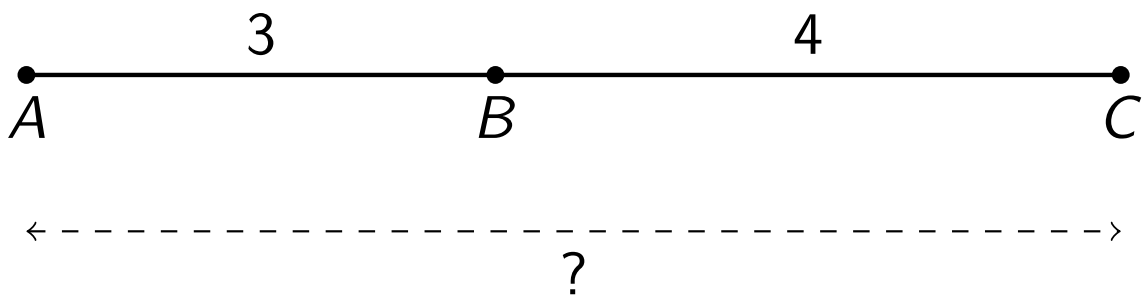
The absolute value of -3 is 3. $|-3| = 3$

Learning Target: I can solve for segment lengths

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.2 Friday 10 Sept

Shown *collinear* points A, B, C. Given $AB = 3$, $BC = 4$.

Find AC.



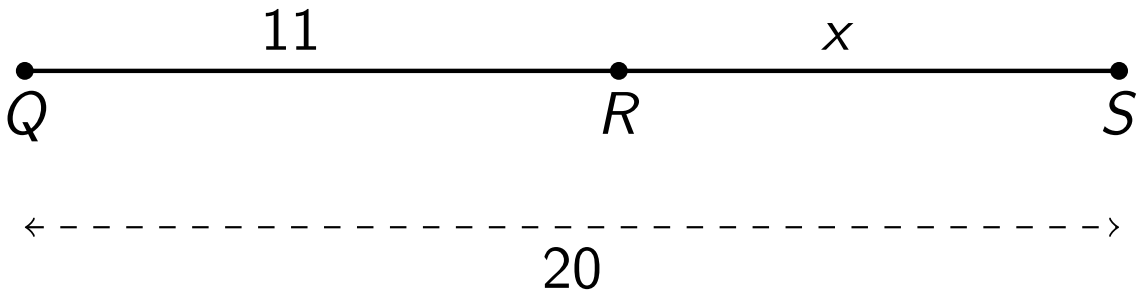
Definition: Points are *collinear* when they lie on a straight line.

Example 2: Points and line segments

Segment Addition Postulate

Given collinear points Q, R, S, with $QR = 11$, $QS = 20$.

Find RS.

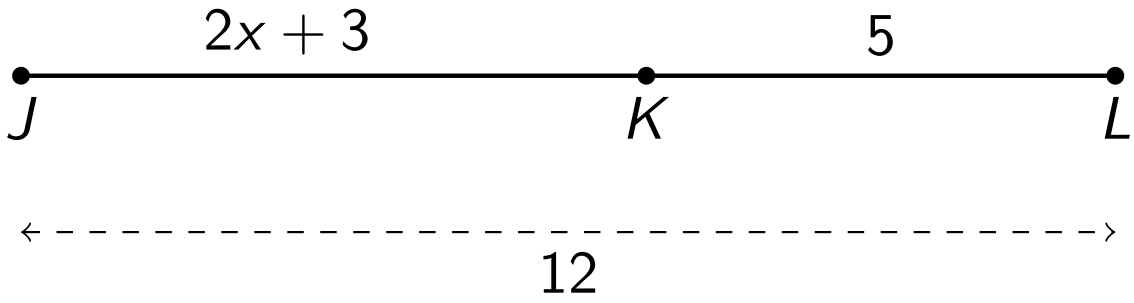


1. How would you check your answer?
2. Which equation represents the situation?

$11 + x = 20$ $x = 20 - 11$

Example 3: Segment addition postulate

Given $\overline{JKL}$, $JK = 2x + 3$, $KL = 5$, $JL = 12$. Find x.



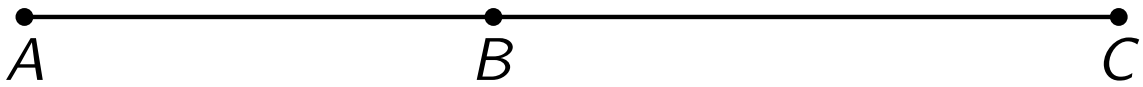
1. Write down an equation to represent the situation.

