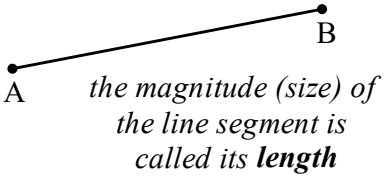
Distance and Length on a Plane

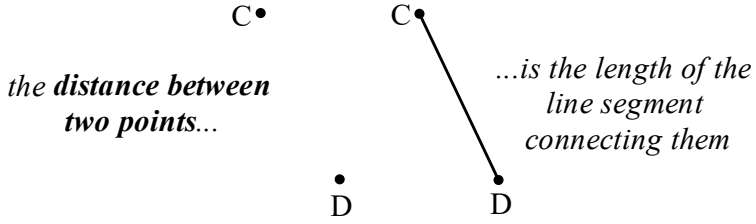
Magnitude is a general term used to describe something's size. Magnitude can refer to anything from the length of a line segment to the volume of a container to the amount of force exerted on a sail by blowing wind. In this course we will tend to focus on magnitudes of physical properties such as length, area, and volume.



the magnitude (size) of the line segment is called its ***length***

Length describes the magnitude of a line segment. In other words, the size of a line segment is called its length.

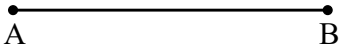
Since there is only one unique line segment we can draw between two points, we define the ***distance between two points*** as the length of the line segment connecting those points.



the ***distance between two points****...*

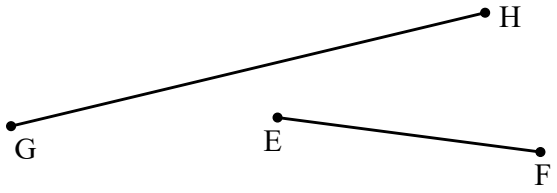
...is the length of the line segment connecting them

We know that $\overline{AB}$ refers to the line segment passing through all points between A and B. Writing the endpoints of a line segment without the segment symbol (so writing AB instead of $\overline{AB}$) represents the length of $\overline{AB}$ (or the distance between A and B).



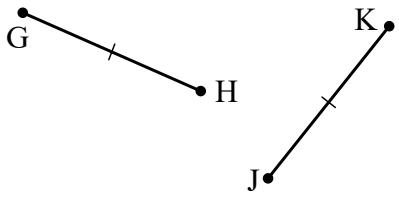
AB refers to the length of the line segment (or the distance between A and B)

1. Use the diagram to the right to answer the following questions.
   a. The length of $\overline{EF}$ is written as _____.
   b. True or False: $EF > GH$. [*Remember that ">" means "greater than".*]
   c. Why is it incorrect to write something like "$\overline{EF} > \overline{AB}$"?

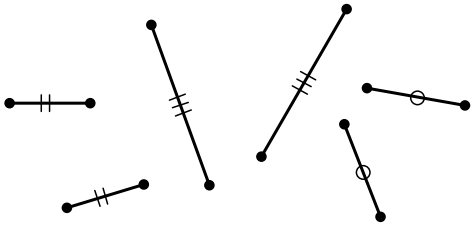


2. Draw two segments $\overline{AB}$ and $\overline{CD}$ such that $AB < CD$.

In the diagram to the right $\overline{GH}$ and $\overline{JK}$ have the same length. We can represent this by making tick marks on the segments as shown.

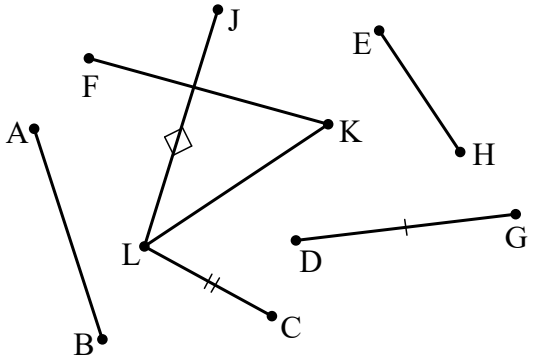


When there are multiple pairs of segments with equal lengths we can distinguish the pairs by using the same number of tick marks or using alternative matching symbols.



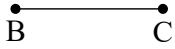
3. Complete the following diagram using the given information. Mark segments with the same length using the same symbols.

JL = FK
CL = EH
AB = DG = LK



Distances from a Point

We have highlighted point *A* along with a line segment $\overline{BC}$.



4. a. Highlight another point *D* with a distance from *A* equal to *BC*.

   b. Highlight another point *E* with a distance from *A* equal to *BC*.

   c. Highlight five more points with distances from *A* equal to *BC*.

   d. Highlight <u>*all*</u> of the points with distances from *A* equal to *BC*.

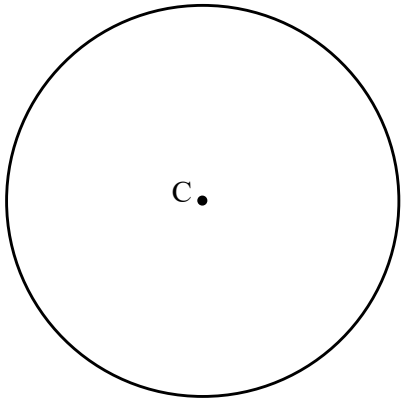
In Exercise #3d you had to draw a circle centered at point A. Each line segment drawn from A to any point on the circle [such as $\overline{AD}$ and $\overline{AE}$] is called a ***radius*** of the circle. Every radius for the same circle has the same length.

We name circles by their center point. So the circle in Exercise #4 is "Circle A" or "$\odot A$".

5. a. Draw $\odot M$ and $\odot T$ where the two circles have different radius lengths. [Use a ***compass*** or similar tool to help you make your drawing precise.]

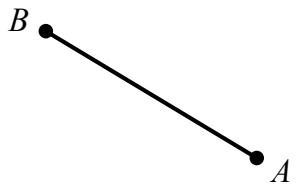
   b. Represent the length of the circles' radii using notation. [*You might need to highlight and label additional points to help you*.]

6. a. Draw five radii for $\odot C$. Use a ***straightedge*** or similar tool to make your drawing precise.



   b. What is true about the radii you drew?

7. a. Use a compass to draw a circle centered at A with $\overline{AB}$ as a radius.



b. What does the circle you drew represent?

8. Our naming convention for circles works really well unless there are multiple circles that share a center. Draw three circles with the same center but different radius lengths. These are called ***concentric circles*** [which means "circles centered together"].

Circle and Radius

A ***circle*** highlights all of the points in a plane ***equidistant*** ("the same distance") from a single point in that plane (the circle's ***center***). Circles with the same center are called ***concentric circles***.

A line segment with an endpoint at a circle's center and another endpoint on the circle is called a ***radius*** of that circle.