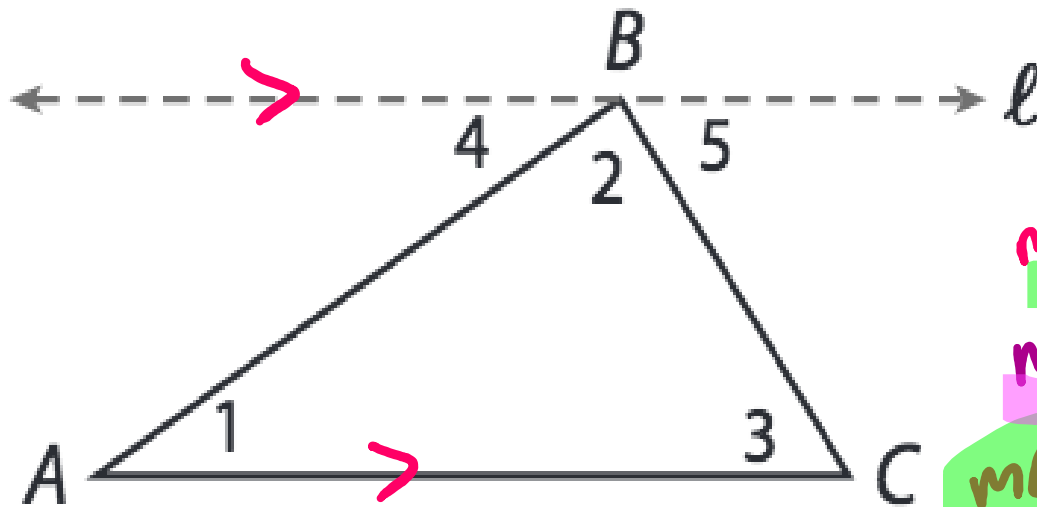


# PROVING the angle sum of a triangle with parallel lines...

Sum of the angles in a  $\triangle = 180^\circ$



$m\angle 1 = m\angle 4$  alt interior

$m\angle 3 = m\angle 5$  alt interior

$$m\angle 4 + m\angle 2 + m\angle 5 = 180^\circ \text{ (line)}$$

$$m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$$

substitution

# A statement and its converse

- “If **two angles are a linear pair**, then **they are supplementary.**”
- The **converse:**
- “If **two angles are supplementary**, then **they are a linear pair.**”

- Can you come up with another if-then statement that is true but the converse would be false?
- Can you come up with one where the converse is also true?

# Would the converse be true?

■ If two angles are vertical, then they are congruent.

■ “If two angles are congruent, then they are vertical.”

T  
F

■ If an angle is acute, then its supplement is obtuse.

■ “If an angle’s supplement is obtuse, then the angle is acute.”

T

T

■ If you add two even numbers, then their sum will be even.

■ “If the sum of two numbers is even, then the two numbers are even.”

F

$$3+1=4$$

T

Write the converse of each statement.

1. If  $a = b$ , then  $a + c = b + c$ .

If  $a + c = b + c$ , then  $a = b$ .

2. If  $m\angle A + m\angle B = 90^\circ$ , then  $\angle A$  and  $\angle B$  are complementary.

If  $\angle A$  and  $\angle B$  are complementary, then

$$m\angle A + m\angle B = 90^\circ.$$

3. If  $AB + BC = AC$ , then  $A$ ,  $B$ , and  $C$  are collinear.



If  $A, B, C$  are collinear, then  $AB + BC = AC$

## Same Side Interior Angles Postulate:

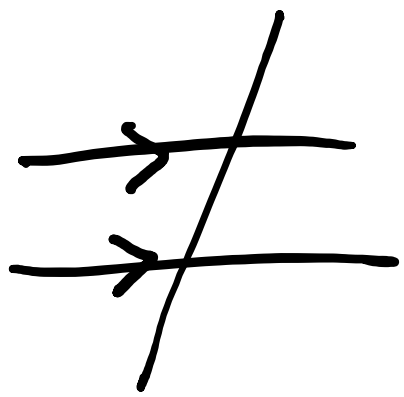
If two parallel lines are cut by a transversal, then the pairs of same-side interior angles are supplementary