2. Solve for x.

3. Check your answer.

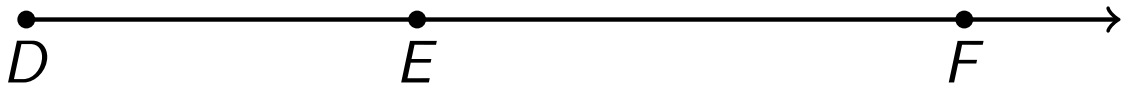
Example 4 (challenge): Segment addition postulate

Given $\overline{ABC}$, $AB = 3x - 7$, $BC = x + 5$, $AC = 14$. Find AB.



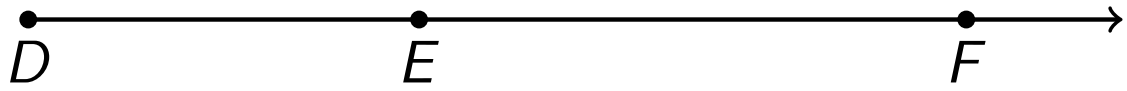
Solve for length using the Segment Addition postulate

Given $\overrightarrow{DEF}$, $DE = x + 1$, $EF = 9$, $DF = 3x$. Find DE.



Solve for length using the Segment Addition postulate

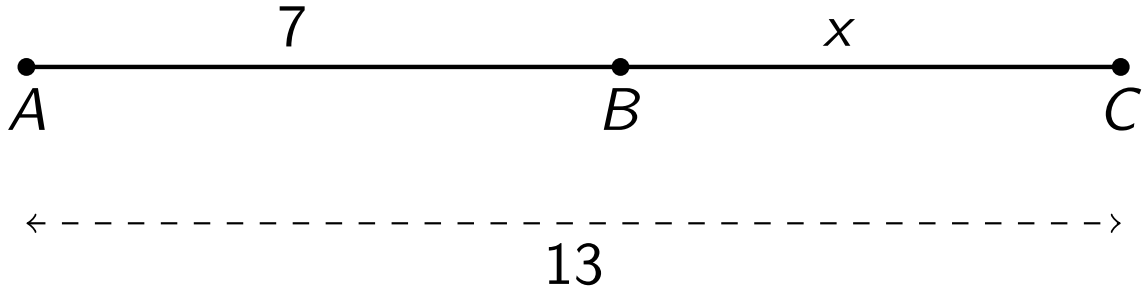
Given $\overrightarrow{DEF}$, $DE = x + 1$, $EF = 9$, $DF = 3x$. Find DE.



1. Sketch and label the situation
2. Write a geometric equation
3. Substitute algebraic values
4. Solve for x
5. Answer the question
6. Check your answer

Using algebra to model a length situation

Do Now: Given collinear points A, B, C, with $AB = 7$, $AC = 13$.



1. Which equation most simply represents the situation?

   $7 + x = 13$ $\qquad\qquad$ $x = 13 - 7$

2. Find BC.

Classwork: Handout (pre-quiz for 6th period)

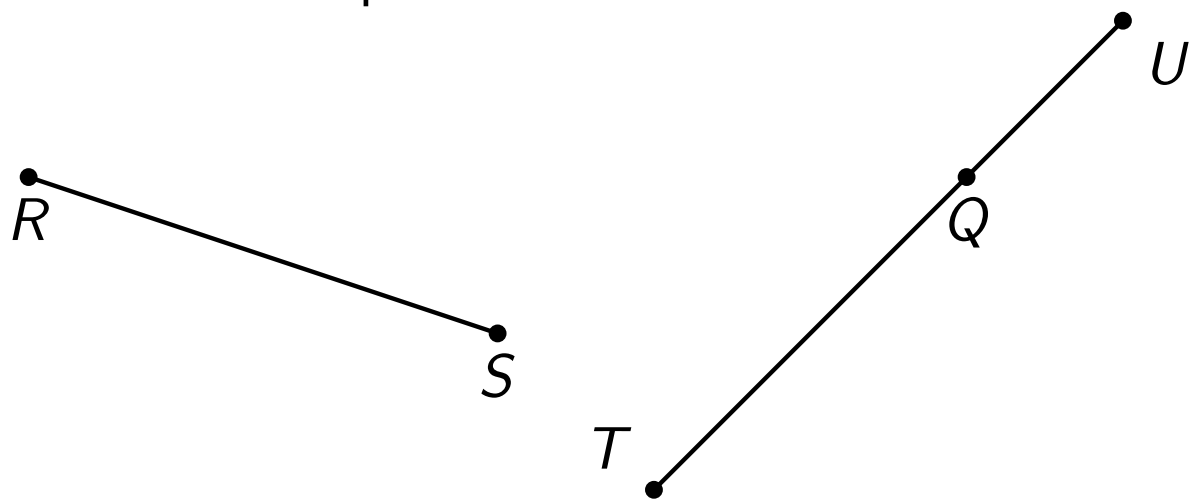
Lesson: Point, line segment, end point, collinear, distance or length; line, ray, plane, coplanar, *congruent* line segments

Midpoints, bisectors, practice segment addition situations

Review: points, segments, length

Give an example of each geometric object. Use proper notation.

