Geometry Unit 1: Segments, Length, and Area

Bronx Early College Academy

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8-23 September 2022

1.1 Segment addition 8 September

1.2 Solve for length 9 September

1.3 Terminology and notation 12 September

1.4 Midpoint and bisector 13 September

1.5 Equilateral and isosceles triangles, perimeter 14 September

1.6 Roundtable review 15 September

1.7 Unit conversion, Exit note quiz 16 September

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

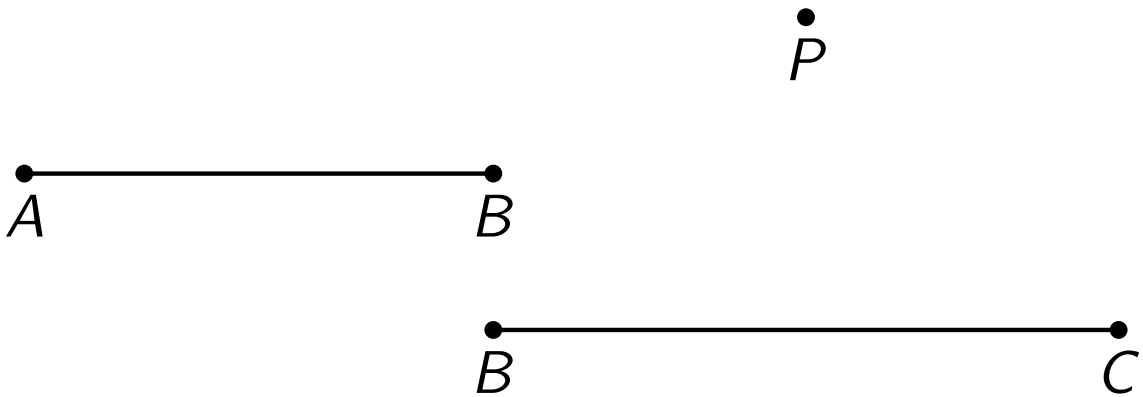
Include common elements: labels, titles, distances

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



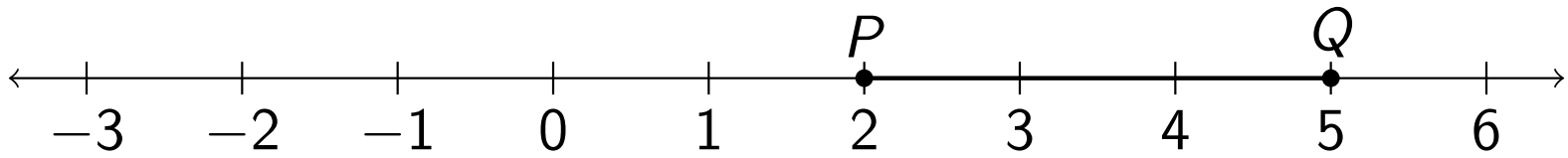
Given:
$AB = 3$
$BC = 4$

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.

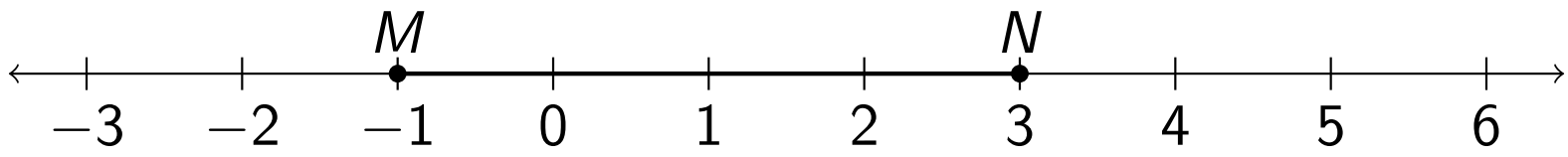


Find the distance on the number line between the points P and Q.

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.



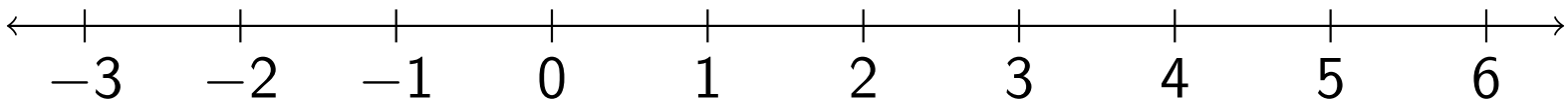
What is the length of the segment $\overline{MN}$? Show your work as an equation.