## Converse of the Same Sides Interior Angles Theorem

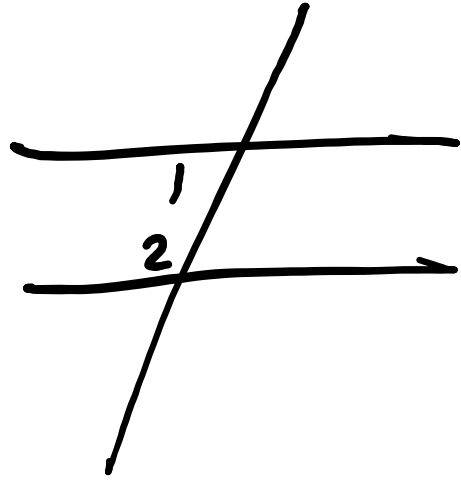
- If two lines are cut by a transversal so that a pair of same-side interior angles are supplementary, then the lines are parallel

# Same Side Interior Angles Postulate

If



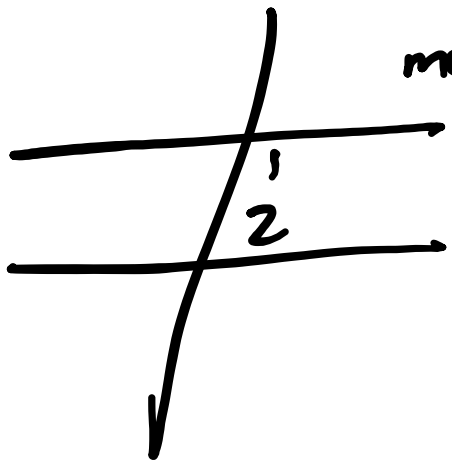
then



$$m\angle 1 + m\angle 2 = 180$$

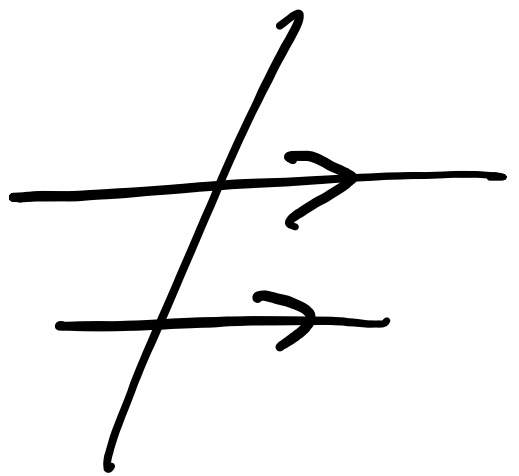
## CONVERSE

If



$$m\angle 1 + m\angle 2 = 180^\circ$$

then



## Corresponding Angles Postulate

If two parallel lines are cut by a transversal, then the pairs of corresponding angles have the same measure

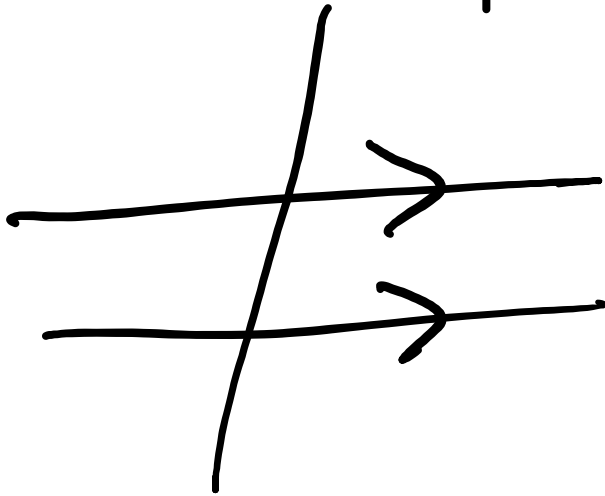
## Converse of the Corresponding Angles Postulate

- If two lines are cut by a transversal so that any pair of corresponding angles are congruent, then the lines are parallel.