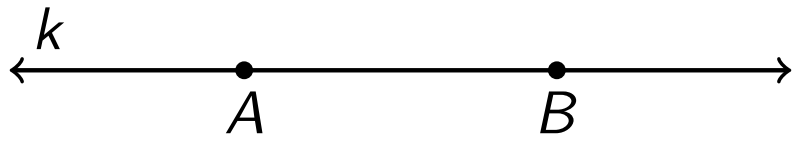
1. point
2. line segment
3. end point
4. three collinear points



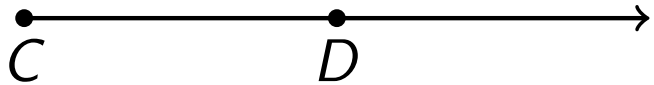
5. Given $TQ = 1.4$, $QU = 0.6$. Find TU.

More definitions: lines, rays, planes

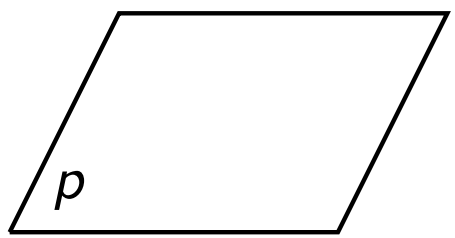
A *line* extends infinitely in both directions, $\overleftrightarrow{AB}$.
(sometimes labeled with a small letter, for example, line k)



A *ray* has one end point and extends infinitely in one direction, $\overrightarrow{CD}$.

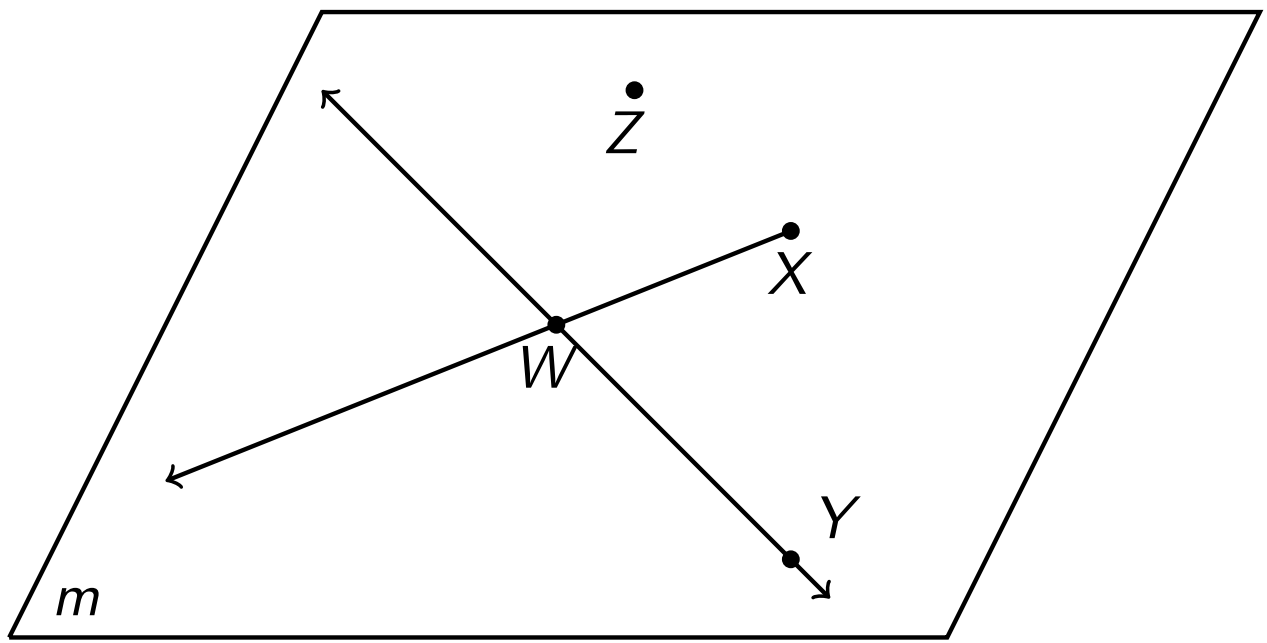


A *plane* is flat and extends infinitely in two directions, p.