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

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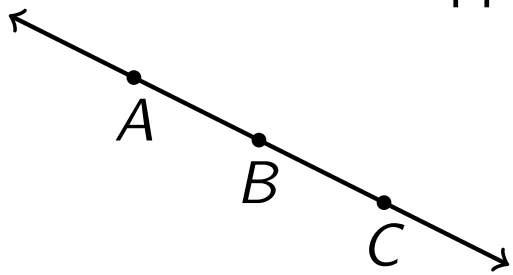
Definition

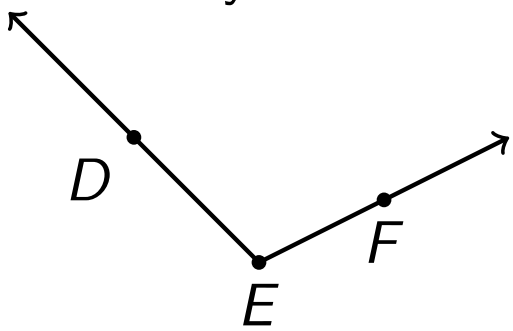
- Point A location, has no size; label with capital letter, P
- End point A point at the end of a line segment
- Segment Two points and all the points between them; label with *end points* and a bar, e.g. $\overline{AB}$
- Distance The positive difference between two points on a number line (length is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

Definition: *Opposite rays* are collinear rays with a common end point.

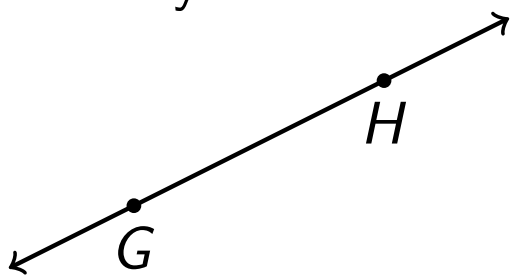
1. $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays



2. These rays do not make a straight line.

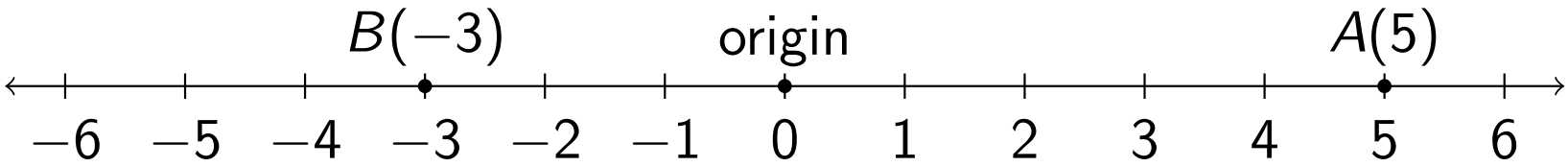


3. The rays $\overrightarrow{GH}$ and $\overrightarrow{HG}$ do not share a common end point.



Absolute value: the distance from a point to the origin

Always a positive number (or zero)



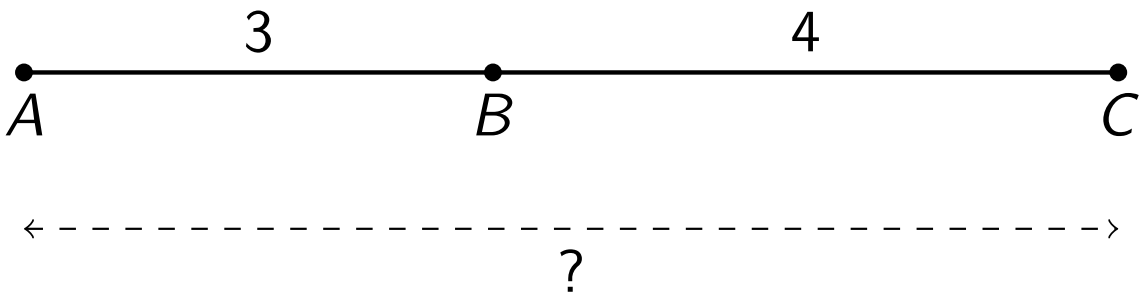
The absolute value of 5 is 5. $|5| = 5$

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.

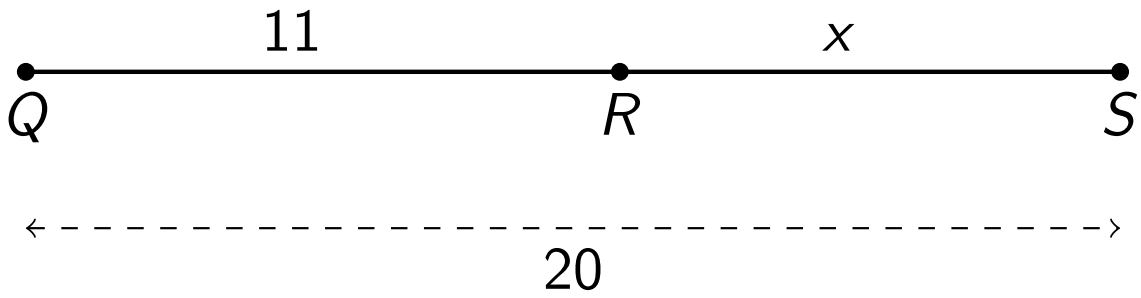
Segment Addition Postulate: lengths add. e.g. $AB + BC = AC$

Example 2: Points and line segments

Segment Addition Postulate

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

Find RS.

