Geometry Unit 1: Segments, Length, and Area

Bronx Early College Academy

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8-23 September 2022

Learning Target: I can measure my world

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.1 Thursday 8 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"

A *diagram* is a simplied image representing a situation

This is an example diagram of a desk arrangement

When making diagrams

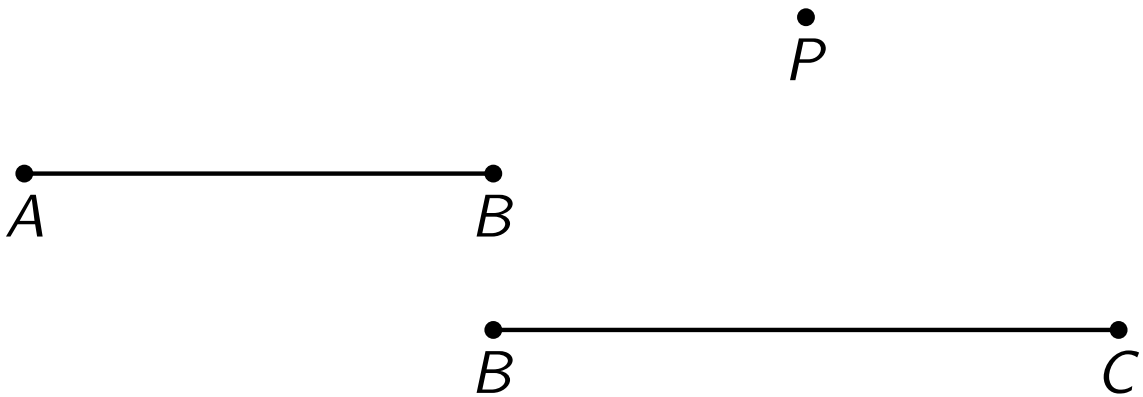
Include common elements: labels, titles, distances

Conventions: standard ways of doing things to make it easier to work with other people

Write down vocabulary and terminology in your notebook with definitions and examples. (e.g. I write important terms in *italics*)

Example: Points and line segments

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



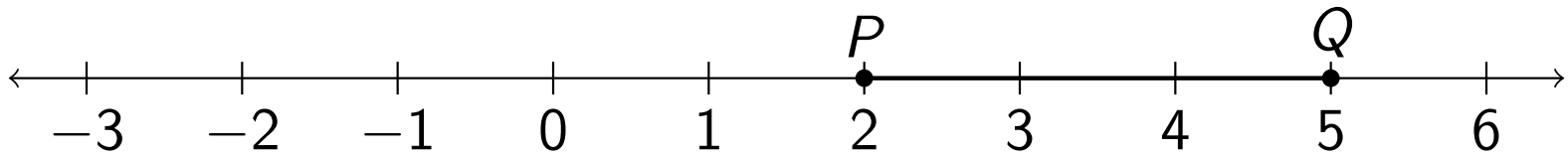
Given:
$AB = 3$
$BC = 4$

The *length* of a line segment is the distance between the two end points. The length of segment $\overline{AB}$ is written AB (no bar over).

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.

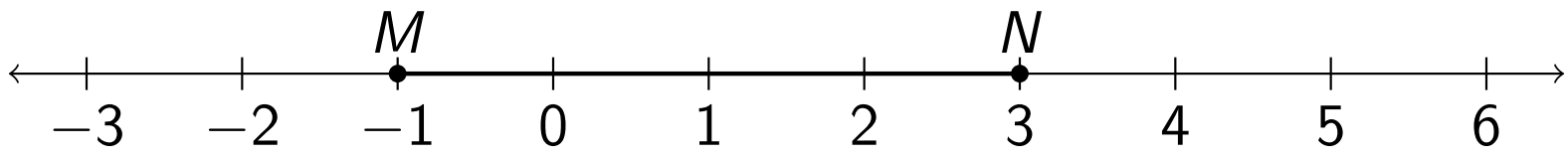


Find the distance on the number line between the points P and Q.

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.



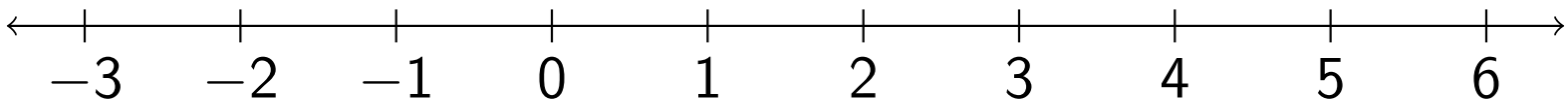
What is the length of the segment $\overline{MN}$? Show your work as an equation.

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.