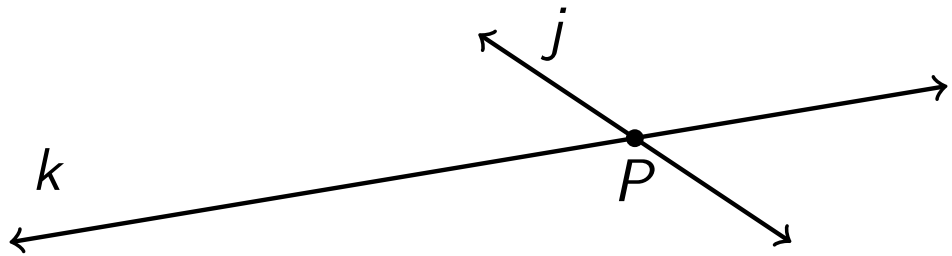
Several objects are shown in a plane

1. T F The name of the plane is m
2. T F The line $\overleftrightarrow{WY}$ is in the plane
3. T F The ray $\overrightarrow{WX}$ is shown in the plane
4. T F Points W, X, and Z are collinear

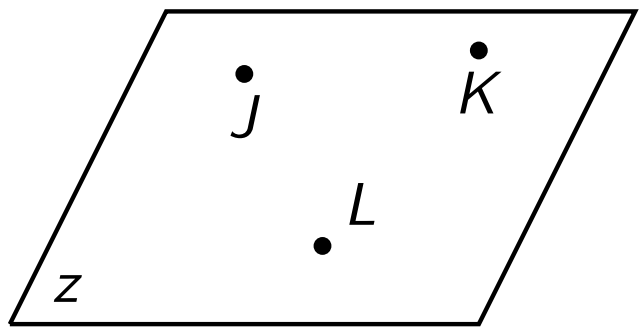


More definitions: intersections, coplanar

Two lines *intersect* if they cross. Their common point is the *intersection*. (shown here, lines j and k intersect at point P)



Coplanar means to lie in the same plane. Three points are always coplanar, but four points may not be.



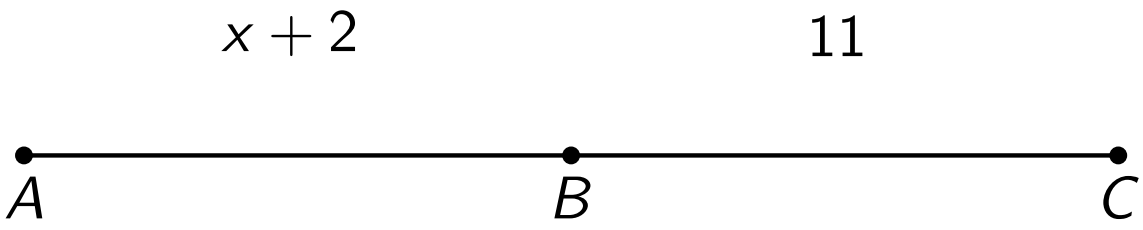
Learning Target: I can bisect a length

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.4 Monday 20 Sept

Do Now: Point B is in the exact middle between A and C

Given point B is the midpoint of $\overline{AC}$, with $AB = x + 2$, $BC = 11$.

Find x.



Lesson: Number lines, distance and length, absolute value

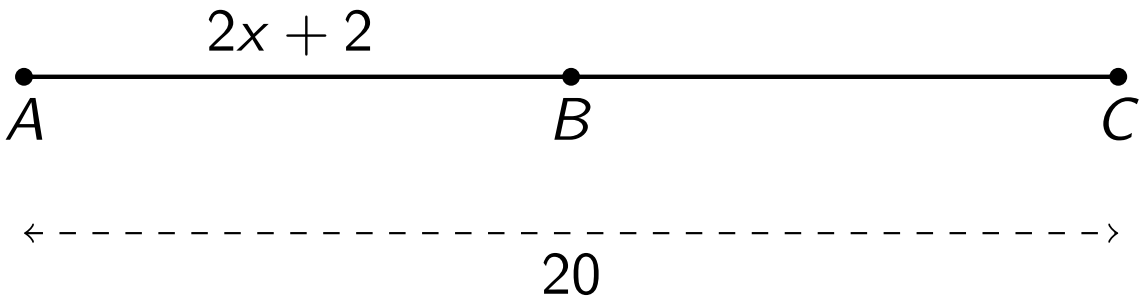
Practice midpoints and segment addition situations

The midpoint of a line segment

Also called the bisector

Given $\overline{ABC}$, with $AB = 2x + 2$, $AC = 20$. $AB = BC$

Find x.

