

# 1.1 Segment Length and Midpoints

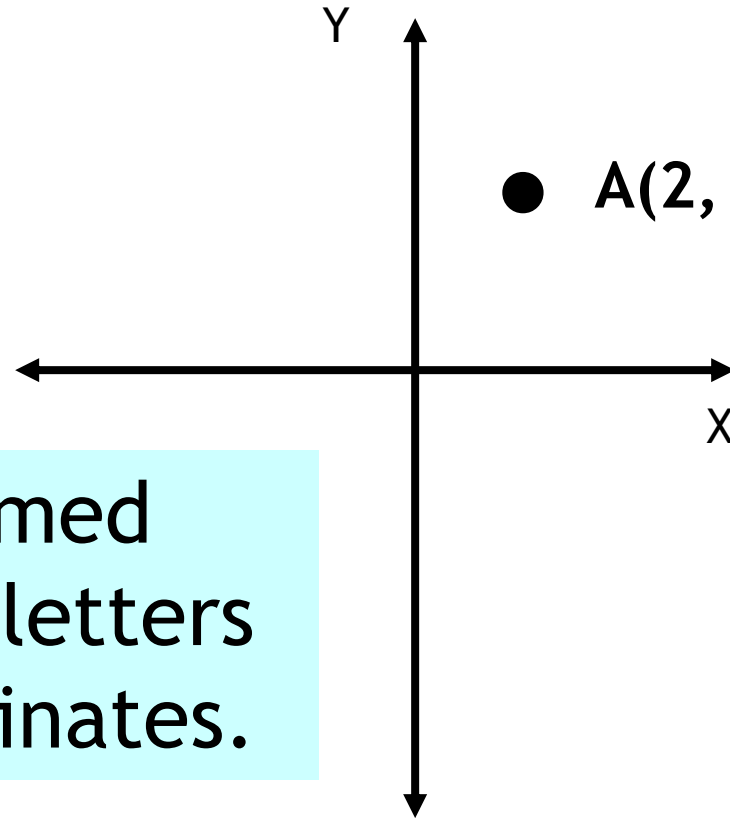
Essential Question: How do you draw a segment and measure its length?

- ▶ The most fundamental concepts in geometry do not have precise definitions but, we understand their meanings intuitively. We say these concepts are *undefined*.
- ▶ There are 3 undefined terms in geometry: point, line, and plane.

Point: A ***point*** indicates a position or location in space.

● P

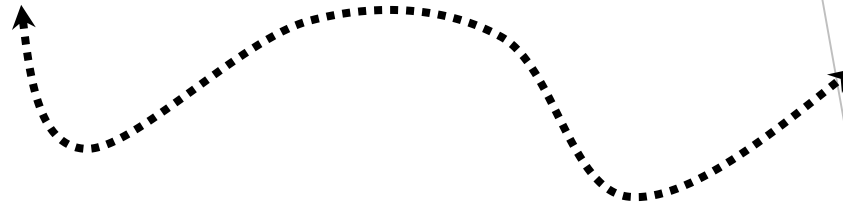
● A(2, 6)



Points are named using capital letters and/or coordinates.

Line: A line is an infinite set of adjacent points.

Ex: Curved line



Ex: Straight line



Naming a Line:

a) Two points on the line:  $\overleftrightarrow{AB}$ ,  $\overleftrightarrow{AC}$ ,  $\overleftrightarrow{BA}$ ,  $\overleftrightarrow{BC}$ , etc...



b) Single lowercase letter

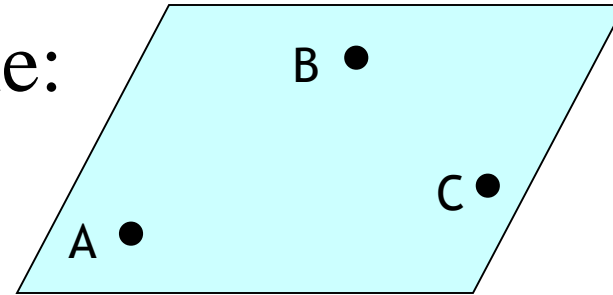


Plane: A ***plane*** is a set of points that forms a completely flat surface.