Take class notes in a composition book

Copy definitions using your own words. Write down example diagrams and problems

Definitions:

Point	A location, has no size; label with capital letter, P
End point	A point at the end of a line segment
Segment	Two points and all the points between them; label with *end points* and a bar, e.g. $\overline{AB}$
Distance	The positive difference between two points on a number line (length is the same thing). $AB = 3$ inches
Conventions	Standard ways of doing things to make it easier to work with other people

Take class notes in a composition book

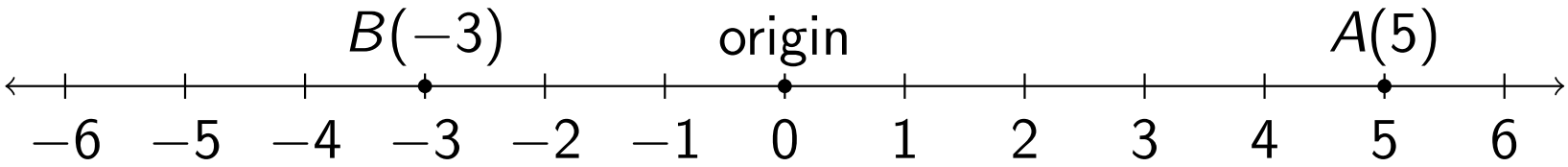
Copy definitions using your own words. Write down example diagrams and problems

Definition

- Point A location, has no size; label with capital letter, P
- End point A point at the end of a line segment
- Segment Two points and all the points between them; label with *end points* and a bar, e.g. $\overline{AB}$
- Distance The positive difference between two points on a number line (length is the same thing). $AB = 3$ inches
- Conventions Standard ways of doing things to make it easier to work with other people

Absolute value: the distance from a point to the origin

Always a positive number (or zero)



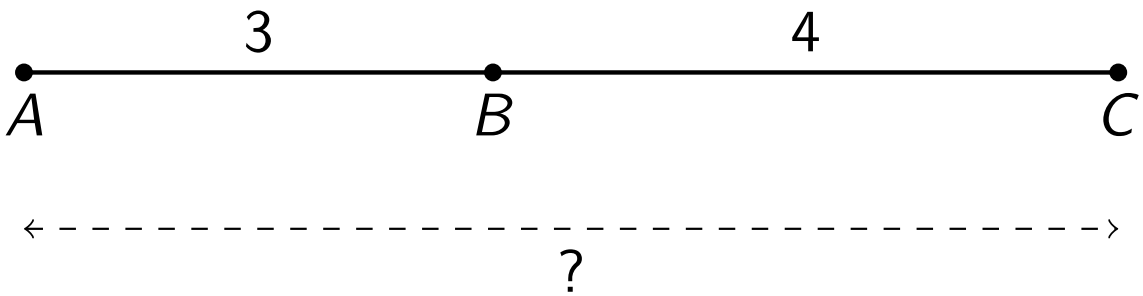
The absolute value of 5 is 5. $|5| = 5$

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 9 September

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



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

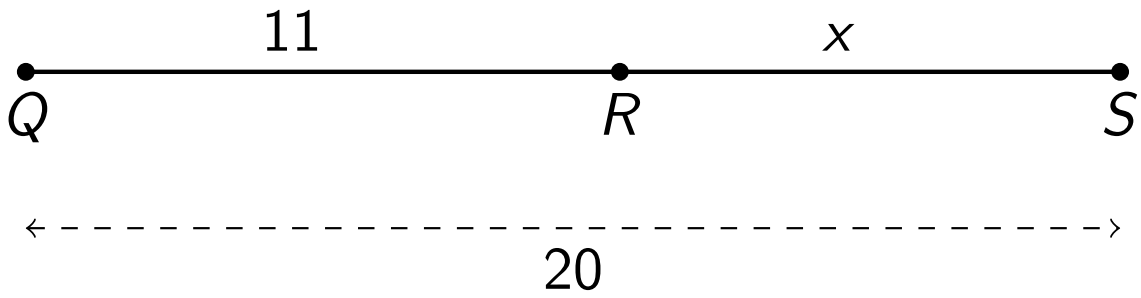
Segment Addition Postulate: lengths add. e.g. $AB + BC = AC$

Example 2: Points and line segments

Segment Addition Postulate

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

Find RS.

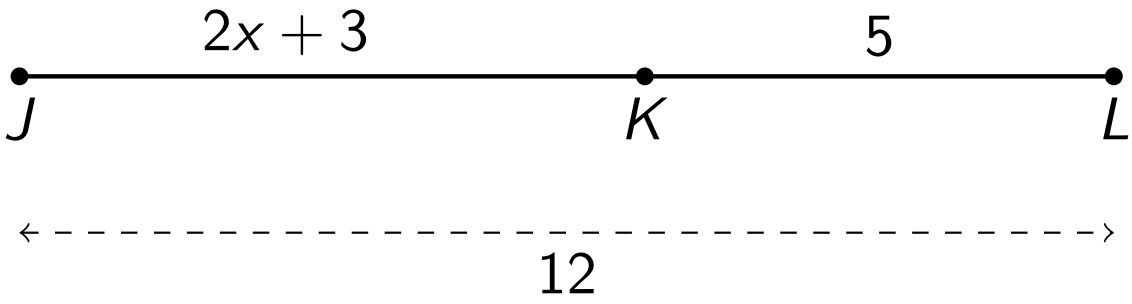


1. How would you check your answer?
2. Which equation represents the situation?

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

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.

