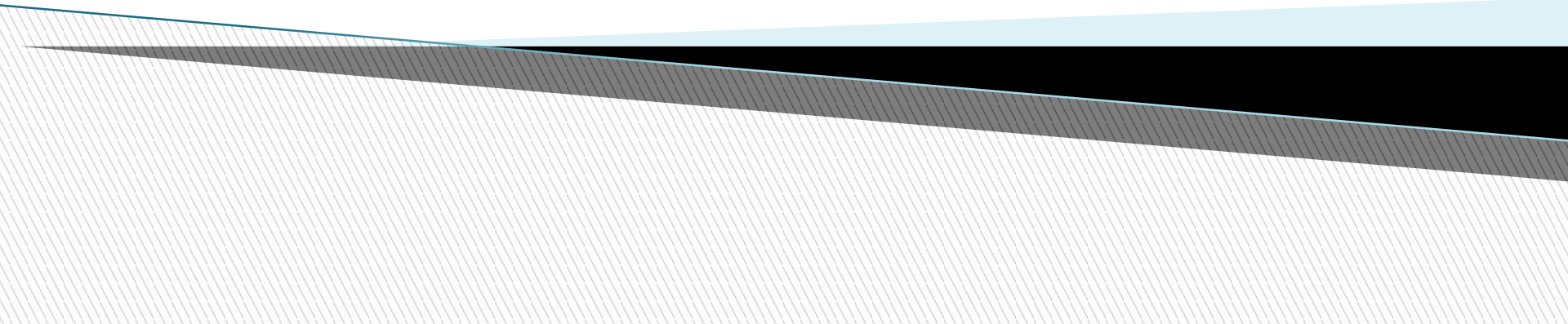


1.3 Measuring Segments



1.3 Measuring Segments

On a freshwater fishing trip, you catch the fish below. By law, you must release any fish between 15 and 19 in. long. You need to measure your fish, but the front of the ruler on the boat is worn away. Can you keep your fish? Explain how you found your answer.

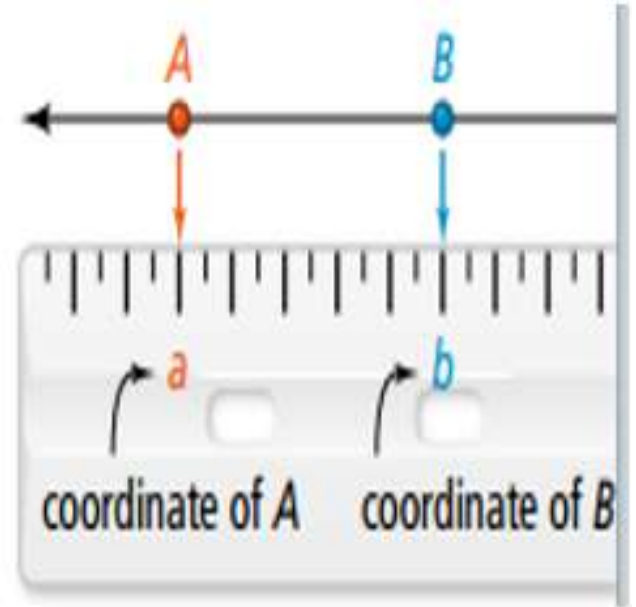


Yes, it is not between 15–19 in. long. The tail of the fish reaches to the 16 in. mark, and the space in the front of the fish is more than one inch, so it is less than 15 inches long.

Also, you can move the fish towards the end of the ruler. The fish will end up between 17 and 29 in.
 $29 - 17 = 12$, so the fish is 12 in.

Review: Ruler Postulate

- ▶ Every point on a line can be paired with a real number. The real number that corresponds to a point is called the coordinate of the point.
- ▶ Basically this postulate says that we can assign a “length” to an object. (We can measure things).
- ▶ The use of an actual ruler is always an estimate because:
 - There’s human error.
 - We can only measure at the smallest increment on the ruler... For instance, how do you know that something measures 15 inches exactly? Maybe it’s really 14.999 in. or 15.000001 in.