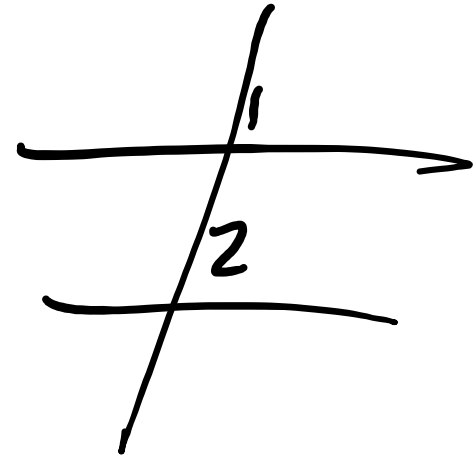


# Corresponding $\angle$ s Theorem

If



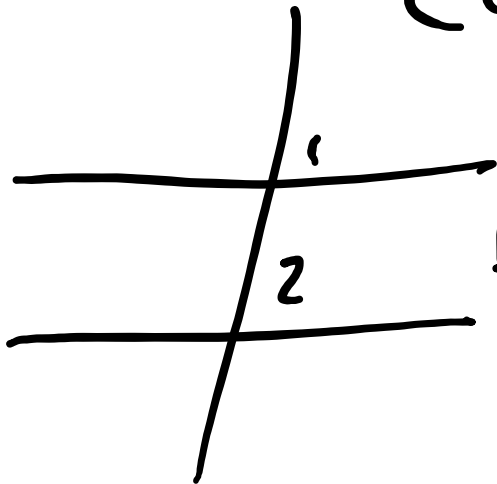
then



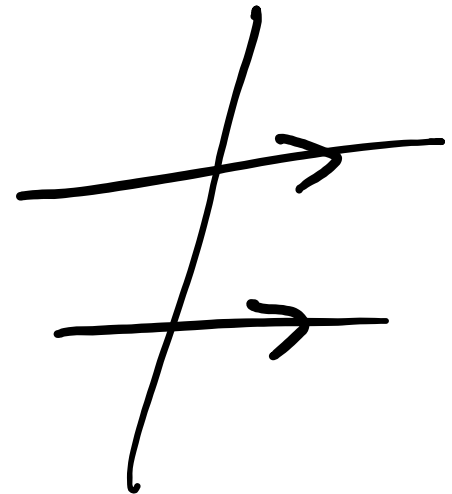
$\angle 1 \cong \angle 2$

## Converse

If



$\angle 1 \cong \angle 2$ , then

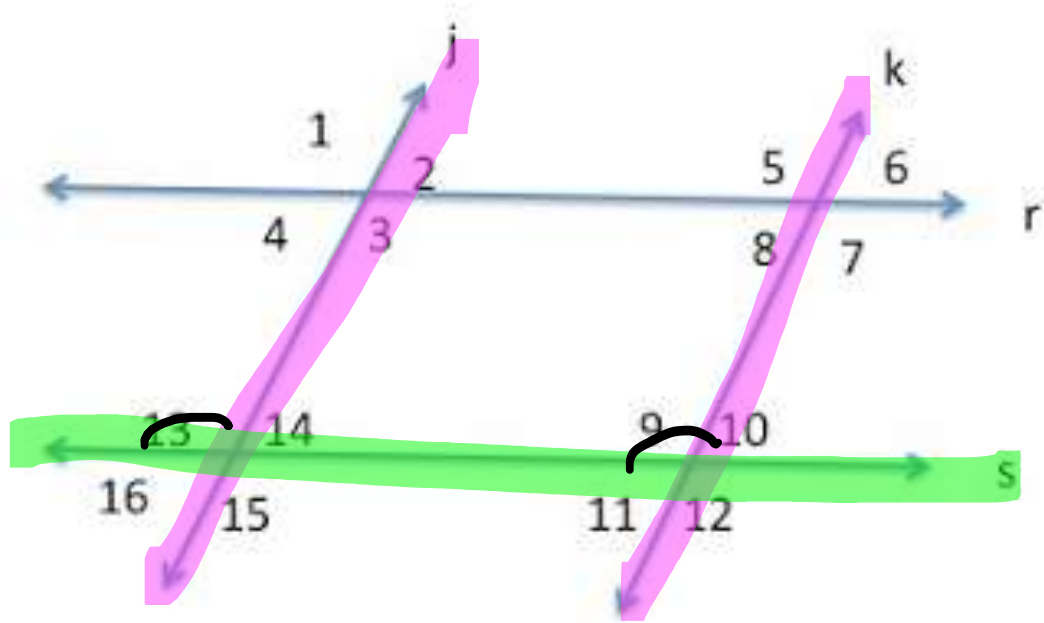


# Converse of the Alternate Interior Angles Theorem

- If two lines are cut by a transversal so that any pair of alternate interior angles are congruent, then the lines are parallel.