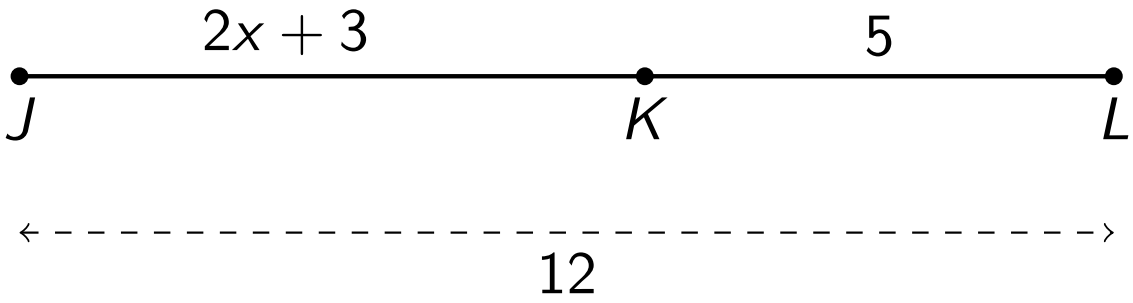
2. Solve for x.

3. Check your answer.

Example 3: Use algebra to model a length situation

Write the steps in your notebook

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



$$JK + KL = JL$$

$$(2x + 3) + 5 = 12$$

$$2x + 8 = 12$$

$$2x = 4$$

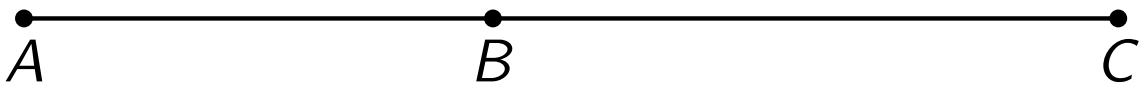
$$x = 2$$

$$2(2) + 3 + 5 = 12?$$

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

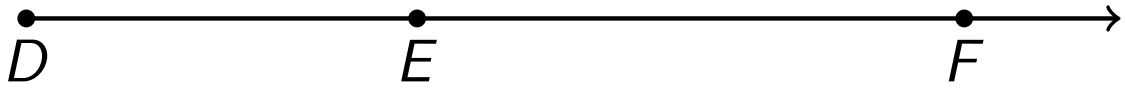
Example 4 (challenge): Segment addition postulate

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



Example 5: Solve an equation with x on both sides

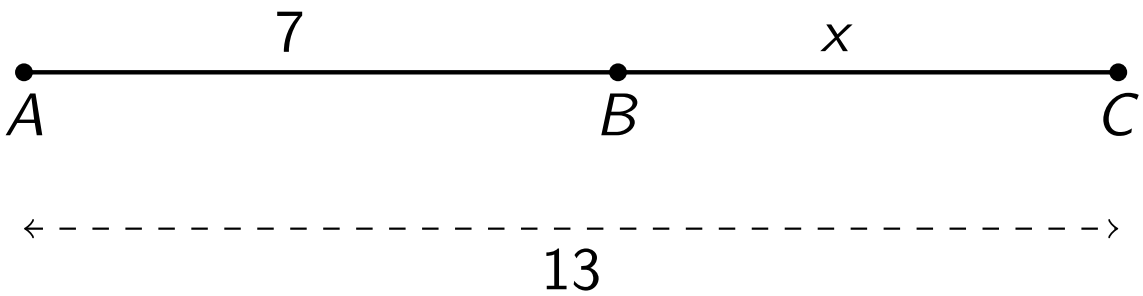
Given $\overrightarrow{DEF}$, $DE = x + 1$, $EF = 9$, $DF = 3x$. Find DE.