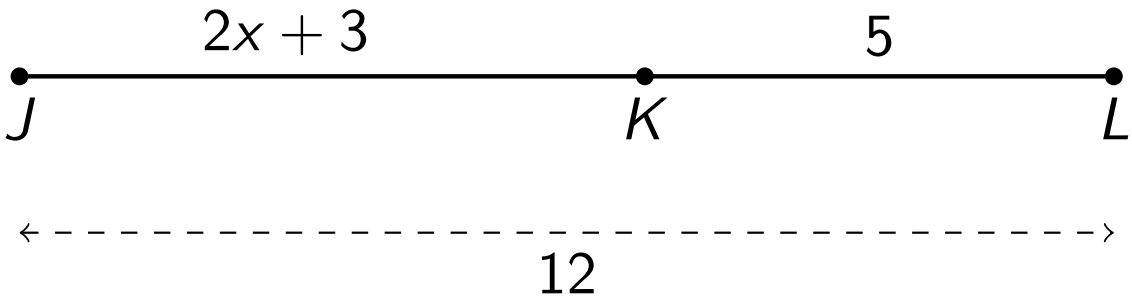


1. How would you check your answer?
2. Which equation represents the situation?

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

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.

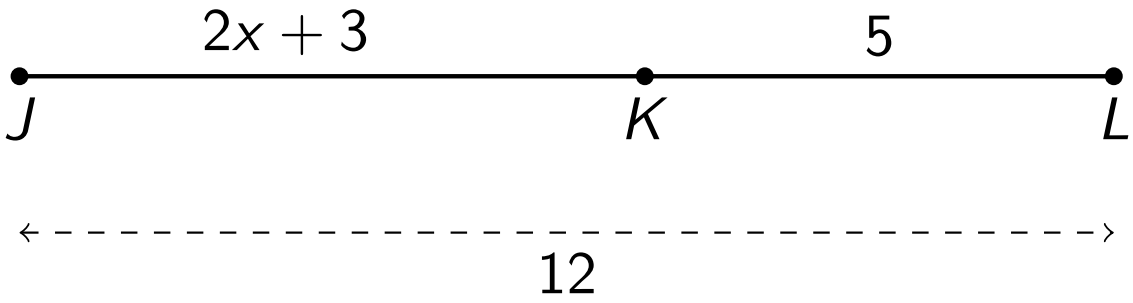
2. Solve for x.

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.



$$JK + KL = JL$$

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

$$2x + 8 = 12$$

$$2x = 4$$

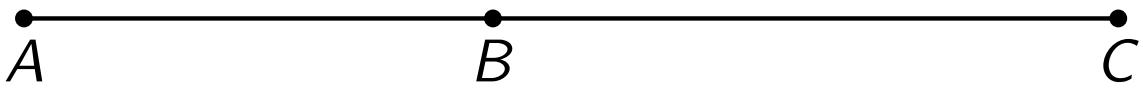
$$x = 2$$

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

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

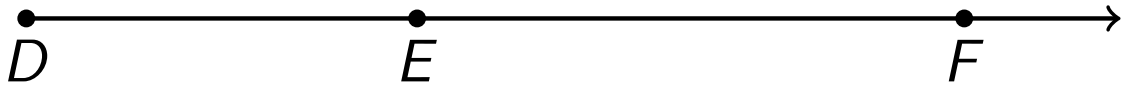
Example 4 (challenge): Segment addition postulate

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



Example 5: Solve an equation with x on both sides

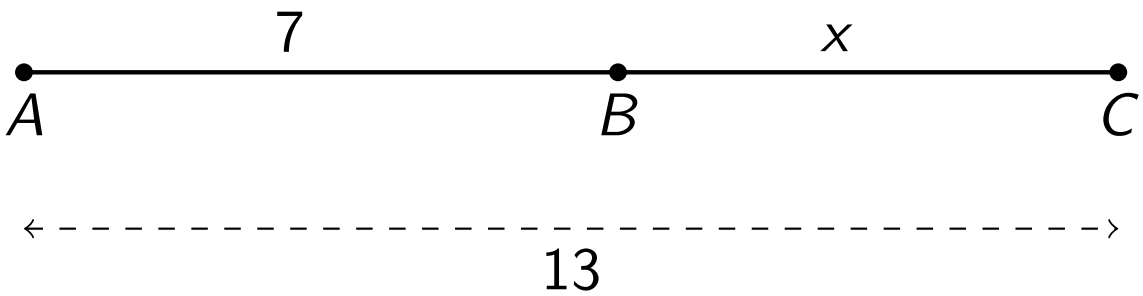
Given $\overrightarrow{DEF}$, $DE = x + 1$, $EF = 9$, $DF = 3x$. Find DE.



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.