# Converse of the Alternate Exterior Angles Theorem

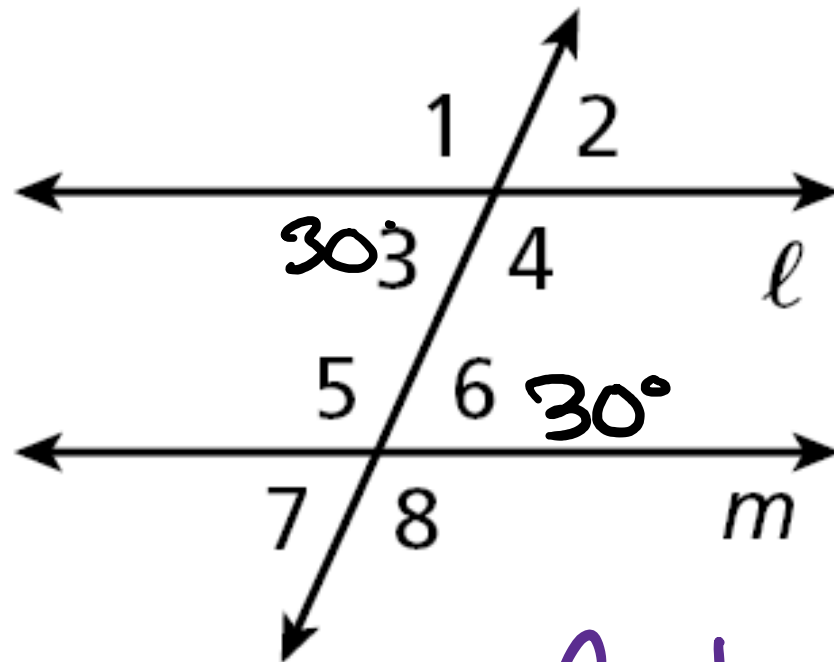
- If two lines are cut by a transversal so that any pair of alternate exterior angles are congruent, then the lines are parallel.



Which lines are parallel if  $\angle 9 \cong \angle 13$ ?

line  $j \parallel$  line  $k$  by the converse of the corresponding  $\angle$  theorem

Is  $l \parallel m$ ? Explain using a converse.



Yes by the converse of the alternate interior angles theorem,  
 $l \parallel m$

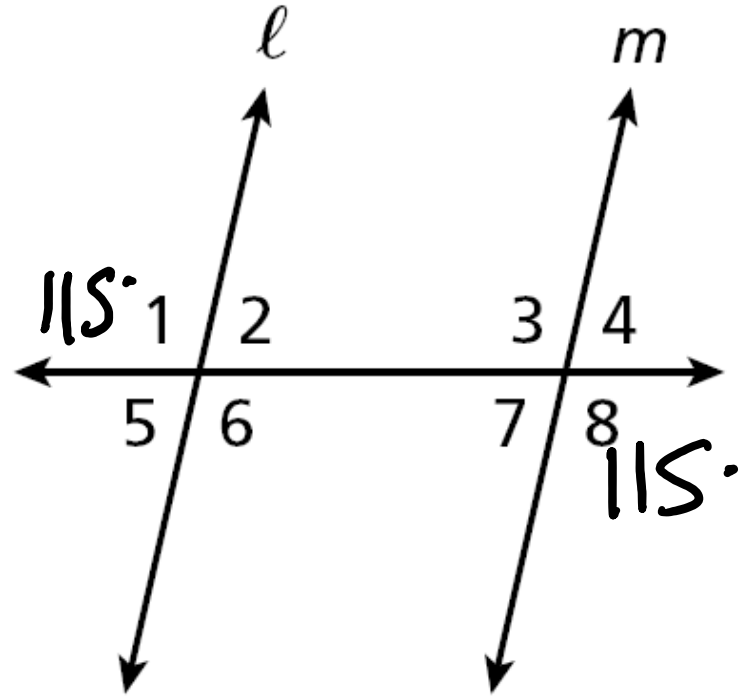
Is  $l \parallel m$ ? Explain using a converse.