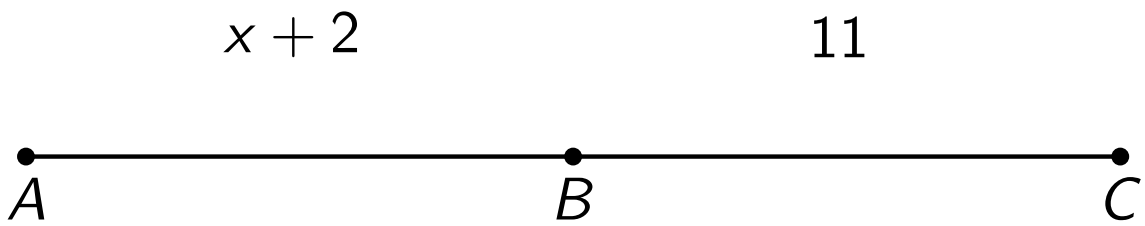


Definition: the *midpoint* or *bisector* of a line segment divides it exactly in half. Use "hash marks" to indicate equal length.

A bisector creates two line segments with the same length

Congruent line segments are the same length

Given point B is the midpoint of $\overline{AC}$, with $AB = x + 2$, $BC = 11$.
Find x.

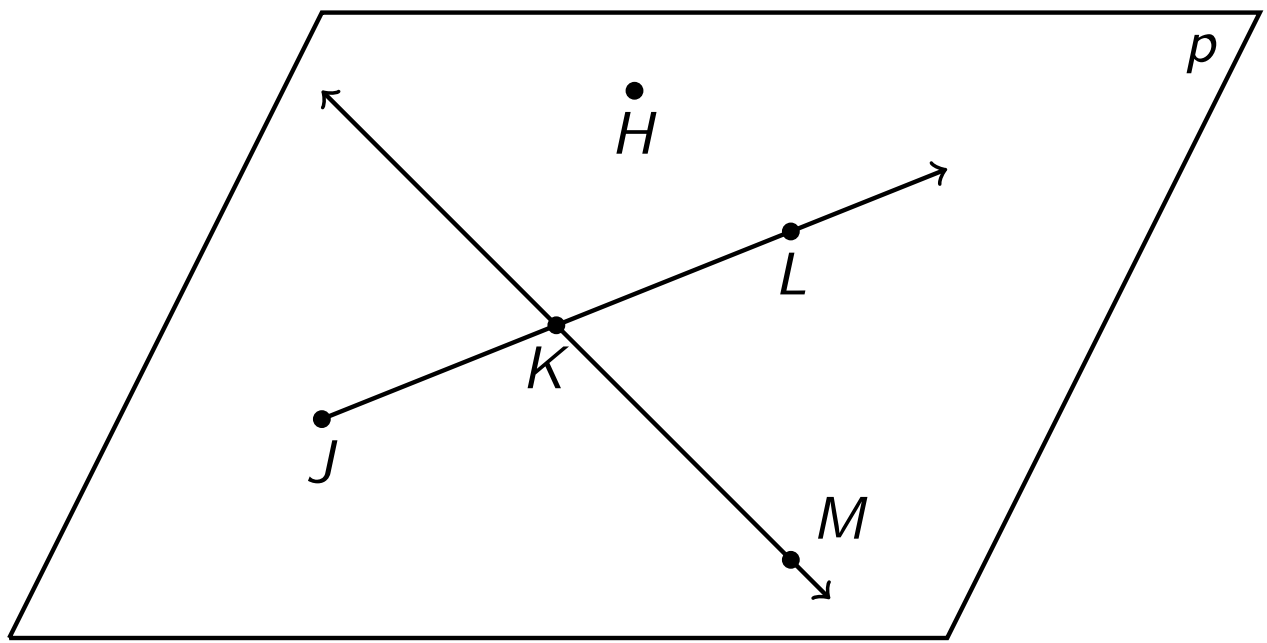


Definition: *Congruent* means equal in length. $\overline{AB} \cong \overline{BC}$
We mark congruent segments in diagrams with cross hatch marks.