Naming a Plane:

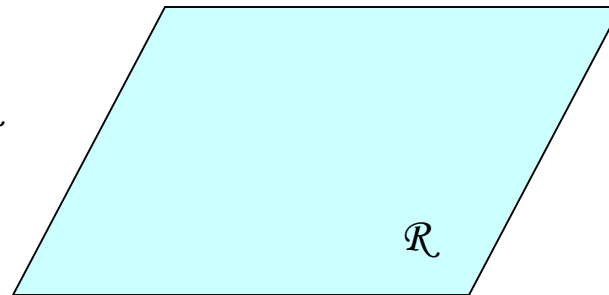
a) Three points on the plane:

Plane  $ABC$

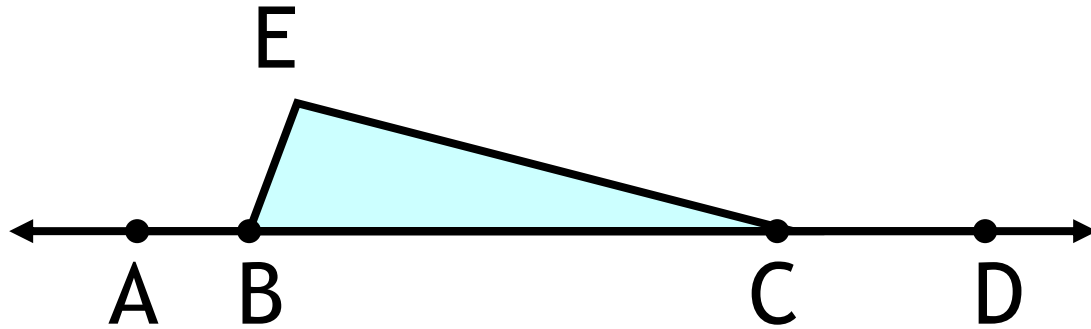


b) Single uppercase letter:

Plane  $\mathcal{R}$



Def: Collinear Points: A collinear set of points is a set of points all of which lie on the same straight line.



- Points A, B, C and D are collinear.
- Points A, E and C are not collinear.

## Def: Line Segment:



A line segment is the set of two points on a line called *endpoints*, and all points on the line between the endpoints.

## Naming a Line Segment:

Use the names of the endpoints.



“Line segment”  $\overline{AB}$  is part of “Line”  $\overleftrightarrow{AB}$

## Def: Ray:



A ray is a portion of a line that starts at a point (endpoint) and continues forever in one direction.

## Naming a Ray:

Use the names of the endpoints.



$\overrightarrow{AB}$  or  $\overleftarrow{BA}$



Coplanar: points that lie on the same plane

Parallel: lines that lie in the same plane but do not intersect

Postulate: a statement that is accepted as true without proof

## Postulate 1-2-2 Segment Addition Postulate

If  $B$  is between  $A$  and  $C$ ,  
then  $AB + BC = AC$ .



*Example:*

$G$  is between  $F$  and  $H$ ,  $FG = 6$ , and  $FH = 11$ .

Find  $GH$ .

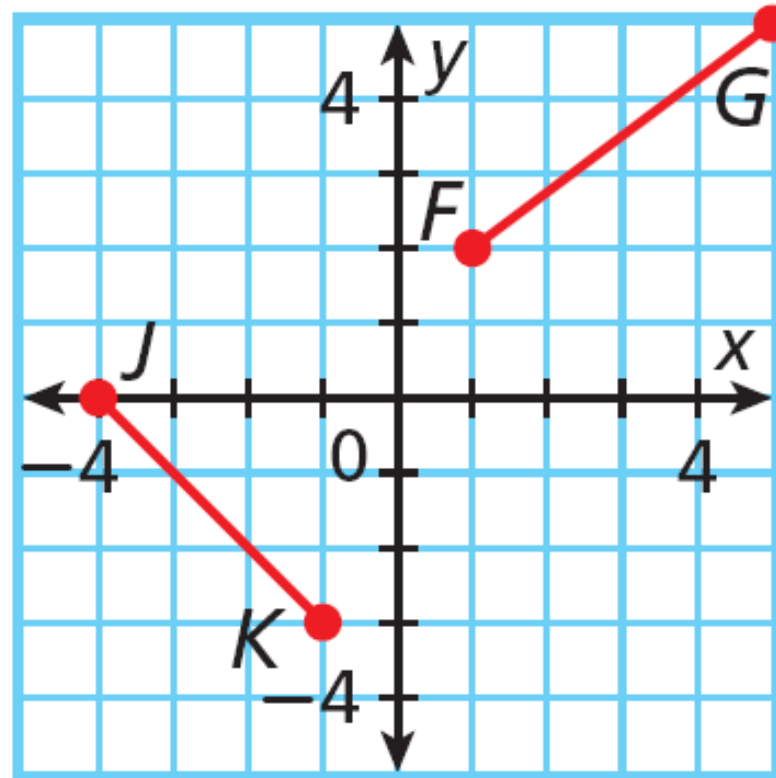
## Distance Formula

In a coordinate plane, the distance  $d$  between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