yes by the  
converse of the  
alternate exterior  
angles theorem

$l \parallel m$



$\parallel$  parallel



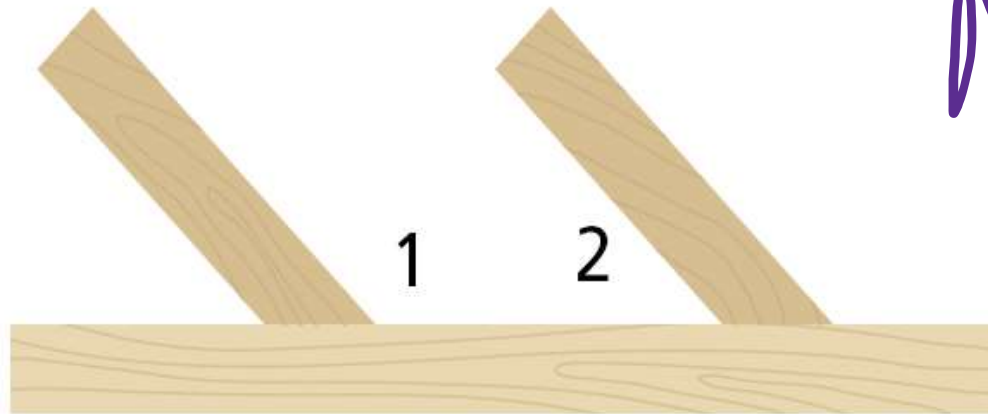
A carpenter is creating a woodwork pattern and wants two long pieces to be parallel.

$m\angle 1 = (8x + 2)^\circ$  and  $m\angle 2 = (2x + 10)^\circ$ .

If  $x = 15$ , is A parallel to B?

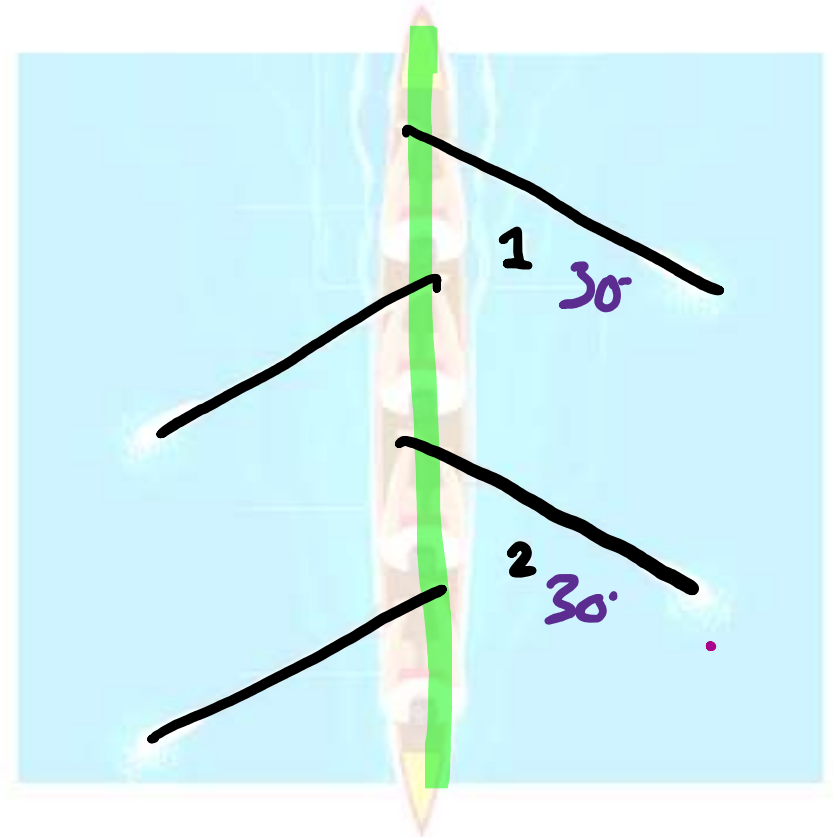
Piece A

Piece B



No

**What if...?** Suppose the corresponding angles on the opposite side of the boat measure  $(4y - 2)^\circ$  and  $(3y + 6)^\circ$ , where  $y = 8$ . Are the oars parallel?