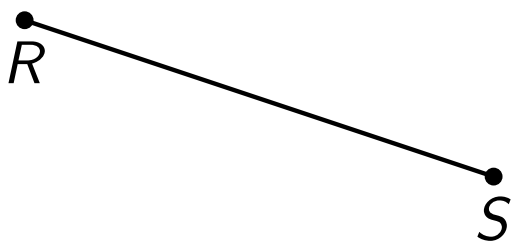
$7 + x = 13$ $x = 13 - 7$

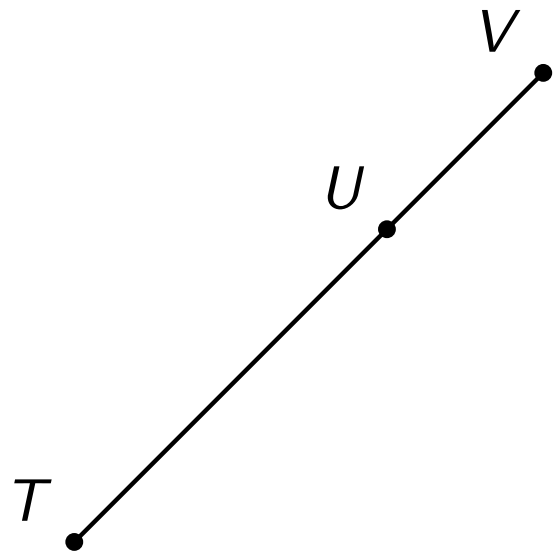
2. Find BC.

Write down an example of each geometric object.

Use proper notation.

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

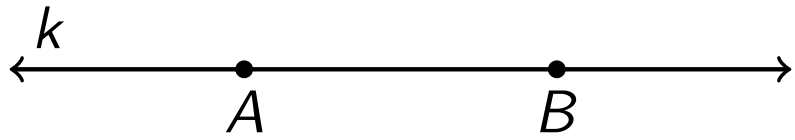




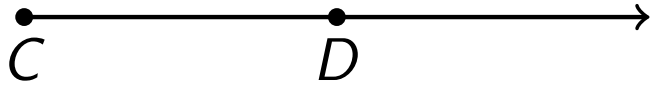
5. Given $TU = 1.4$, $UV = 0.6$. Find TV. (label the diagram first)

More definitions: lines, rays, planes

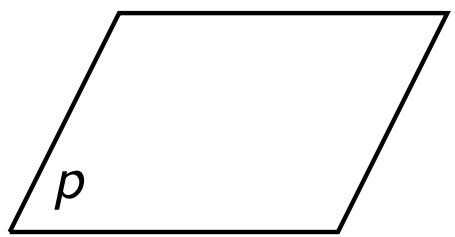
A *line* extends infinitely in both directions, $\overleftrightarrow{AB}$.
(sometimes labeled with a small letter, for example, line k)



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

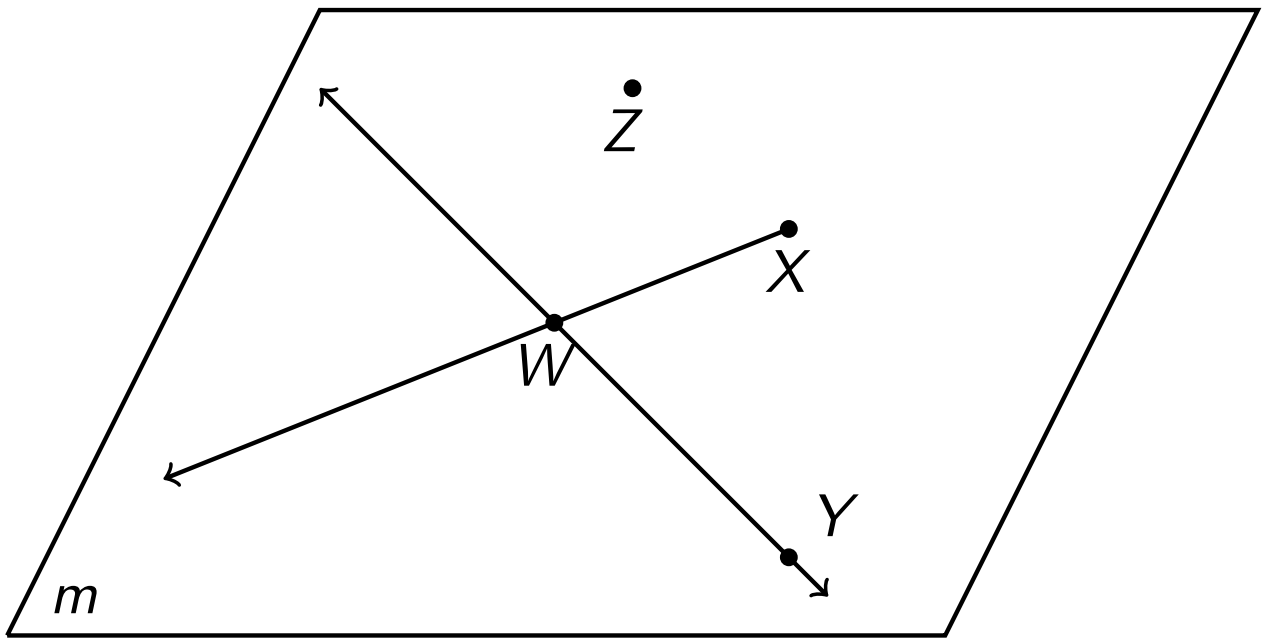


A *plane* is flat and extends infinitely in two directions, p.