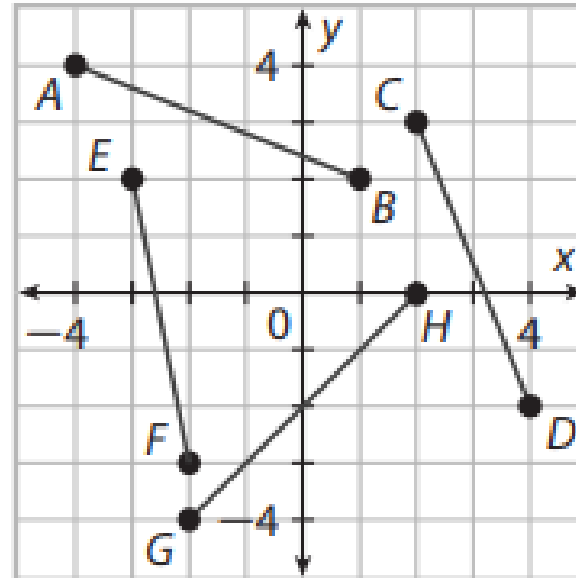
### Example

Find  $FG$  and  $JK$ . Justify your answer.

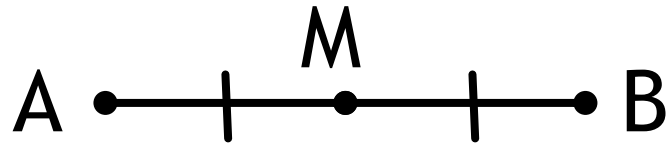


## Example

Given  $E(-2, 1)$ ,  $F(-5, 5)$ ,  $G(-1, -2)$ ,  $H(3, 1)$ .  
Find  $EF$  and  $GH$  and justify your answer.



Def: Midpoint The midpoint of a line segment divides the line segment into two congruent segments.