Learning Target: I can use geometric conventions

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.3 Monday 12 Sept

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



1. Circle the equation that most simply represents the situation.

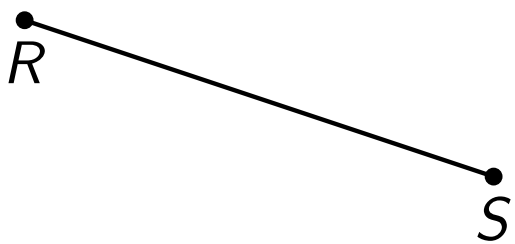
$7 + x = 13$ $x = 13 - 7$

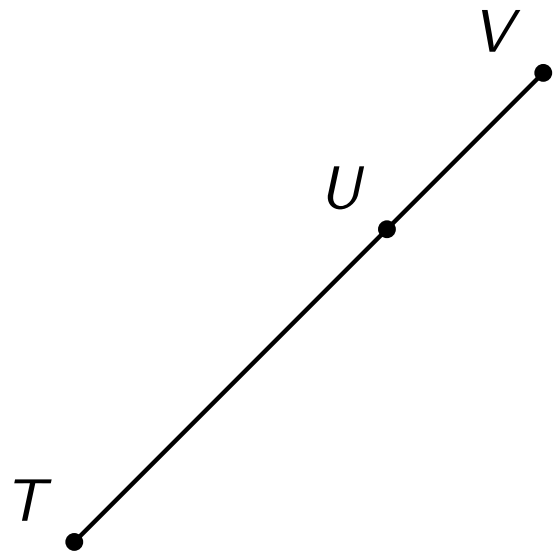
2. Find BC.

Write down an example of each geometric object.

Use proper notation.

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

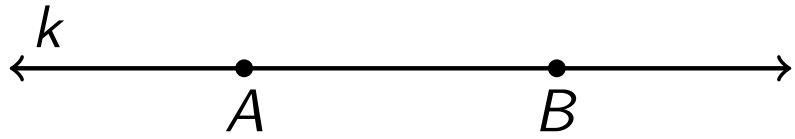




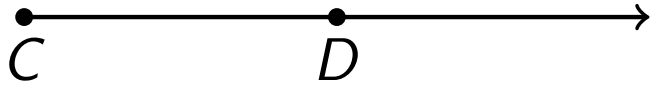
5. Given $TU = 1.4$, $UV = 0.6$. Find TV. (label the diagram first)

More definitions: lines, rays, planes

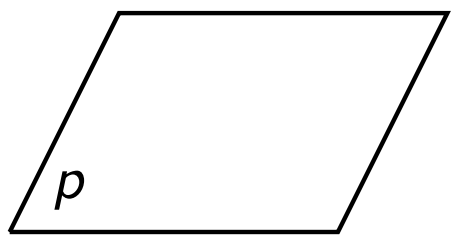
A *line* extends infinitely in both directions, $\overleftrightarrow{AB}$.
(sometimes labeled with a small letter, for example, line k)



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

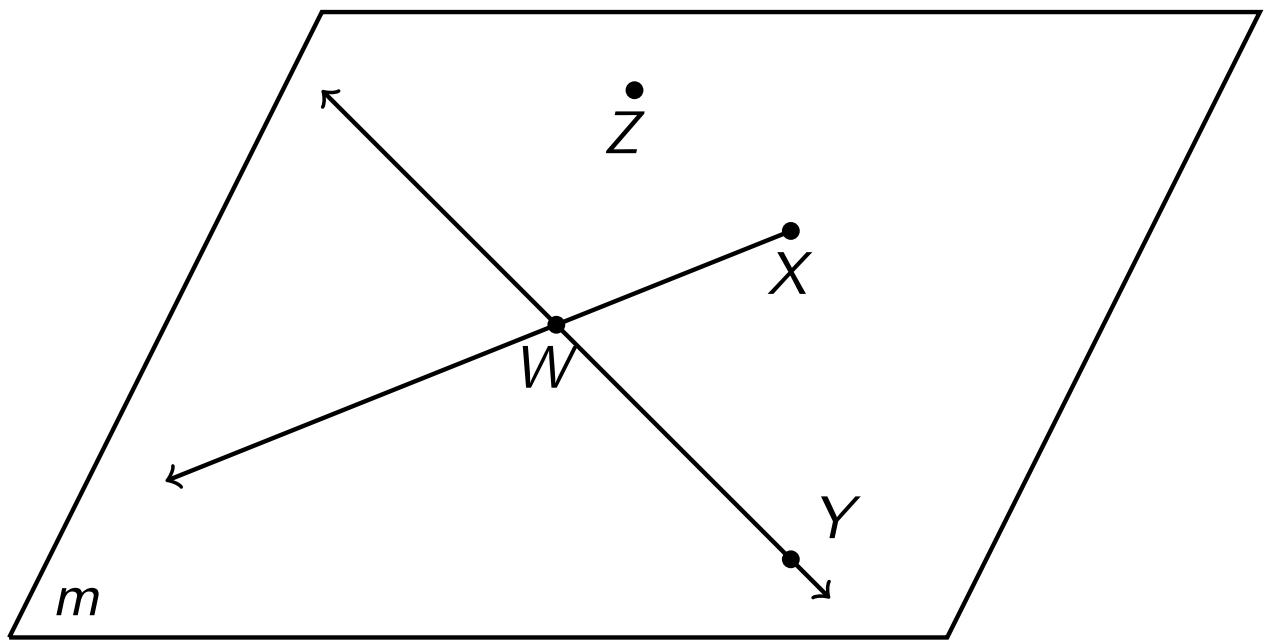


A *plane* is flat and extends infinitely in two directions, p.



