

# Geometry Unit 1: Length

Bronx Early College Academy

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9-23 September 2022

1.1 1st day of Geometry, Segment addition, 13-14 Sept

1.2 Segment addition, midpoint, 10 Sept

1.3 Midpoint and bisector, 13 Sept

1.5 Midpoint calculations; Isosceles triangles, 21 Sept

1.x Applications, xx September

# 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

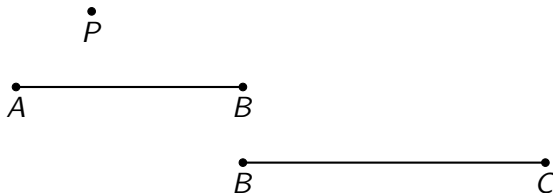
Definitions:

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  $\overline{AB}$ ,  $\overline{BC}$



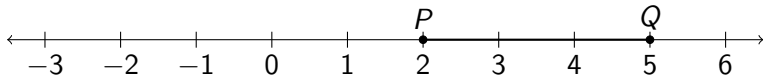
Given  $AB = 3$ ,  $BC = 4$ .

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.

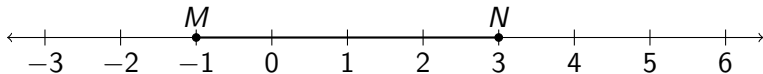


What is the distance on the number line between the points  $P$  and  $Q$ ?

## 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  $H(4.5)$ .

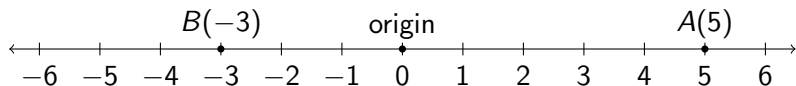


1. Mark and label the points and segment on the number line.
2. What is the length of the segment  $\overline{GH}$ ? Show your work as an equation.



# 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.  $|-3| = 3$

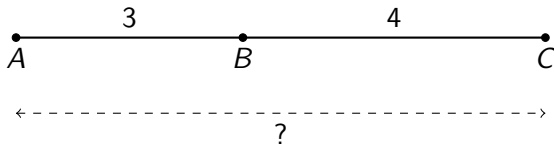
# Learning Target: I can solve for segment lengths

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  $AC$ .



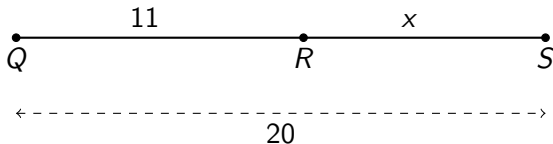
Definition: Points are *collinear* when they lie on a straight line.

## Example 2: Points and line segments

### Segment Addition Postulate

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

Find  $RS$ .



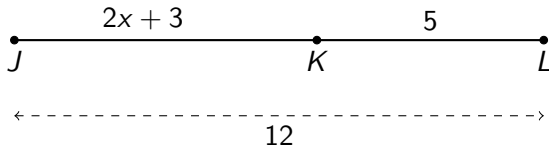
1. How would you check your answer?
2. Which equation represents the situation?

$$11 + x = 20$$

$$x = 20 - 11$$

### Example 3: Segment addition postulate

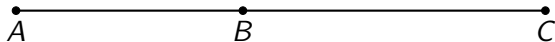
Given  $\overline{JKL}$ ,  $JK = 2x + 3$ ,  $KL = 5$ ,  $JL = 12$ . Find  $x$ .



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

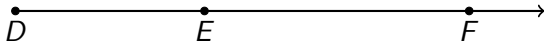
## Example 4 (challenge): Segment addition postulate

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



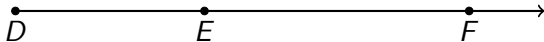
## Solve for length using the Segment Addition postulate

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



## Solve for length using the Segment Addition postulate

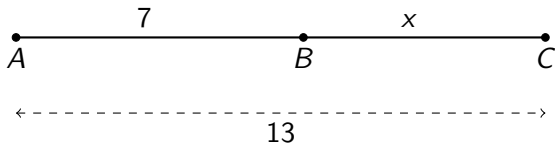
Given  $\overrightarrow{DEF}$ ,  $DE = x + 1$ ,  $EF = 9$ ,  $DF = 3x$ . Find  $DE$ .