$$\overline{AM} \cong \overline{MB}$$

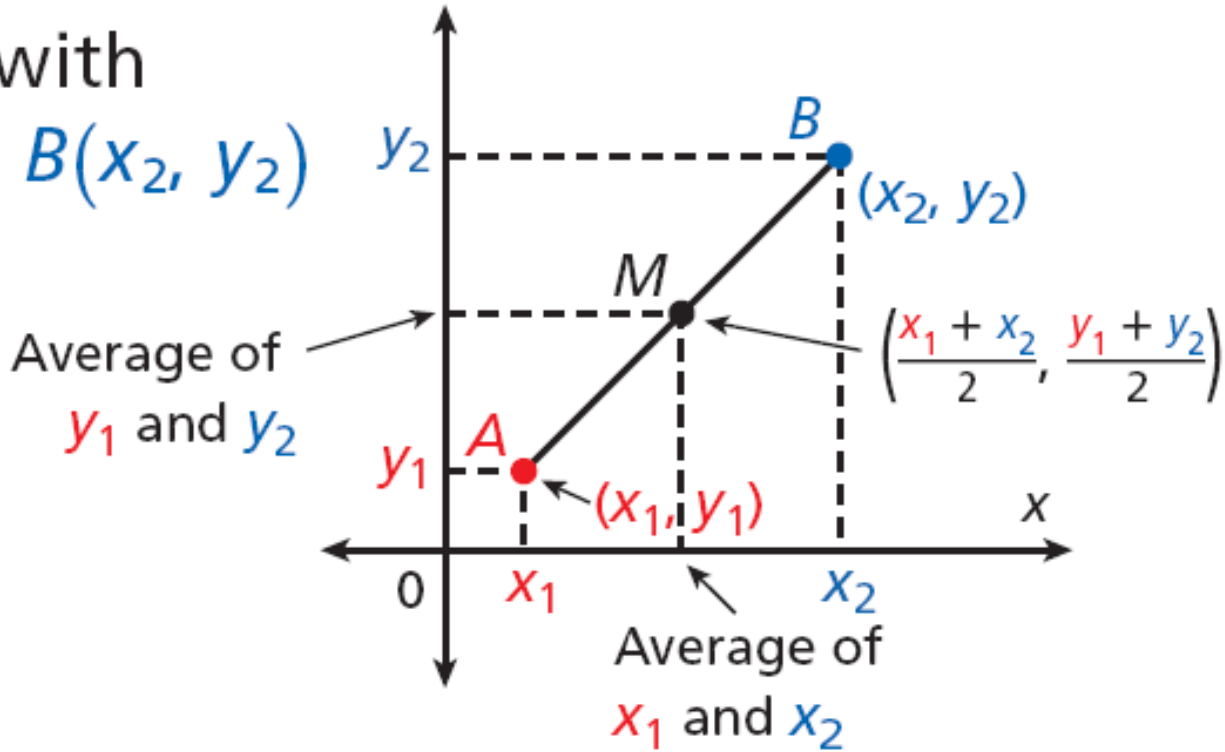
$$AM = MB$$

Segment bisector: a line, ray, or other figure that passes through the midpoint of a segment

## Midpoint Formula

The midpoint  $M$  of  $\overline{AB}$  with endpoints  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is found by

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right).$$



Find the midpoint and determine what quadrant the midpoint lies in.

If  $PQ$  has endpoints  $P(-4, 1)$  and  $Q(2, -3)$ , then the midpoint  $M$  of  $PQ$  lies in where and in what quadrant?

## Essential questions:

- Explain why the distance formula is not needed to find the distance between two points that lie on a horizontal or vertical line.
- When you use the distance formula, does the order in which you subtract the x- and y-coordinates matter? Explain
- When you use the midpoint formula, can you take either point as  $(x_1, y_1)$  or  $(x_2, y_2)$ ? Why or why not?



Book:

Tear out pages 14-17

Do problems 10, 12, 13, 16, 22, 23, 29

# 1.2 Angle Measures and Angle Bisectors

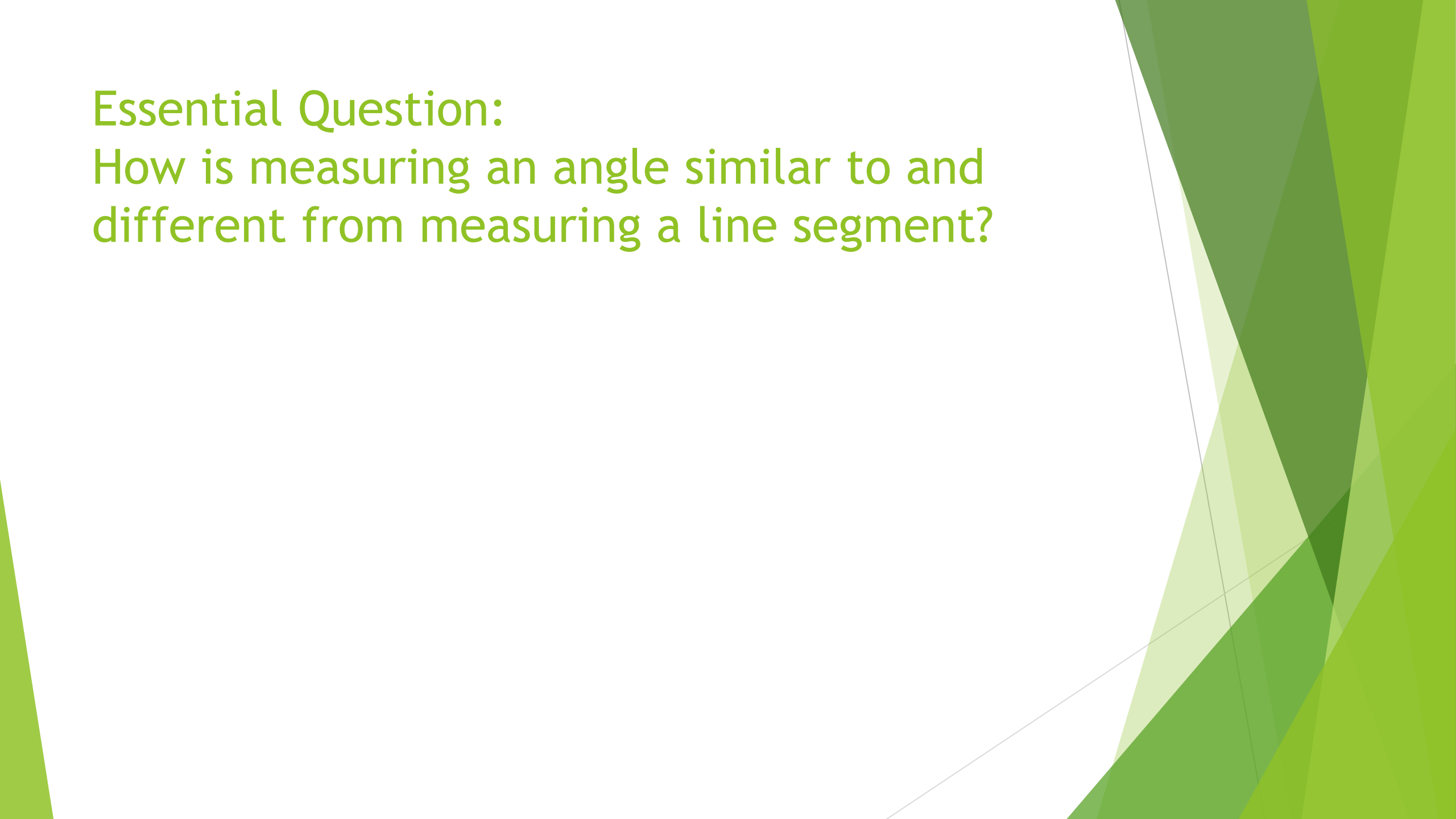
## *Objectives*

Name and classify angles.

Measure and construct angles and angle bisectors.

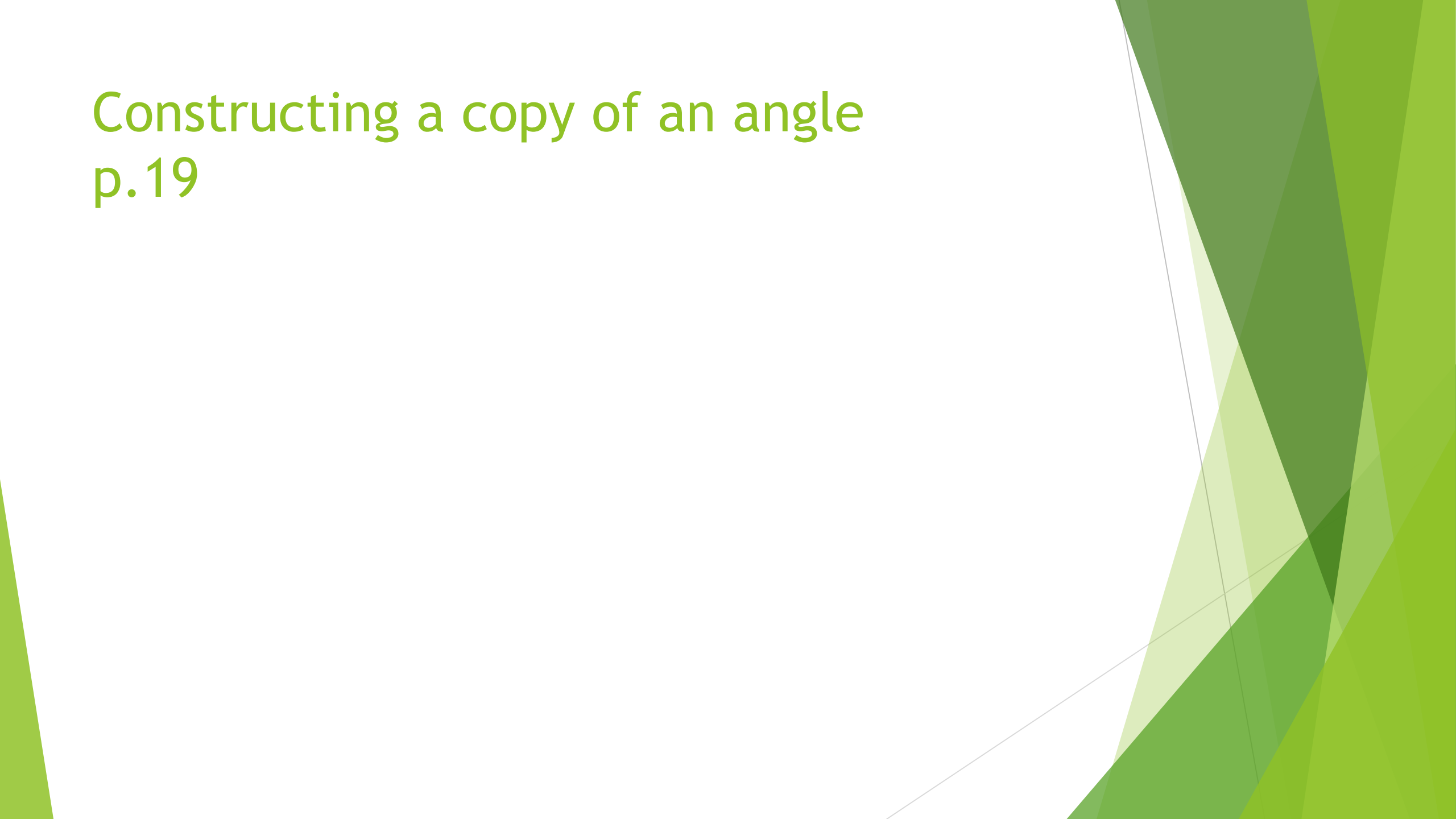
Essential Question:

How is measuring an angle similar to and different from measuring a line segment?



# Constructing a copy of an angle

p.19



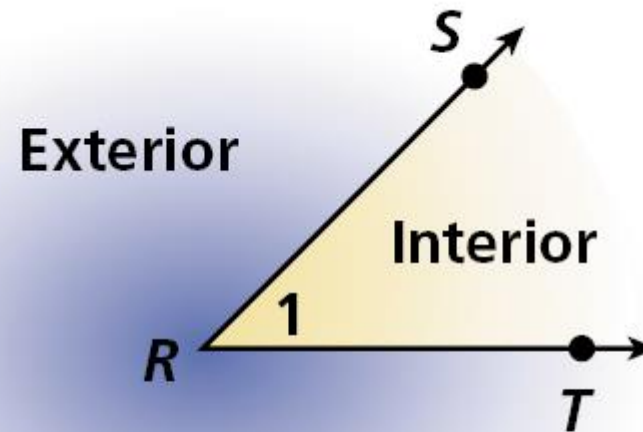
An **angle** is a figure formed by two rays, or sides, with a common endpoint called the **vertex** (plural: *vertices*). You can name an angle several ways: by its vertex, by a point on each ray and the vertex, or by a number.



The set of all points between the sides of the angle is the **interior of an angle**. The **exterior of an angle** is the set of all points outside the angle.

### Angle Name

$\angle R$ ,  $\angle SRT$ ,  $\angle TRS$ , or  $\angle 1$

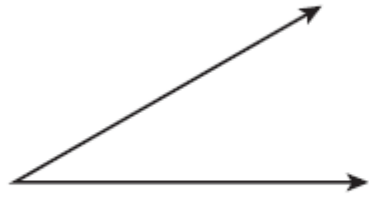


You cannot name an angle just by its vertex if the point is the vertex of more than one angle. In this case, you must use all three points to name the angle, and the middle point is always the vertex.

Question: Without seeing a figure, is it possible to give another name for  $\langle MKG \rangle$ ? If so, what is it? If not, why not?

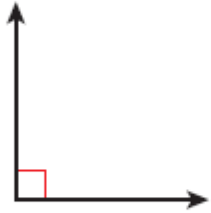
## Types of Angles

### Acute Angle



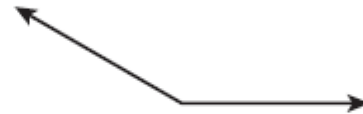
Measures greater than  $0^\circ$  and less than  $90^\circ$

