

Section 7 – Topic 5 Triangle Inequalities

Draw a triangle with sides 2 *cm* and 4 *cm*. What is the length of the third side of this triangle?

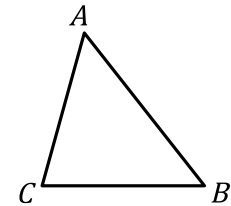
Draw a triangle with sides 35 *mm* and 18 *mm*. What is the length of the third side of this triangle?

What relationship do you notice between the third side and the sum of the first two sides of the triangle you drew?

Is it possible to draw a triangle with a third side that is greater than the sum of the other two sides? Why or why not?

Consider the triangle and the information below.

$$\begin{aligned} AB + BC &> AC \\ BC + AC &> AB \\ AC + AB &> BC \end{aligned}$$



This is the Triangle Inequality Theorem.

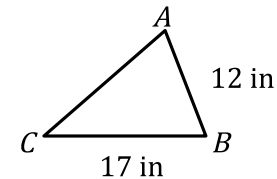
TAKE NOTE!
Postulates &
Theorems

Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

Let's Practice!

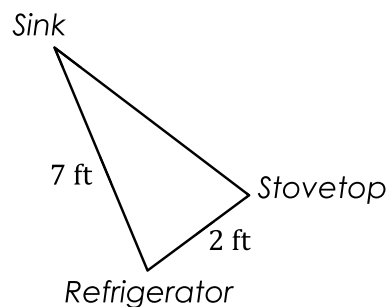
1. Consider the figure below.



Find the range of possible sides lengths for the missing side of the triangle above.

Try It!

2. Consider the figure below.



Darius is remodeling his kitchen. The “kitchen triangle” refers to the triangle formed by the sink, the refrigerator, and the stovetop. The above figure represents the remodeling plan.

Can the distance from his sink to stovetop be 9 feet? Justify your answer.

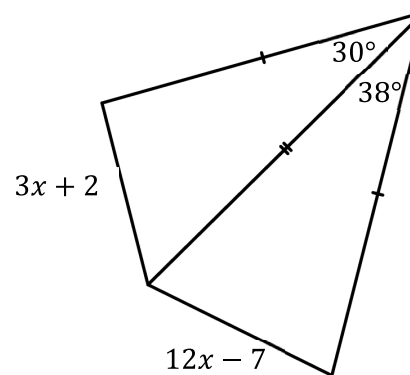
TAKE NOTE!
Postulates &
Theorems

Hinge Theorem

If two sides of one triangle are congruent to two sides of another triangle, and the included angles are not congruent, then the longer third side is opposite the larger included angle.

Let's Practice!

3. Consider the figure below.

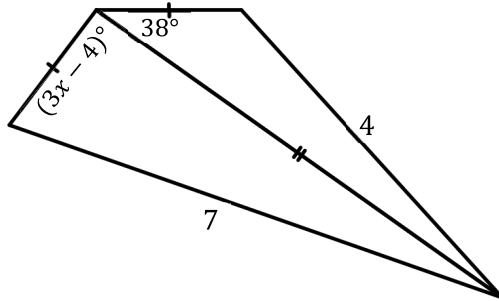


Use an inequality to describe a restriction on the value of x using the Hinge Theorem.



Try It!

4. Consider the figure below.



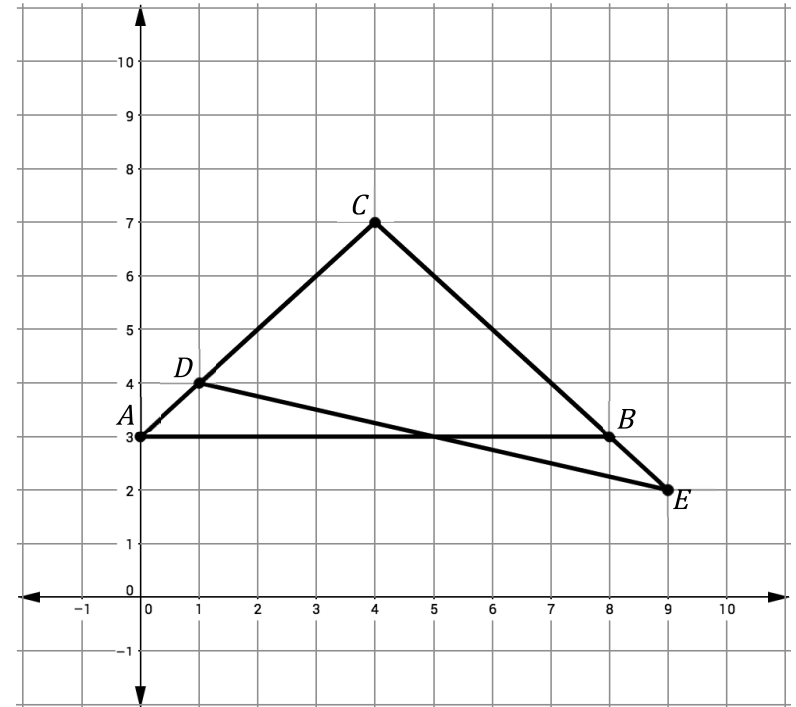
Use an inequality to describe a restriction on the value of x using the Hinge Theorem.

TAKE NOTE!
Postulates &
Theorems

Converse of the Hinge Theorem

If two sides of one triangle are congruent to two sides of another triangle, and the third side of the first triangle is greater than the third side of the second, then the included angle of the first triangle is larger than the included angle of the second.

5. Consider the figure below.



In the figure, $CA = CB$. D is a point on CA and E is a point on the prolonged line segment CB with $DA = BE$. How would you prove $DE > BC$ by applying properties of transformations? Justify your steps.

BEAT THE TEST!

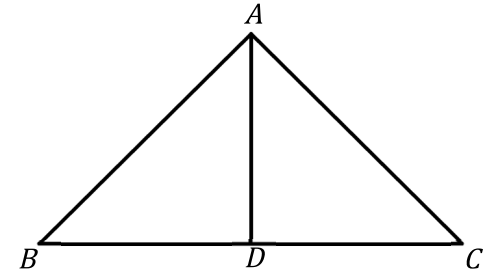
1. Which of the following could represent the lengths of the sides of a triangle? Select all that apply.

- 2 m, 4 m, 7 m
- 3 m, 8 m, 10 m
- 9 m, 10 m, 11 m
- 4 m, 5 m, 9 m
- 7 m, 13 m, 18 m

2. Consider the figure below to the right.

Given: $\triangle ABC$
 $\overline{AD} \perp \overline{BC}$

Prove: $\overline{BC} < \overline{AB} + \overline{AC}$



Consider the options below and use them to complete the flowchart in the next page to prove the triangle inequality theorem. Write the corresponding letter that justify each step.

- A.** The shortest distance from a point q and a line r is the line perpendicular to r and passing through q .
- B.** If $a < b$ and $c < d$, then $a + c < b + d$.
- C.** Segment Addition Postulate
- D.** Given
- E.** Definition of perpendicular lines.