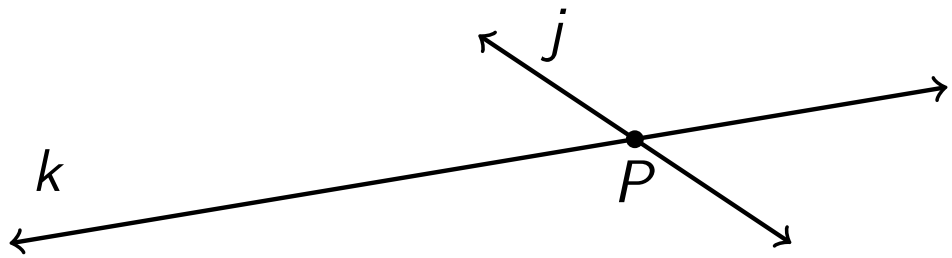
Several objects are shown in a plane

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

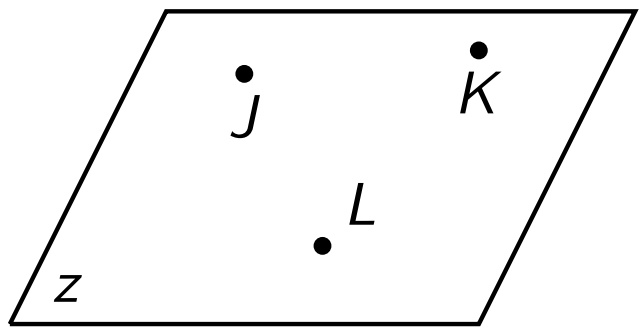


More definitions: intersections, coplanar

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.

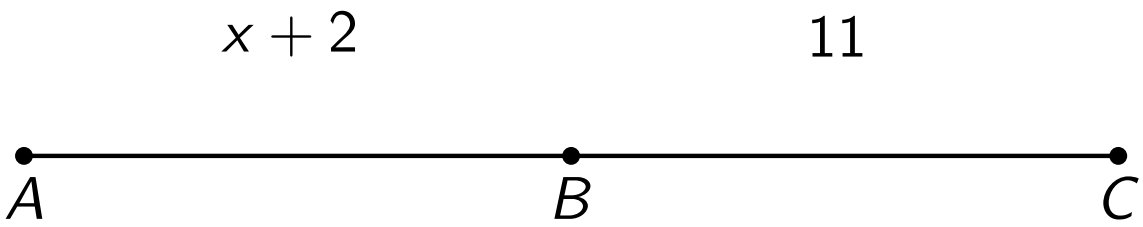


Learning Target: I can *bisect* a length

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.4 Monday 13 Sept

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

Given $AB = x + 2$, $BC = 11$. Find x.

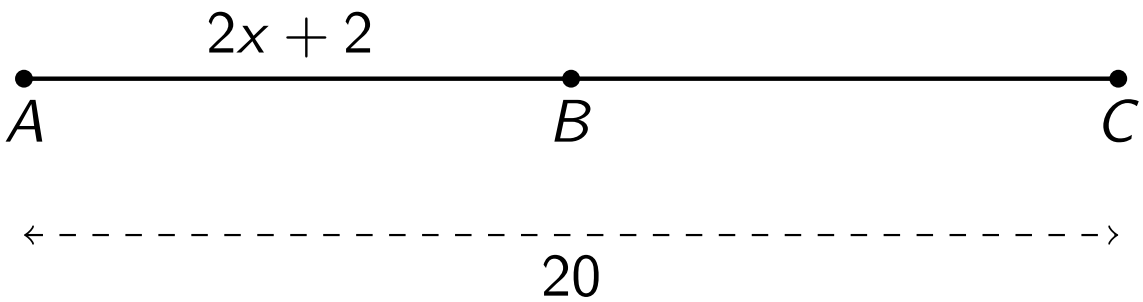


Hint: The line segment is split into two equal lengths.

The *midpoint* of a line segment

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

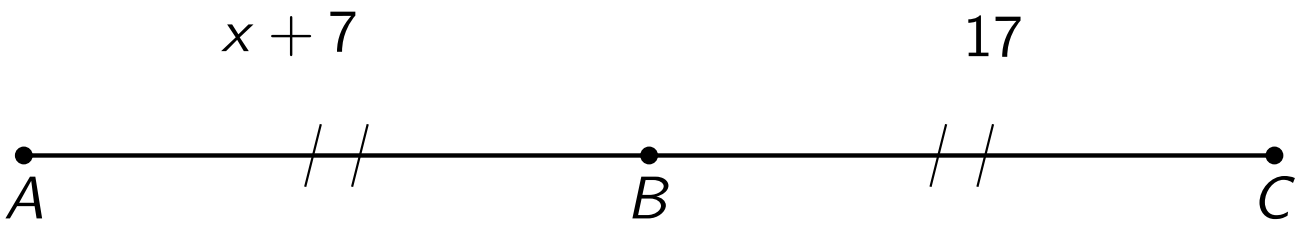
Find x.