### Right Angle



Measures  $90^\circ$

### Obtuse Angle



Measures greater than  $90^\circ$  and less than  $180^\circ$

### Straight Angle



Formed by two opposite rays and measures  $180^\circ$

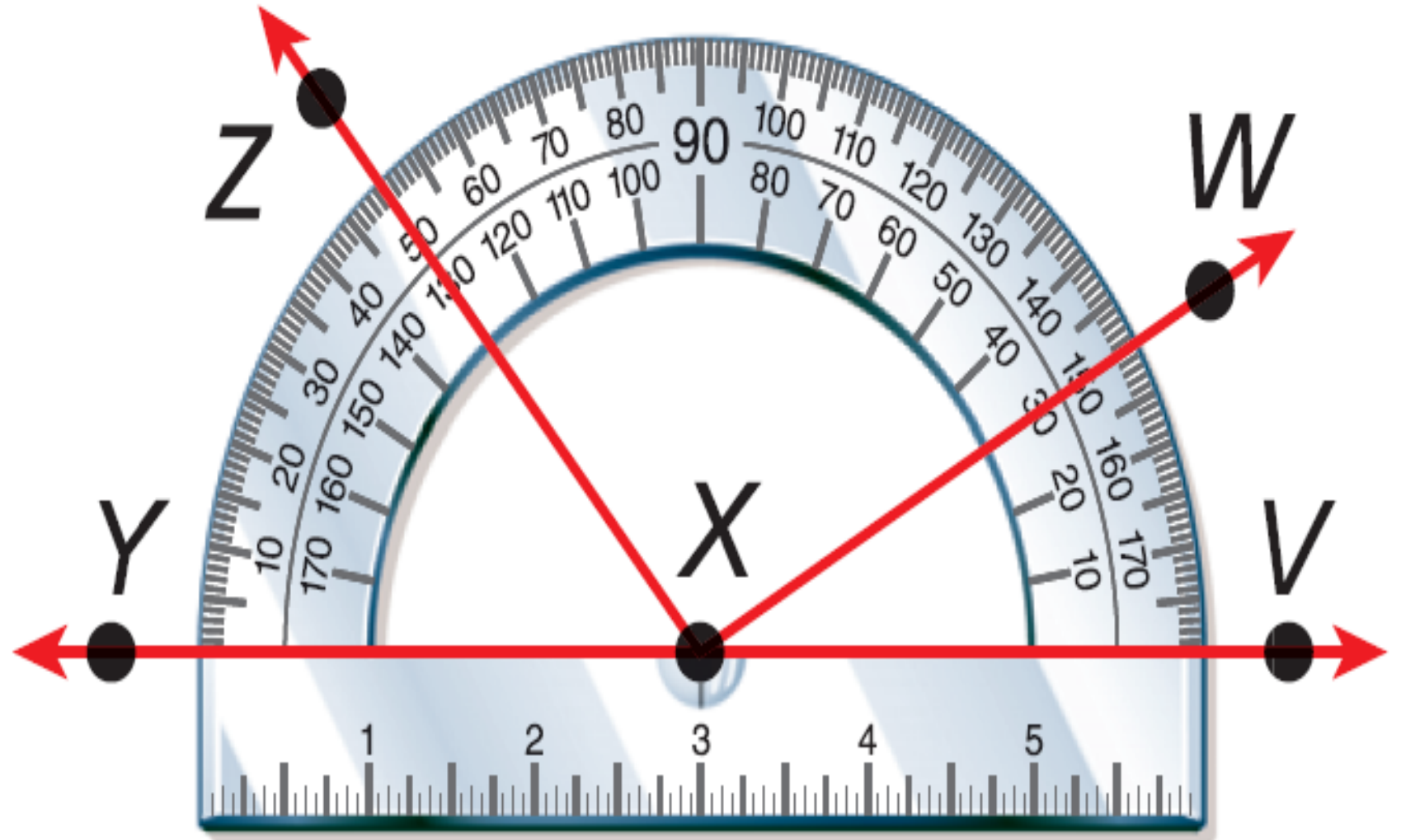


## Example

Find the measure of each angle. Then classify each as acute, right, or obtuse.