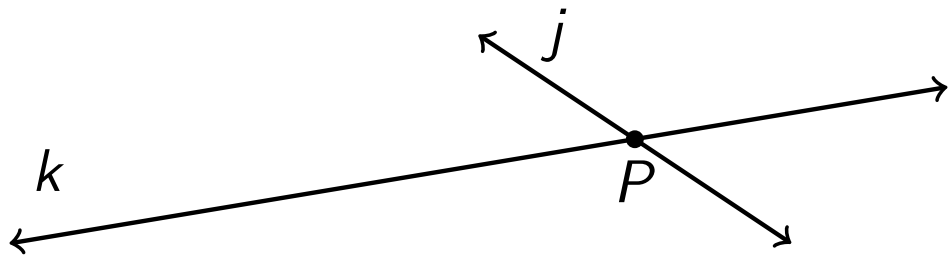
Several objects are shown in a plane

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

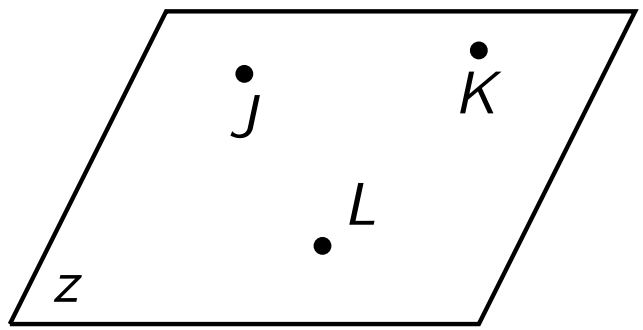


More definitions: intersections, coplanar

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.

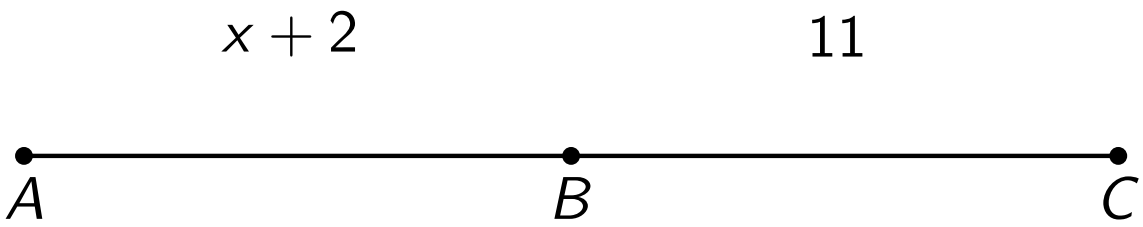


Learning Target: I can *bisect* a length

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.

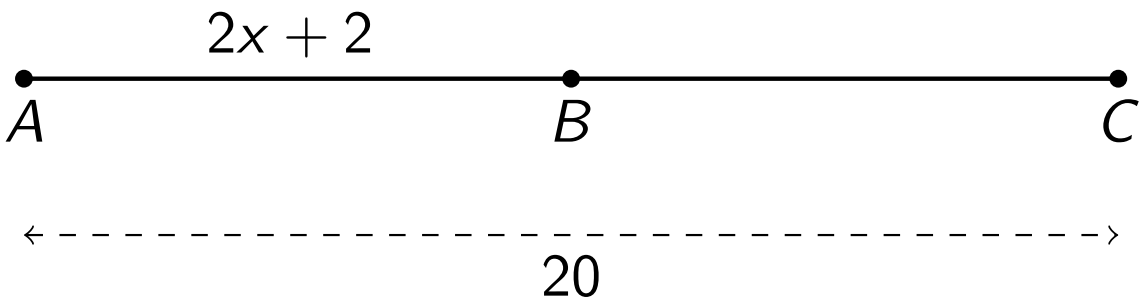


Hint: The line segment is split into two equal lengths.

The *midpoint* of a line segment

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

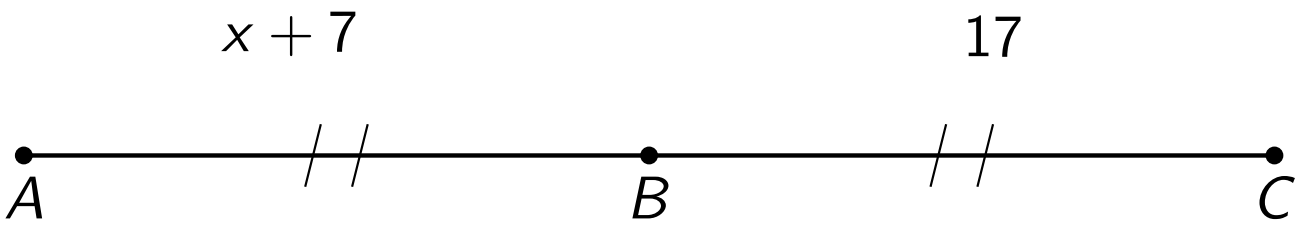
Find x.