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 $AB = x + 7$, $BC = 17$.
Find x.



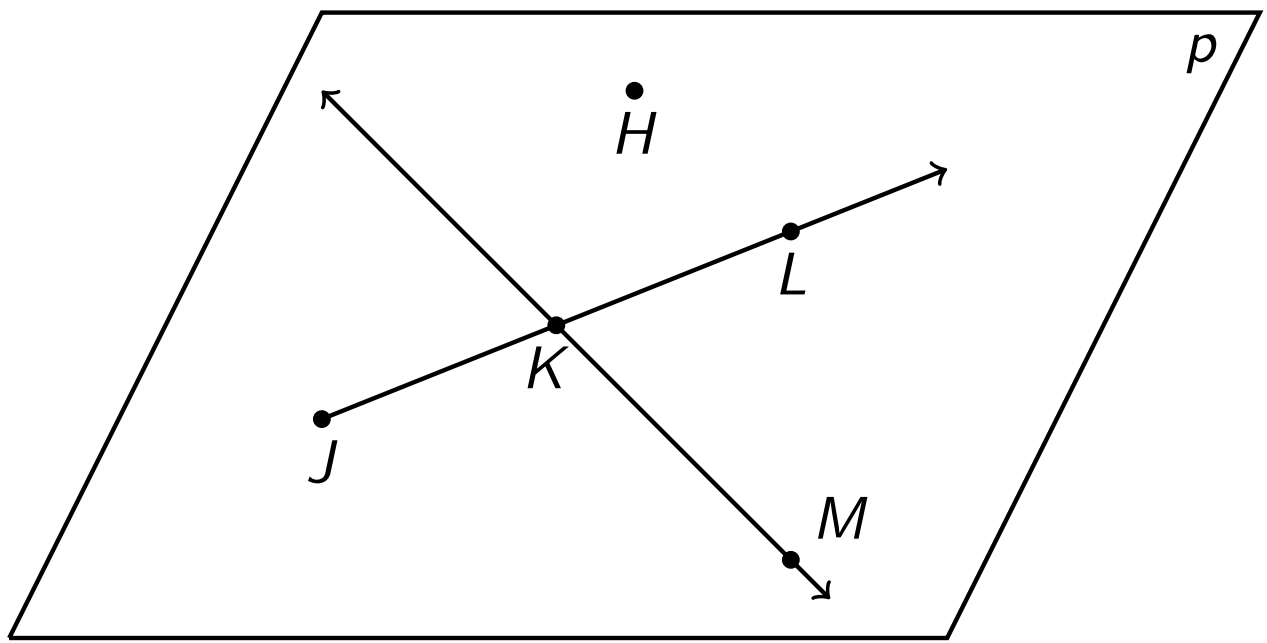
The *midpoint* or *bisector* of a line segment divides it exactly in half.

Congruent means equal in length, $\overline{AB} \cong \overline{BC}$ (also $AB = BC$)
Mark congruent segments in diagrams with cross "*hash*" marks.

Review: Identifying objects in a plane

Circle or mark each item

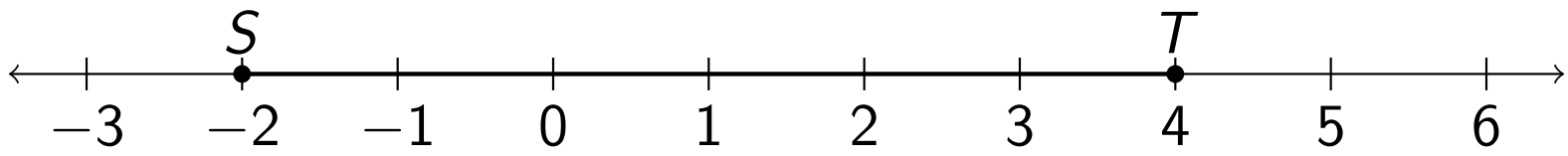
1. The point H
2. The ray $\overrightarrow{JL}$
3. The name of the plane shown



Learning Target: I can work with objects having congruent parts

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.5 Wednesday 14 Sept

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



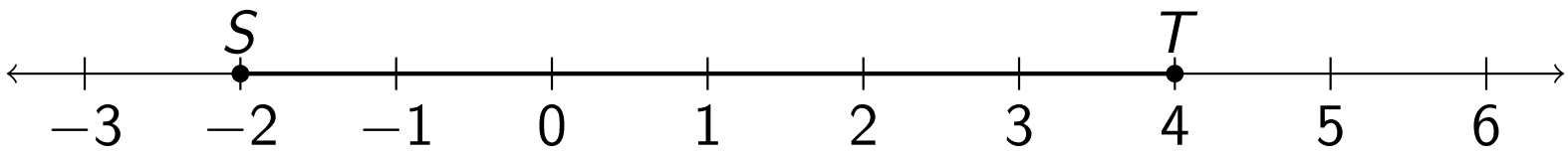
What is the length of the segment $\overline{ST}$? Show your work as an equation.

