Geometry 1.2
Measure segments
Calculate with measures
line segment
betweenness of points
between
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:

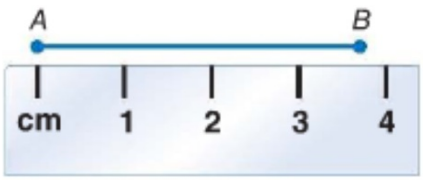
1 Measure Line Segments Unlike a line, a **line segment**, or *segment*, can be measured because it has two endpoints. A segment with endpoints A and B can be named as $\overline{AB}$ or $\overline{BA}$. The *measure* of $\overline{AB}$ is written as AB. The length or measure of a segment always includes 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.



b.

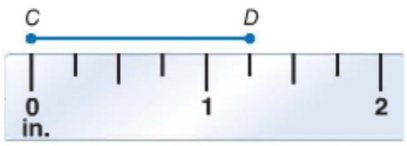
StudyTip

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

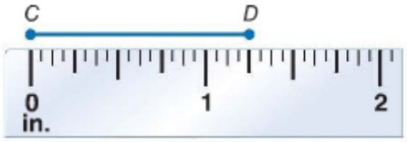
Example 2 Length in Standard Units

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

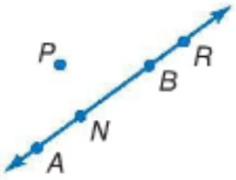
a.



b.



be as precise as you can

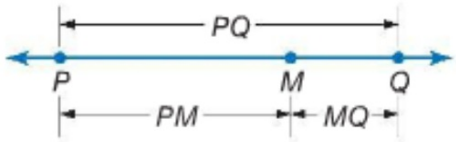


KeyConcept Betweenness of Points

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

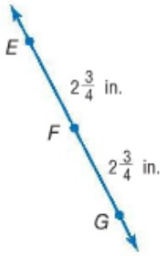
Comparing Measures

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.

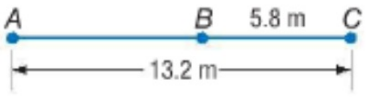
EG is the measure of $\overline{EG}$. Point F is between E and G. Find EG by adding EF and FG.



Example 4 Find Measurements by Subtracting

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

Point B is between A and C.



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 $YZ = 14$.

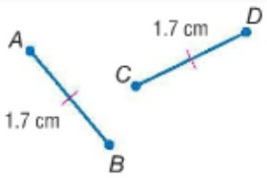
Segments that have the same measure are called **congruent segments**.

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



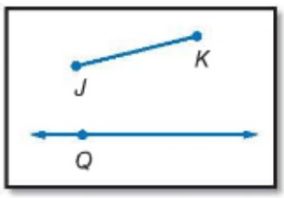
Tools for construction (game rules):
straight edge
compass
pencil
(That's all)

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.

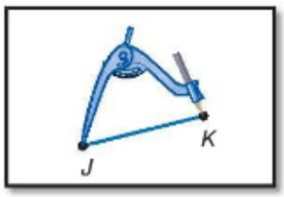
You can construct a segment that is congruent to a given segment.

Construction Copy a Segment

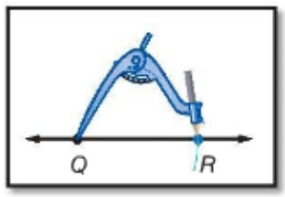
Step 1 Draw a segment $\overline{JK}$. Elsewhere on your paper, draw a line and a point on the line. Label the point Q.



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. $\overline{JK} \cong \overline{QR}$



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