Identifying objects in a plane

Identify each item

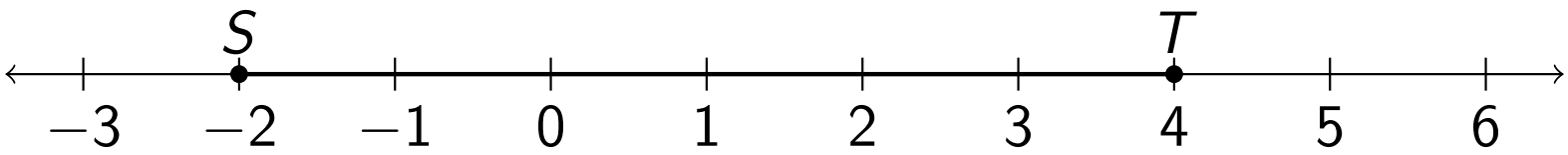
1. The point H
2. The ray $\overrightarrow{JL}$
3. The name of the plane shown



Learning Target: I can work with congruent segments

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.5 Tuesday 21 Sept

Do Now: Given $\overline{ST}$ with $S(-2)$ and $T(4)$



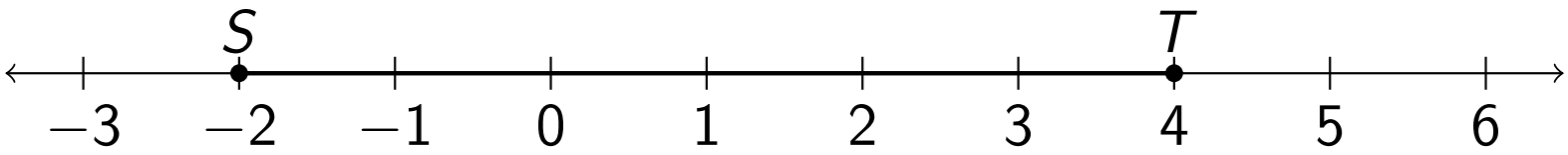
What is the length of the segment $\overline{ST}$? Show your work as an equation.

Lesson: Perimeter, congruent line segments in rectangles & isosceles triangles

Negative number practice on a number line

Take the difference in the points' values. Check by counting the marks.

Given $\overline{ST}$ with $S(-2)$ and $T(4)$, as shown on the number line.

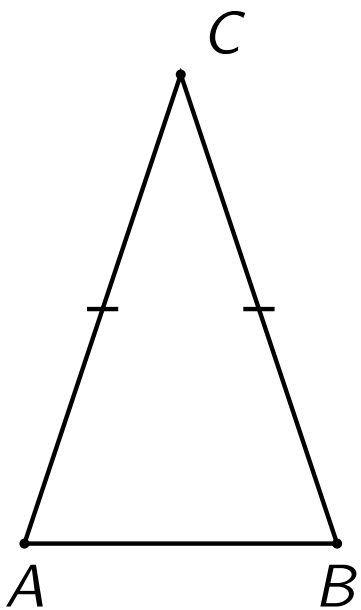


What is the length of the segment $\overline{ST}$? Show your work as an equation.

Why is "minus a negative" the same as add a positive?

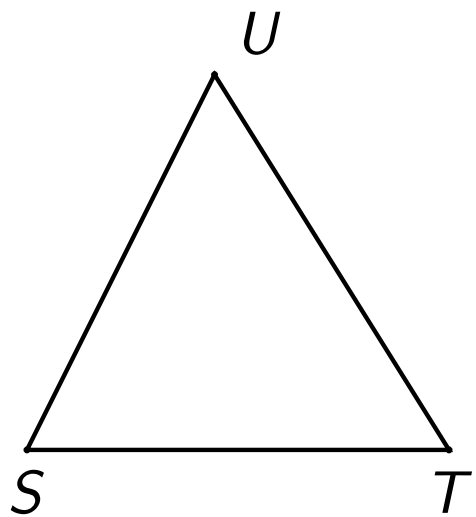
Use proper notation (including the bar over the letters)

Given $\triangle ABC$ write down two congruent line segments using proper notation.



On the diagram mark the congruent line segments with tick marks.

Given $\triangle STU$ with $\overline{ST} \cong \overline{TU}$.