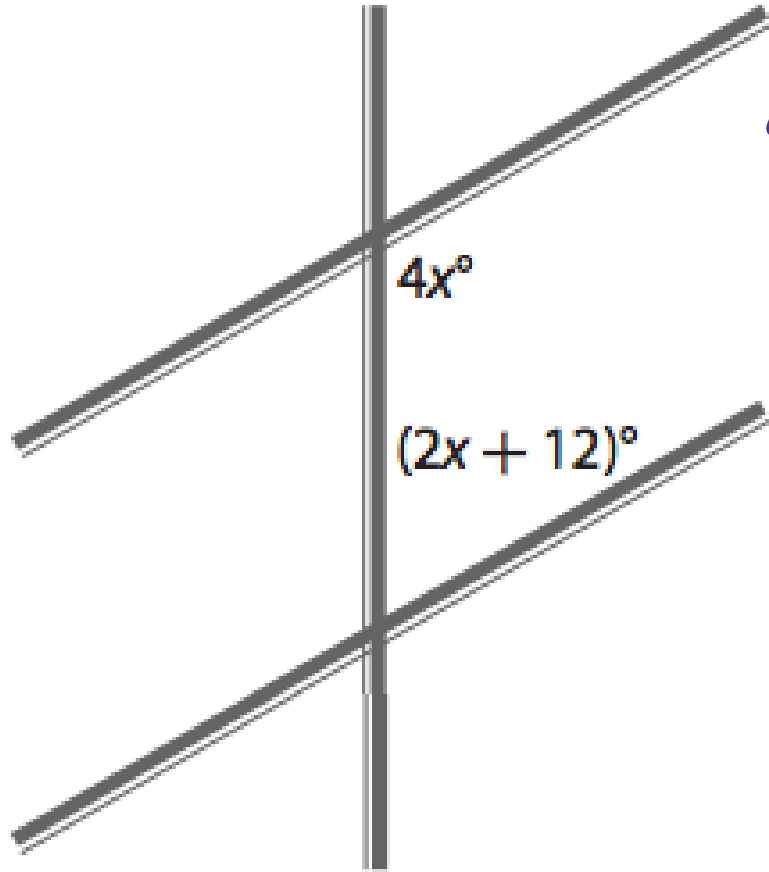


yes  $\rightarrow$

Converse of  
the corresponding angles  
theorem



Find the value of  $x$  so that the two lines are parallel.



$$4x + 2x + 12 = 180$$
$$6x = 168$$

$$x = 6$$

I need a volunteer!

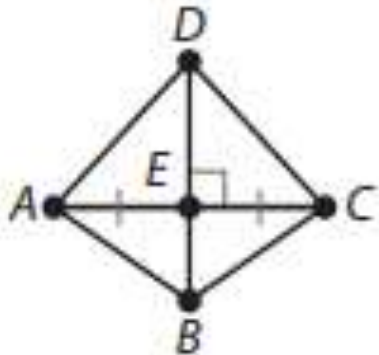
Draw a point that is equidistant (equal distance) from A and B



# Perpendicular Bisector Theorem

- If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment

Use the diagram shown.  $\overline{BD}$  is the perpendicular bisector of  $\overline{AC}$ .



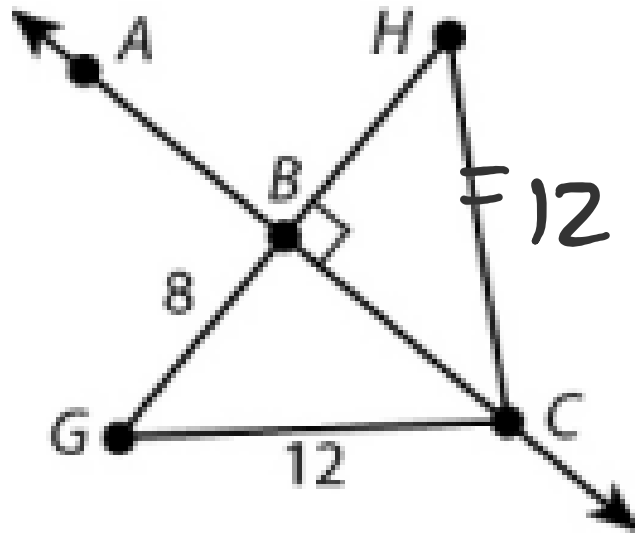
4. Suppose  $ED = 16$  cm and  $DA = 20$  cm. Find  $DC$ .

20cm

5. Suppose  $EC = 15$  cm and  $BA = 25$  cm. Find  $BC$ .

25cm

Given:  $\overline{AC}$  is the perpendicular bisector of  $\overline{GH}$ .



$$GH = \underline{\quad 16 \quad}$$

$$CH = \underline{\quad 12 \quad}$$