

Geometry 1.2

Measure segments

Calculate with measures

line segment — 2 endpoints

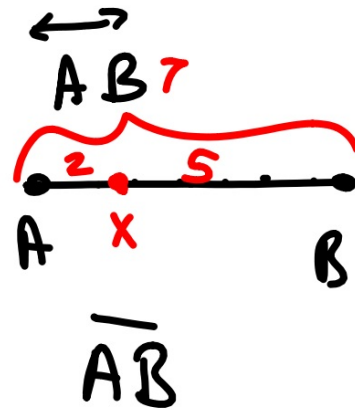
betweenness of points

between — collinear, not nec.
mp

congruent segments

construction

You need your compass today! (or borrow one--cost 1 gc)



- When the ancient Egyptians found a need for a measurement system, they used the human body as a guide. The cubit was the length of an arm from the elbow to the fingertips. Eventually the Egyptians standardized the length of a cubit, with ten *royal cubits* equivalent to one *rod*.



Line vs line segment:

1 Measure Line Segments Unlike a line, a **line segment**, or *segment*, can be measured because it has two endpoints. A segment with endpoints A and B can be named as $\overline{AB}$ or $\overline{BA}$. The *measure* of $\overline{AB}$ is written as AB . The length or measure of a segment always includes a unit of measure, such as meter or inch. All measurements are approximations dependent upon the smallest unit of measure available on the measuring instrument.



Example 1 Length in Metric Units

Find the length of $\overline{AB}$ using each ruler.

a.



4 cm

b.



3.7 cm

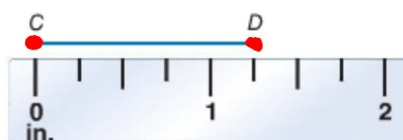
StudyTip

Using a Ruler The zero point on a ruler may not be clearly marked. For some rulers, zero is the left edge of the ruler. On others, it may be a fine line farther in on the scale. If it is not clear where the zero is, align one endpoint on 1

Example 2 Length in Standard Units

Find the length of $\overline{CD}$ using each ruler.

a.



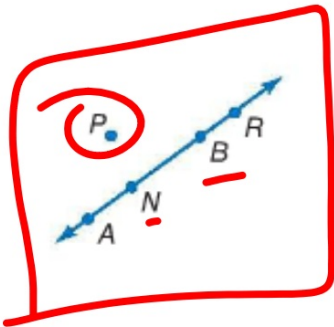
$1 \frac{1}{4}$ in

b.



$1 \frac{5}{8}$ in
 $1 \frac{1}{4}$ in

be as precise as you can



Key Concept Betweenness of Points

Words

Point M is **between** points P and Q if and only if P , Q , and M are collinear and $PM + MQ = PQ$.

Model

1. Must be collinear
2. Lengths must work

StudyTip**Comparing Measures**

Because measures are real numbers, you can compare them. If points X , Y , and Z are collinear in that order, then one of these statements is true: $XY = YZ$, $XY > YZ$, or $XY < YZ$.

Example 3 Find Measurements by Adding

Find EG . Assume that the figure is not drawn to scale.

EG is the measure of $\overline{EG}$. Point F is between E and G . Find EG by adding EF and FG .

$$\begin{aligned} 2\frac{3}{4} + 2\frac{3}{4} &= 4\frac{6}{4} \\ &= 5\frac{2}{4} \\ &= 5\frac{1}{2} \text{ in} \end{aligned}$$

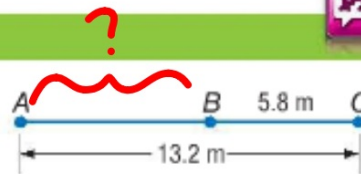


Example 4 Find Measurements by Subtracting



Find AB . Assume that the figure is not drawn to scale.

Point B is between A and C .



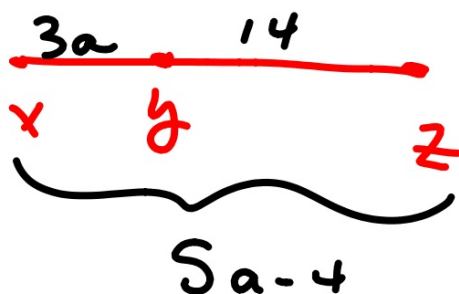
$$? + 5.8 = 13.2$$

$$7.4\text{ m}$$



Example 5 Write and Solve Equations to Find Measurements

ALGEBRA Find the value of a and XY if Y is between X and Z , $XY = 3a$, $XZ = 5a - 4$, and $YZ = 14$.



$$\begin{array}{r} 3a + 14 = 5a - 4 \\ -3a + 4 \quad -3a + 4 \\ \hline \end{array}$$

$$\frac{18}{2} = \frac{2a}{2}$$

$$9 = a$$

$$\begin{array}{l} a = \\ xy = \end{array}$$

211

Segments that have the same measure are called **congruent segments**.

WatchOut!

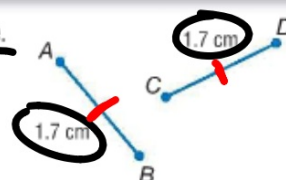
Equal vs. Congruent Lengths are equal and segments are congruent. It is correct to say that $AB = CD$ and $\overline{AB} \cong \overline{CD}$. However, it is *not* correct to say that $\overline{AB} = \overline{CD}$ or that $AB \cong CD$.

KeyConcept Congruent Segments

Words Congruent segments have the same measure.

Symbols $\cong$ is read *is congruent to*. Red slashes on the figure also indicate congruence.

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



Tools for construction (game rules):

straight edge

compass

pencil

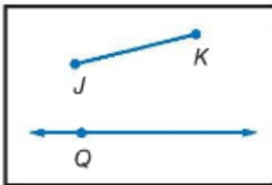
(That's all)

Drawings of geometric figures are created using measuring tools such as a ruler and protractor. **Constructions** are methods of creating these figures without the benefit of measuring tools. Generally, only a pencil, straightedge, and compass are used in constructions. *Sketches* are created without the use of any of these tools.

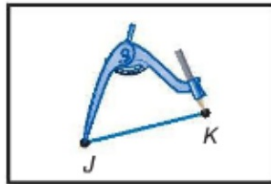
You can construct a segment that is congruent to a given segment.

Construction Copy a Segment

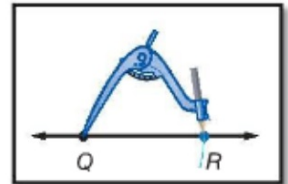
Step 1 Draw a segment $\overline{JK}$. Elsewhere on your paper, draw a line and a point on the line. Label the point Q .



Step 2 Place the compass at point J and adjust the compass setting so that the pencil is at point K .



Step 3 Using that setting, place the compass point at Q and draw an arc that intersects the line. Label the point of intersection R . $\overline{JK} \cong \overline{QR}$



1.2 p. 18

11-31 022

42-45