Sketch an isosceles triangle

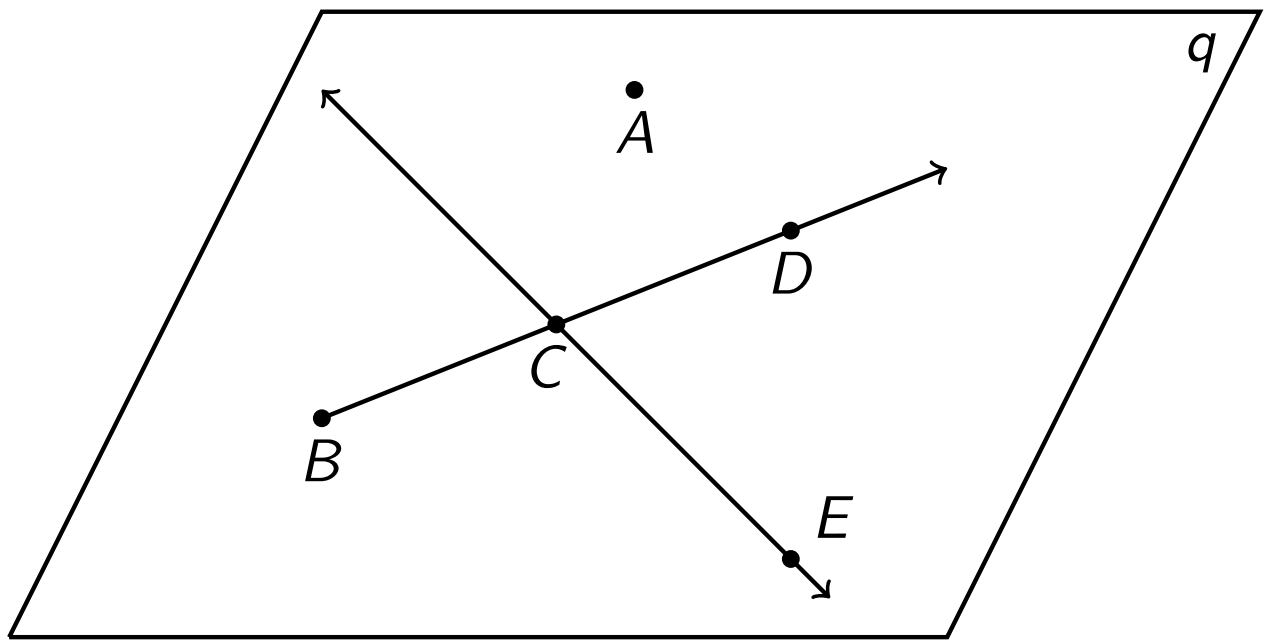
Mark the congruent sides with tick marks.

Draw a ray. (careful! which direction does it go?)

Given the points X and Y, draw $\overrightarrow{YX}$.

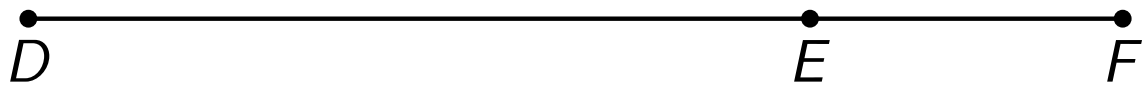
Identify each item.

1. The point A
2. The ray $\overrightarrow{BD}$
3. The name of the plane



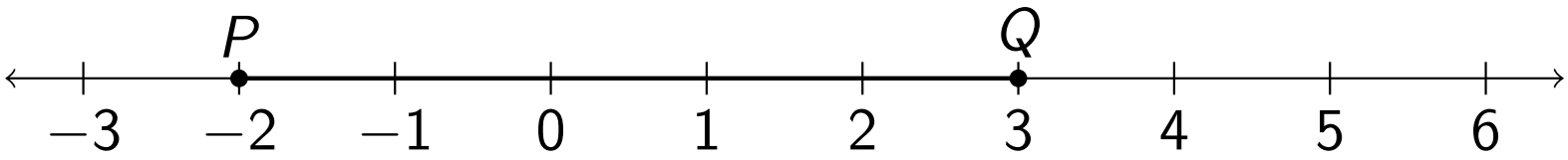
Apply the Segment Addition Postulate
Show your work by marking the diagram and writing an equation.

Given $\overline{DEF}$, $DE = 8.5$, and $EF = 2.5$. Find DF.



Find the length of the line segment $\overline{PQ}$.

Given $P(-2)$ and $Q(3)$, as shown on the number line.



State an equation and the solution.

Check your work by counting the distance. Leave marks to show your work.

Formal meanings of sketch, draw, and construct

1. *Sketch* is to make a freehand diagram of important features.

   Use a pencil to write carefully in your notebook or on paper.

2. *Draw* is to depict with accurate measures using ruler, protractor, and compass.

   For example, draw a diagram of your room.