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.

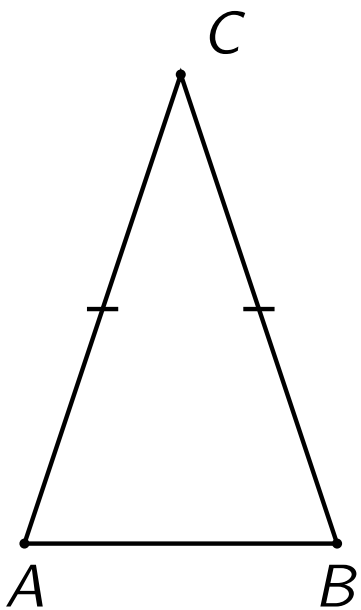


What is the length of the segment $\overline{ST}$? Show your work as an equation.

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

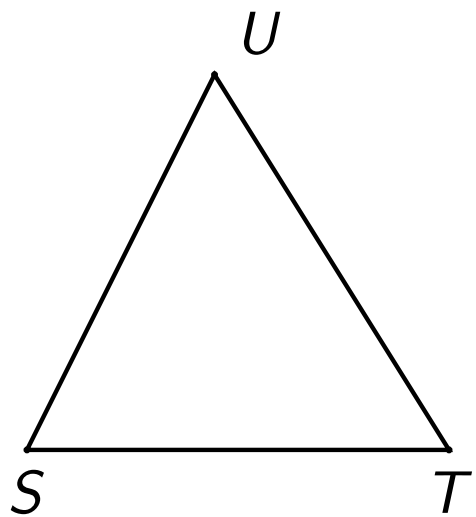
Use proper notation (including the bar over the letters)

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.

ToDo: equilateral $\triangle$, isosceles, perimeter, quadrilaterals

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"

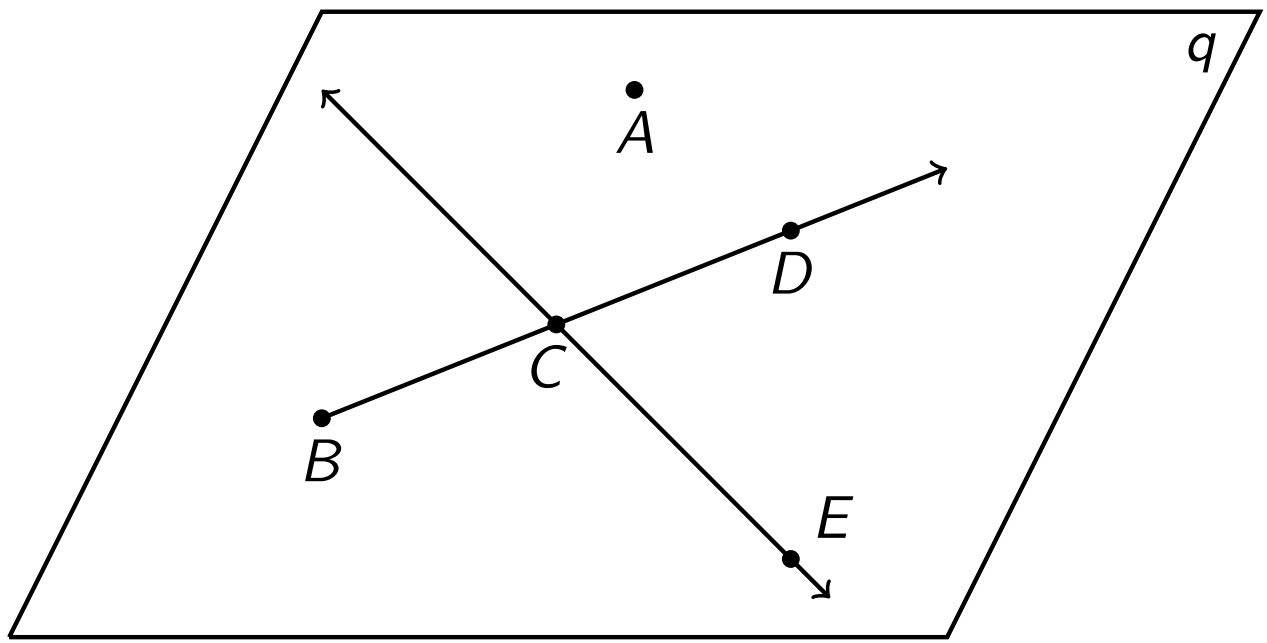
Review problem slides

CCSS: HSG.CO.A.1 Know precise geometric definitions Review September

Draw a ray. (careful! which direction does it go?) Given the points X and Y, draw $\overrightarrow{YX}$.