Distance

- ▶ The **distance** between points A and B is the absolute value of the difference of their coordinates, or $|a - b|$.
- ▶ Note:
 - **\overline{AB}** refers to the segment AB.
 - **AB** refers to the length or distance of \overline{AB}
 - $AB = |a - b|$



Example 1



What is ST ?

$$\begin{aligned} | -4 - 8 | &= \\ | -12 | &= \\ 12 \end{aligned}$$

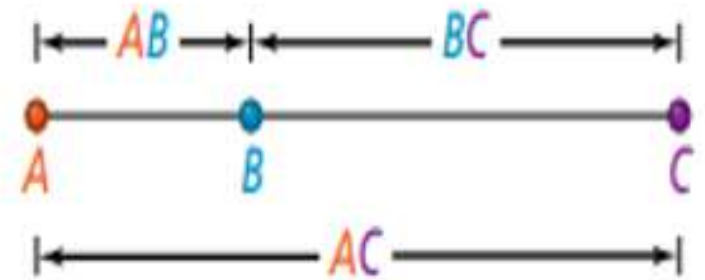
What is SU ?

$$\begin{aligned} | -4 - 10 | &= \\ | -14 | &= \\ 14 \end{aligned}$$

Measures in
Geometry are
ALWAYS
positive!!!

Segment Addition Postulate

- ▶ If three points A, B, and C are collinear and B is between A and C, then $AB + BC = AC$.



Part + Part = Whole

Example 2:

- If $EG = 59$, what are EF and FG ?

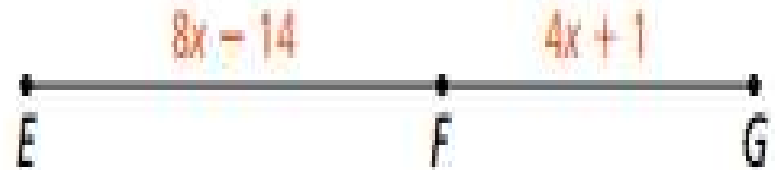
$$EF + FG = EG$$

$$8x - 14 + 4x + 1 = 59$$

$$12x - 13 = 59$$

$$12x = 72$$

$$x = 6$$



Plug it in!!!

$$\begin{array}{ll} EF = 8x - 14 & FG = 4x + 1 \\ = 8(6) - 14 & = 4(6) + 1 \\ = 34 & = 25 \end{array}$$

You Try!

In the diagram, $JL = 120$. What are JK and KL ?

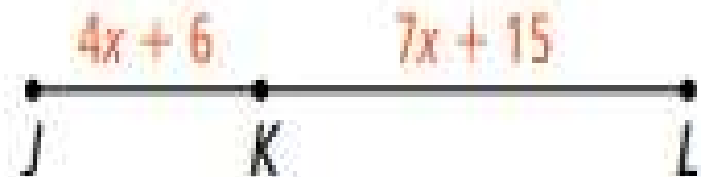
$$JK + KL = JL$$

$$4x + 6 + 7x + 15 = 120$$

$$11x + 21 = 120$$

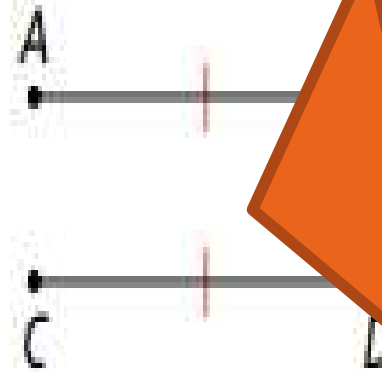
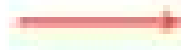
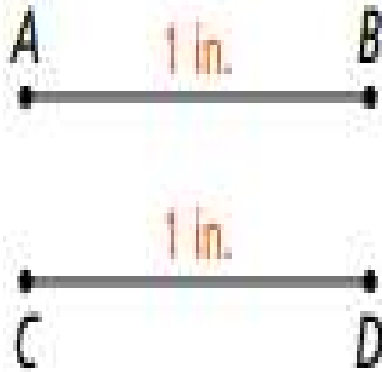
$$11x = 99$$