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.



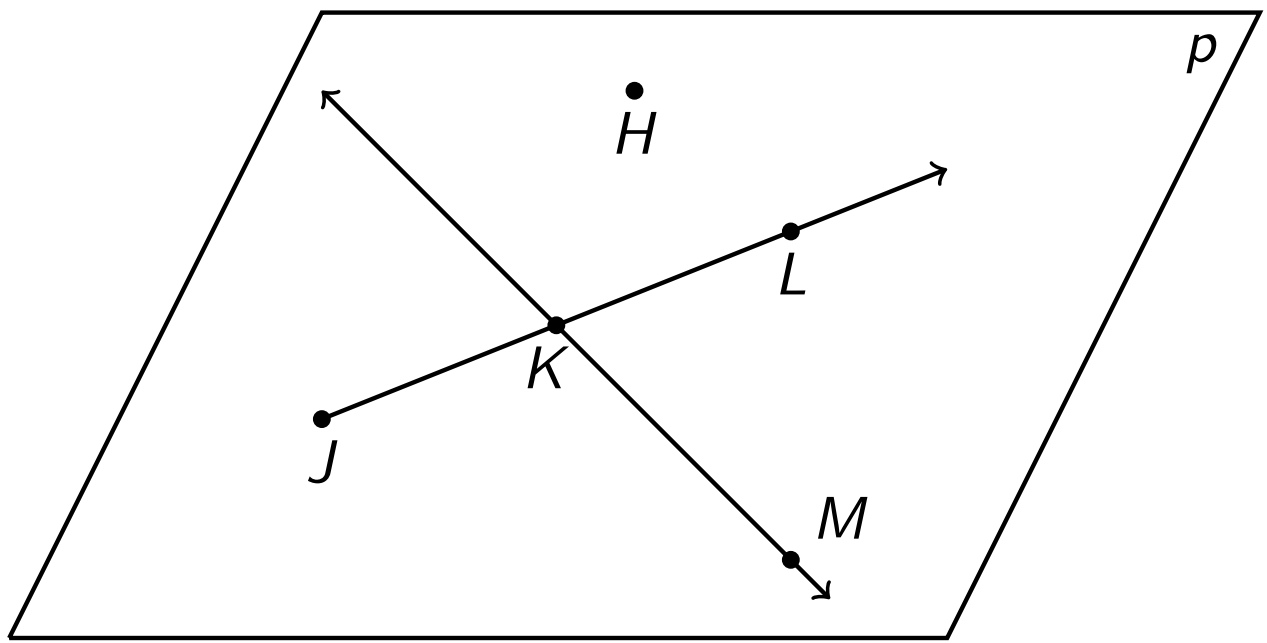
The *midpoint* or *bisector* of a line segment divides it exactly in half.

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

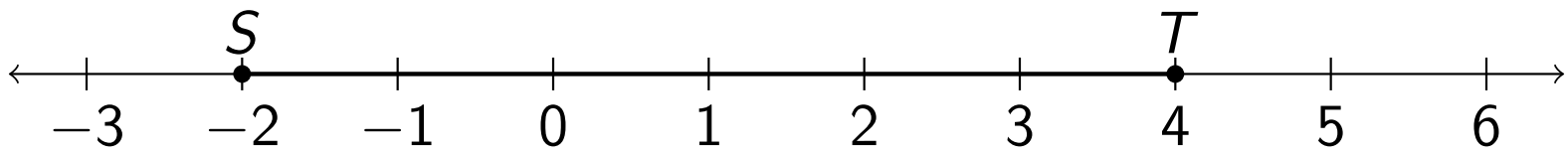
1. The point H
2. The ray $\overrightarrow{JL}$
3. The name of the plane shown



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 $T(4)$



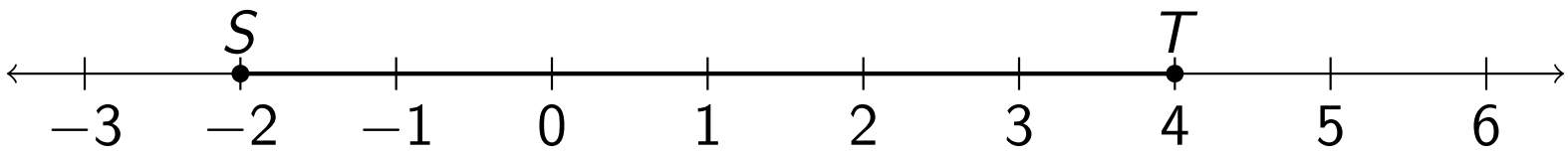
What is the length of the segment $\overline{ST}$? Show your work as an equation.