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?

$$7 + x = 13$$

$$x = 13 - 7$$

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

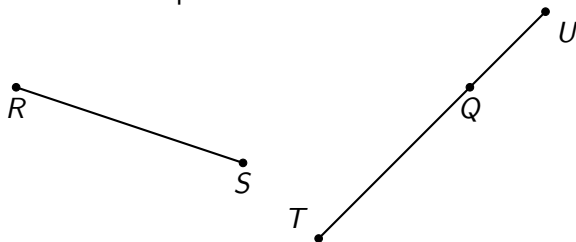
Midpoints, bisectors, practice segment addition situations



# Review: points, segments, length

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

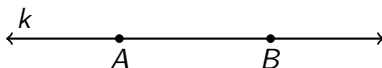
1. point
2. line segment
3. end point
4. three collinear points



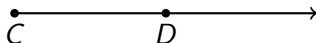
5. Given  $TQ = 1.4$ ,  $QU = 0.6$ . Find  $TU$ .

## 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,  $\overrightarrow{CD}$ .

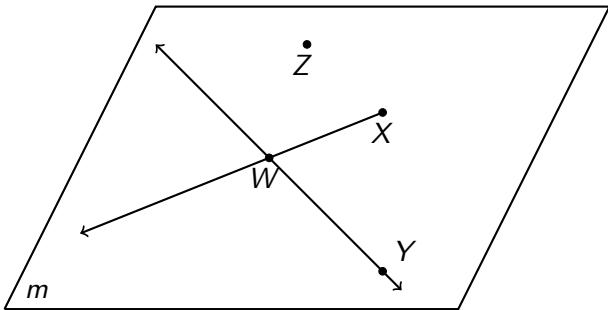


A *plane* is flat and extends infinitely in two directions,  $p$ .



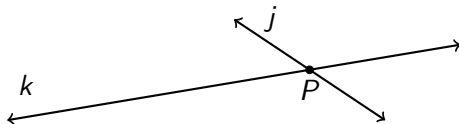
## Several objects are shown in a plane

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

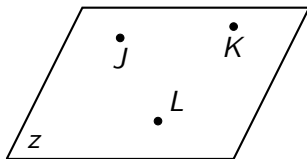


## More definitions: intersections, coplanar

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

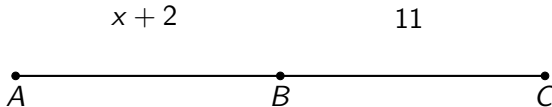
CCSS: HSG.CO.A.1 Know precise geometric definitions

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

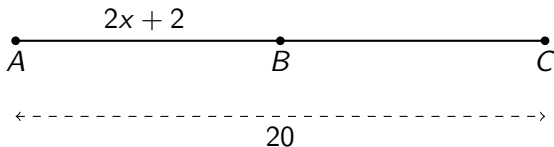
Practice midpoints and segment addition situations

# The midpoint of a line segment

Also called the bisector

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

Find  $x$ .

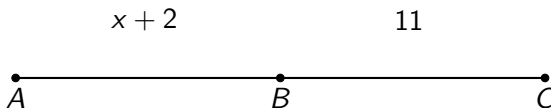


Definition: the *midpoint* or *bisector* of a line segment divides it exactly in half. Use “hash marks” to indicate equal length.