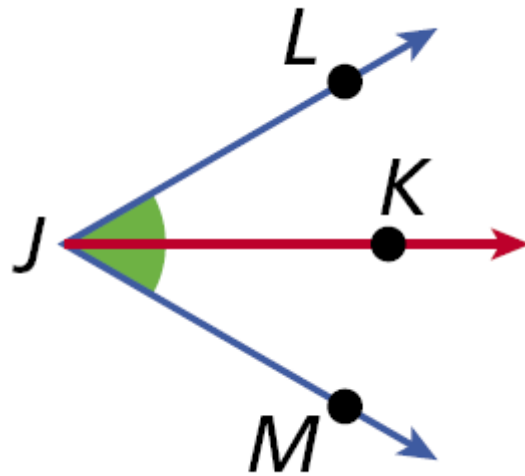
A.  $\angle WXV$

B.  $\angle ZXW$



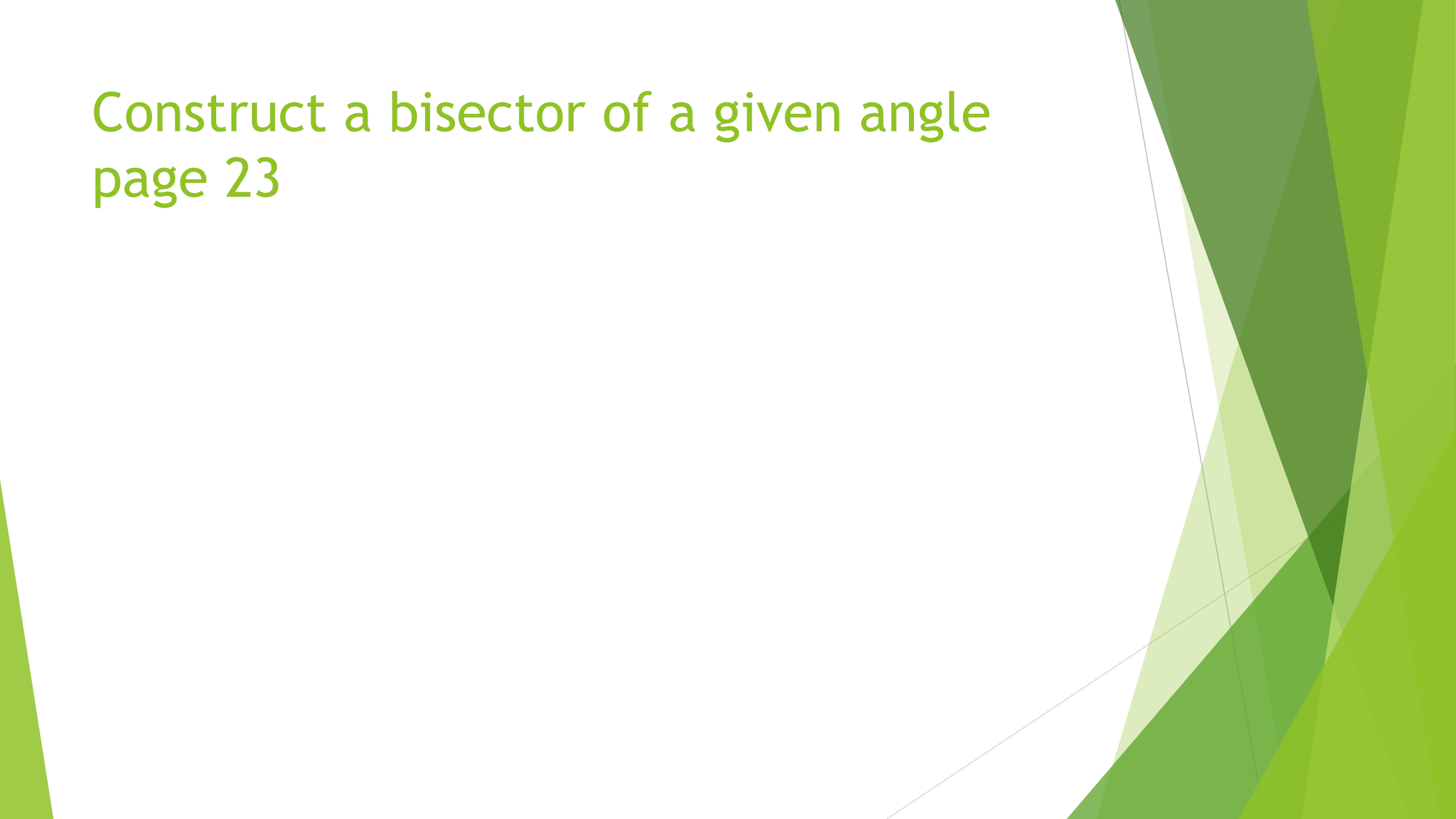
An **angle bisector** is a ray that divides an angle into two congruent angles.

$\overrightarrow{JK}$  bisects  $\angle LJM$ ; thus  $\angle LJK \cong \angle KJM$ .



# Construct a bisector of a given angle

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## Essential Questions:

- ▶ What is the relationship between a segment bisector and an angle bisector?
- ▶ Many protractors have two sets of degree measures around the edge. When you measure an angle, how do you know which of the two measures to use?

Pages 25-29

problems 1, 4, 6, 8, 11, 13, 15, 20, 21,  
23