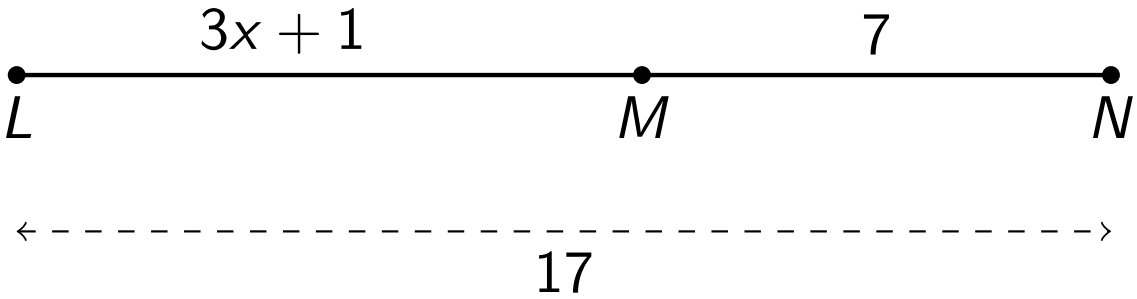
3. *Construct* is a formal, logical process to create geometric figures using only a straightedge and compass.

4. Drawn to *scale* means that all of the lengths are proportional. (e.g. a "scale model")

   Tests will often warn that diagrams are "not drawn to scale"

Segment addition practice

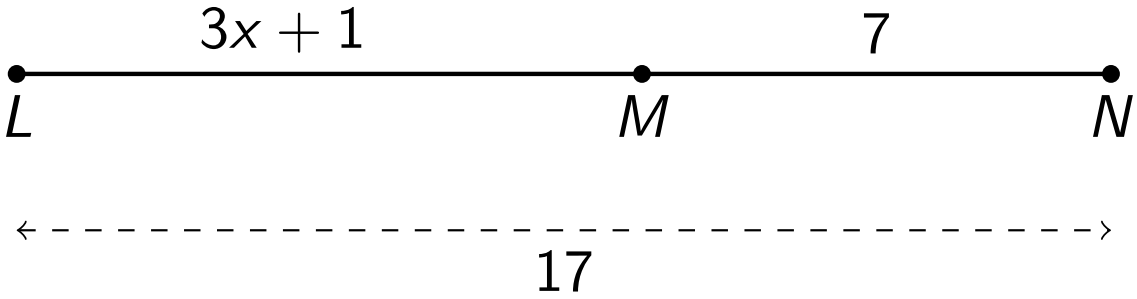
Do Now: Given $\overline{LMN}$, $LM = 3x + 1$, $MN = 7$, $LN = 17$. Find x.



1. Write down an equation to represent the situation.
2. Solve for x.
3. Check your answer.

Solve for x using the segment addition postulate

Given $\overline{LMN}$, $LM = 3x + 1$, $MN = 7$, $LN = 17$. Find x.



1. Write down an equation to represent the situation.

2. Solve for x.

3. Check your answer.

Midpoint example

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.7 Thursday 23 Sept

Given M bisects $\overline{AB}$, $AM = 5x + 2$, $MB = 20$.

1. Mark the diagram with the values and tick marks
2. Write an equation and solve for x
3. Check your result

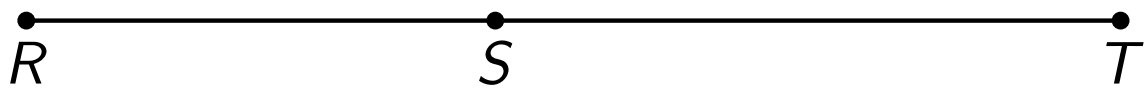
Solve for x given a bisector

Given M is the midpoint of $\overline{AB}$, $AM = 5x + 2$, $MB = 20$.

1. Mark the diagram with the values and tick marks
2. Write an equation and solve for x
3. Check your result

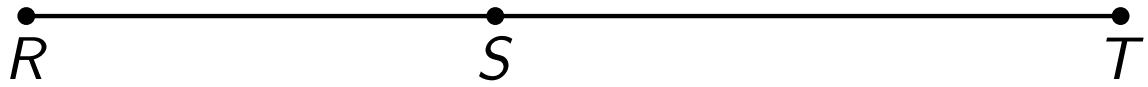
Segment addition with fractions

Do Now: Given $\overline{RST}$, $RS = 3\frac{2}{3}$, and $RT = 9\frac{1}{3}$. Find ST.



Mark the diagram and state your answer as a fraction

Given $\overline{RST}$, $RS = 3\frac{2}{3}$, and $RT = 9\frac{1}{3}$. Find ST.



Solution

Given M bisects $\overline{PQ}$, $PM = x + 7$, $PQ = 23$.

1. Mark the diagram with the values and tick marks
2. Write an equation and solve for x
3. Check your result