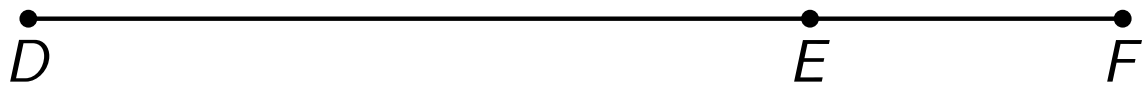
Identify each item.

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



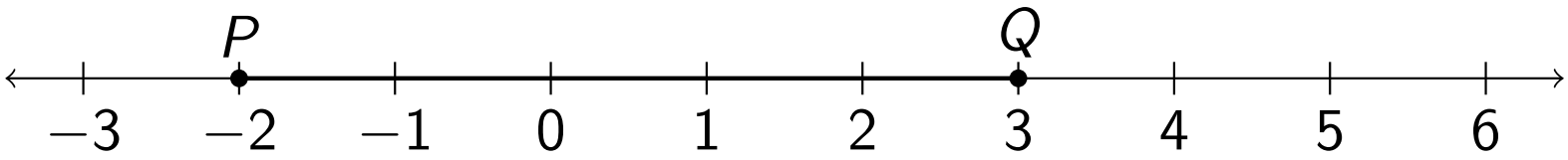
Apply the Segment Addition Postulate
Show your work by marking the diagram and writing an equation.

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.

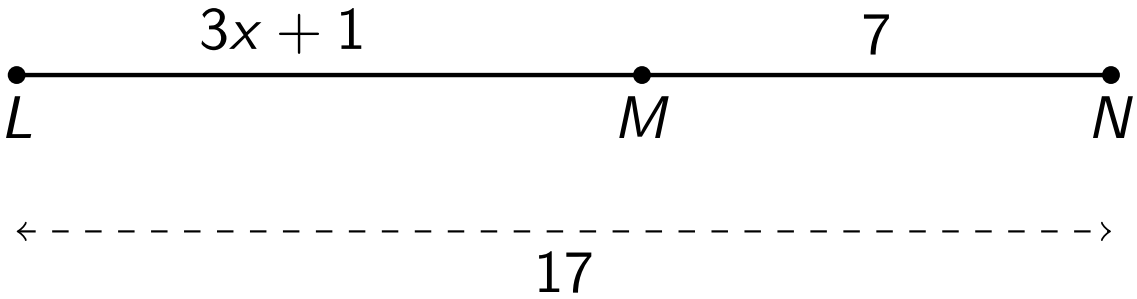


State an equation and the solution.

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

Segment addition practice

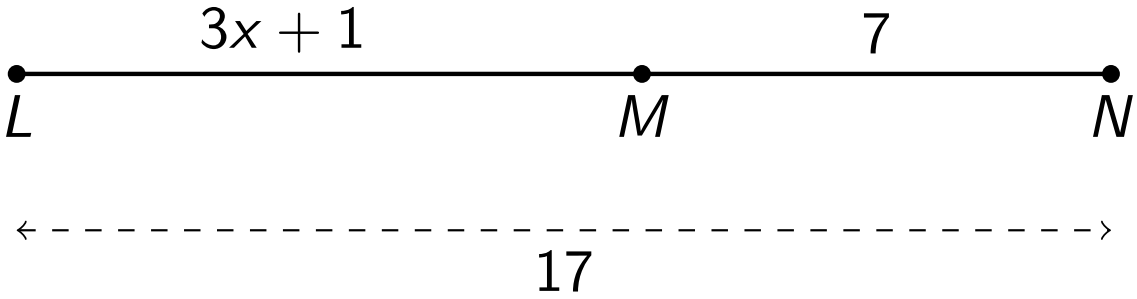
Do Now: Given $\overline{LMN}$, $LM = 3x + 1$, $MN = 7$, $LN = 17$. Find x.



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

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

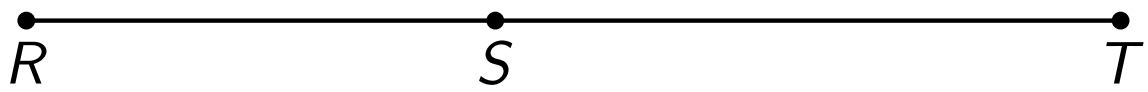
Solve for x given a bisector

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

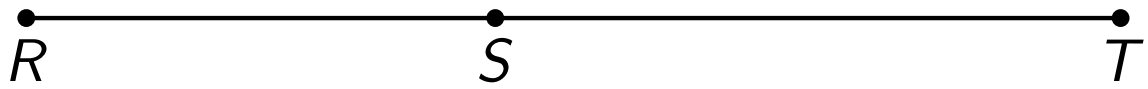
Segment addition with fractions

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

Segment bisector example

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

Sandbox

(i) one

(ii) two

(iii) three

box goes here xx yy

T F one

T F two

T F three

End point The point at the end of a line segments

Line An infinite number of points extending in both directions forever

Definition

A prime number is a number that has exactly two divisors.