$$x = 9$$



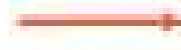
$$\begin{array}{ll} JK = 4x + 6 & KL = 7x + 15 \\ = 4(9) + 6 & = 7(9) + 15 \\ = 42 & = 78 \end{array}$$

Congruent \cong Segments



Mark \cong segments with a hash mark.

$$\overline{AB} = \overline{CD}$$

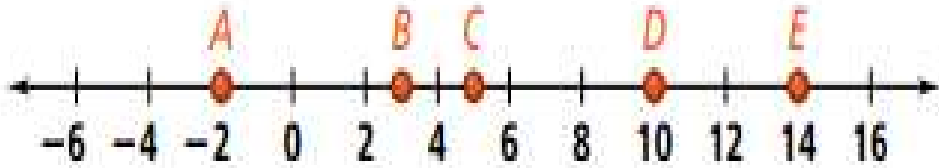


$$\overline{AB} \cong \overline{CD}$$

Lengths are
=
Equal

Segments are
 \cong
Congruent

Example 3



► Are AC and BD congruent??

$$\begin{aligned} AC &= |-2 - 5| \\ &= |-7| \\ &= 7 \end{aligned}$$

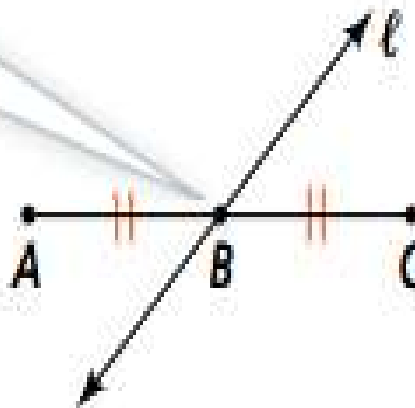
$$\begin{aligned} BD &= |3 - 10| \\ &= |-7| \\ &= 7 \end{aligned}$$

YES!!! $AC \cong BD$

Vocabulary

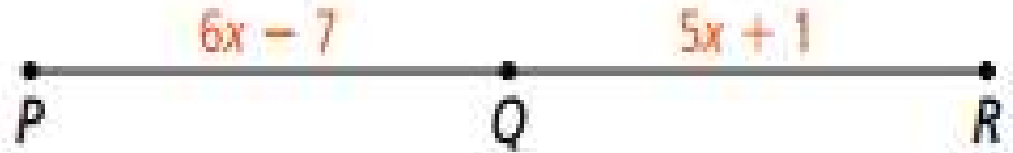
- ▶ The midpoint of a segment is a point that divides the segment into 2 congruent segments.
- ▶ A segment bisector is either a point, line, ray, or other segment that intersects a segment at its midpoint. (ℓ bisects the segment)

B is the midpoint
of \overline{AC} .



ℓ is a segment
bisector of \overline{AC} .

Example 4



- Q is the midpoint of PR . What are PQ , QR and PR ?

$$\begin{array}{r} 6x - 7 = 5x + 1 \\ -5x \quad -5x \\ \hline x - 7 = 1 \\ +7 \quad +7 \\ \hline x = 8 \end{array}$$

$$\begin{aligned} PQ &= 6x - 7 \\ &= 6(8) - 7 \\ &= 41 \end{aligned}$$

$$\begin{aligned} QR &= 5x + 1 \\ &= 5(8) + 1 \\ &= 41 \end{aligned}$$

$$\begin{aligned} PR &= 41 + 41 \\ &= 82 \end{aligned}$$