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.

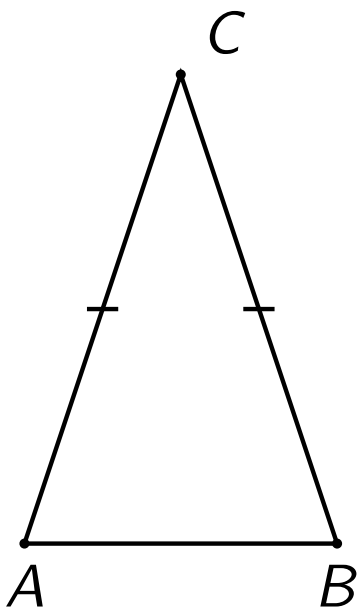


What is the length of the segment $\overline{ST}$? Show your work as an equation.

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

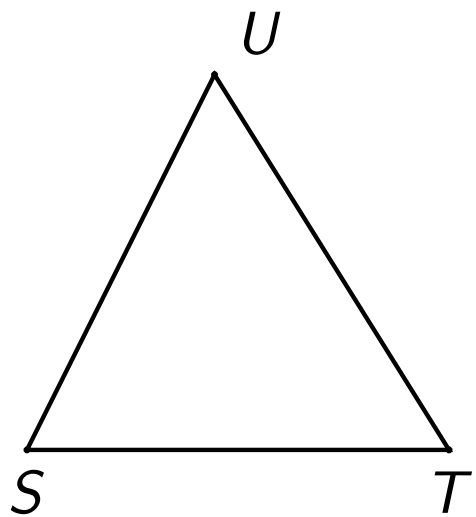
Use proper notation (including the bar over the letters)

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"

Learning Target: I can collaborate in review

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.6 Thursday 15 September

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

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

Groupwork review for quiz tomorrow

"Roundtable" of four students, with four topics assigned

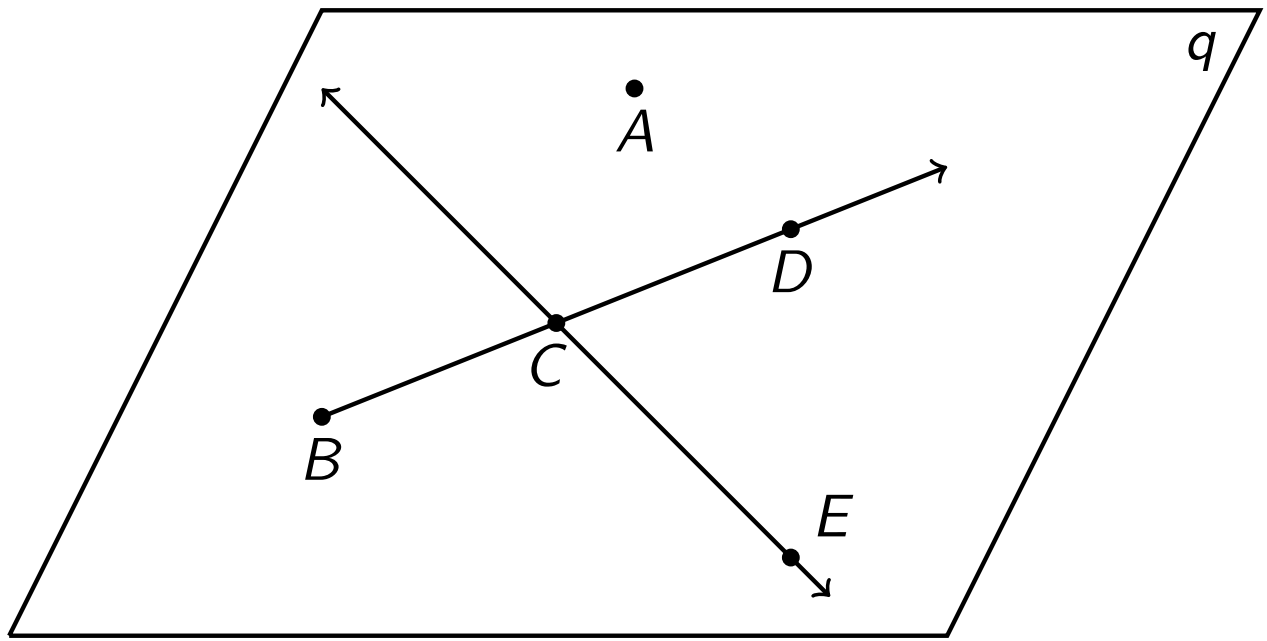
Geometry skills to study / teach

1. Conventions: terminology, notation, diagramming
2. Perimeter and special shapes:
   - Scalene, isosceles, and equilateral $\triangle$s
   - Squares, rectangles, rhombuses, kites
3. Modeling situations with algebra
4. Solving algebraic equations for one variable

Identify each item.