# 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  $x$ .



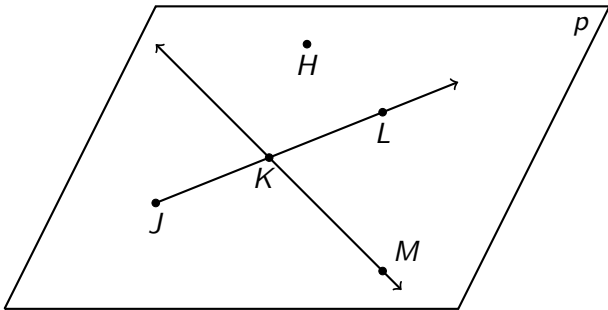
Definition: *Congruent* means equal in length.  $\overline{AB} \cong \overline{BC}$

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



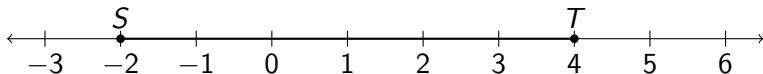


## Learning Target: I can work with congruent segments

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

1.5 Tuesday 21 Sept

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



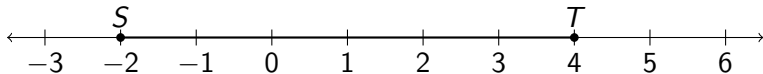
What is the length of the segment  $\overline{ST}$ ? Show your work as an equation.

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.

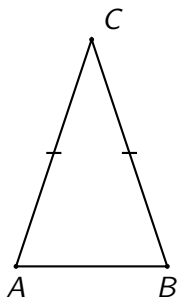


What is the length of the segment  $\overline{ST}$ ? Show your work as an equation.

Why is “minus a negative” the same as add a positive?

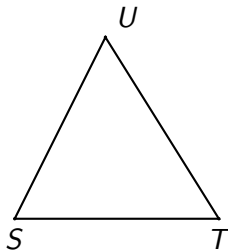
## Use proper notation (including the bar over the letters)

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?)

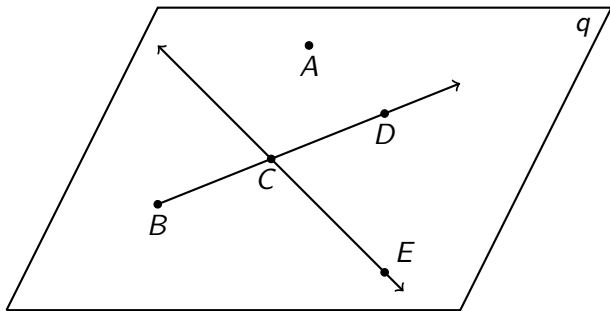
Given the points  $X$  and  $Y$ , draw  $\overrightarrow{YX}$ .

$\dot{X}$

$\dot{Y}$

## Identify each item.

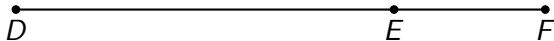
1. The point  $A$
2. The ray  $\overrightarrow{BD}$
3. The name of the plane



## Apply the Segment Addition Postulate

Show your work by marking the diagram and writing an equation.

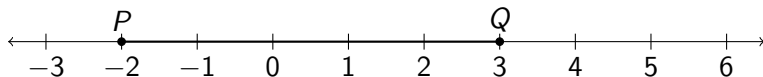
Given  $\overline{DEF}$ ,  $DE = 8.5$ , and  $EF = 2.5$ . Find  $DF$ .





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.

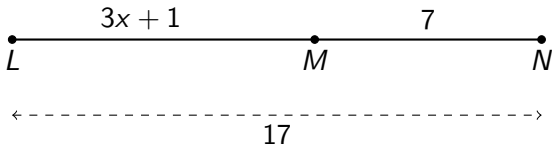
Check your work by counting the distance. Leave marks to show your work.

# 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

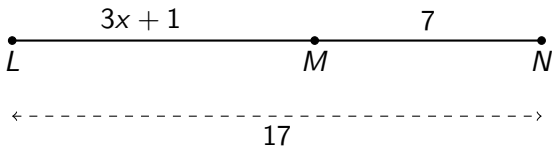
Do Now: Given  $\overline{LMN}$ ,  $LM = 3x + 1$ ,  $MN = 7$ ,  $LN = 17$ . Find  $x$ .



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

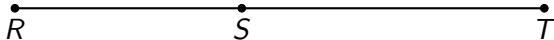
Given  $M$  is the midpoint of  $\overline{AB}$ ,  $AM = 5x + 2$ ,  $MB = 20$ .

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