Example of Topic 1: Conventions: terminology, notation, diagramming

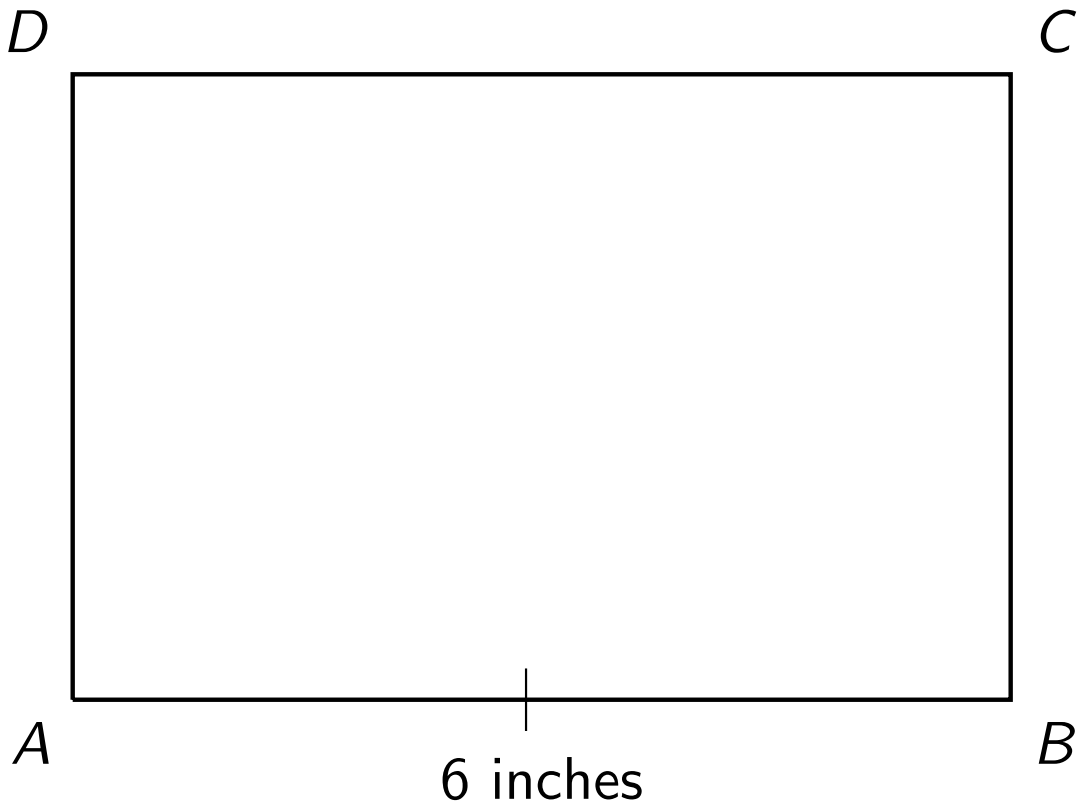
1. The point A
2. The ray $\overrightarrow{BD}$
3. The name of the plane



Find the perimeter of the rectangle *ABCD* finish

Example of Topic 2: Perimeter and special triangles and quadrilaterals

Given $AB = 6$ inches, $BC = 4$ inches.



Write down an equation to represent the situation

Example of Topic 3: Modeling situations with algebra

Given M is the midpoint of $\overline{AB}$, $AM = 4x + 2$, $AB = 20$.

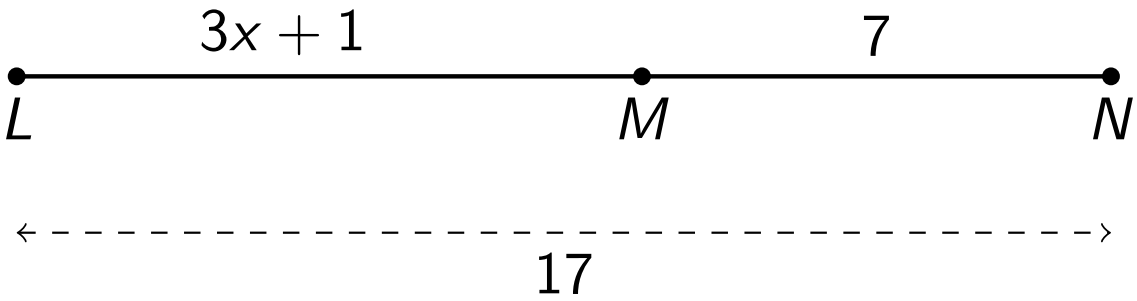
First mark the diagram with hash marks and values.

Sometimes you will not be asked to solve the equation.

Solve for x

Example of Topic 4: Solving algebraic equations for one variable

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



$$3x + 7 = 17$$

You must check the solution.

Learning Target: I can change units of length

CCSS: HSG.CO.A.1 Know precise geometric definitions 1.7 Friday 16 September

Do Now: Mike is six feet tall. How many inches is that?

Conversion ratio: 1 foot $=$ 12 inches

Exit note quiz today