Name: _____ Date: _____

Unit 5 Lesson 5 Exploring Triangle Inequality

Essential Question:

- What are the relationships between the sides and angles in triangles?

Objectives:

- Write a rule about the relationships between the three sides in triangles.
- Determine the possible side lengths for the third side of a triangle when two side are known.
- Order the sides and angles in a triangle by their measurements.

Materials:

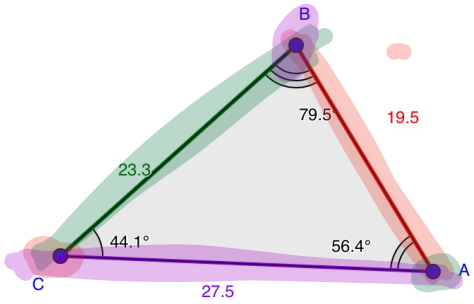
- iPad
- Internet
- partner
- Triangle Inequality Exploration applet
- Partner

Pacing

- Parts I-III (50 minutes - teacher led classwork)
- 5 min break
- Part IV (30 minutes - independent classwork)

Part I: Specific Cases & Examples

Open the Triangle Inequality Exploration applet. Connect the three segments to form a triangle. When a triangle is formed, the angle measurements will appear. Record the side and angle measurements in the table.

Screenshot: 		
△ABC		
m∠A	***m∠B***	***m∠C***
56.4°	79.5°	44.1°
Side Lengths		
BC	***AC***	***AB***
23.3	27.5	19.5
Shortest Side Length	**Middle Side Length**	**Longest Side Length**
AB=19.5	BC=23.3	AC=27.5
Color the angles to match the opposite side lengths.		
Add the two shorter sides and subtract the two longer sides. Compare them to the indicated side using an inequality.		
Add the 2 shorter sides: 19.5+23.3=42.8	>, <, or = >	Longest Side Length 27.5
Subtract the 2 longer sides: 27.5−23.3=4.2	>, <, or = <	Shortest Side Length 19.5

Example 2		
Screenshot:		
△ABC		
m∠A	***m∠B***	***m∠C***
Side Lengths		
BC	***AC***	***AB***
Shortest Side Length	**Middle Side Length**	**Longest Side Length**
Color the angles to match the opposite side lengths.		
Add the two shorter sides and subtract the two longer sides. Compare them to the indicated side using an inequality.		
Add the 2 shorter sides:	>, <, or =	Longest Side Length
Subtract the 2 longer sides:	>, <, or =	Shortest Side Length

Example 3		
Screenshot:		
△ABC		
m∠A	***m∠B***	***m∠C***
Side Lengths		
BC	***AC***	***AB***
Shortest Side Length	**Middle Side Length**	**Longest Side Length**
Color the angles to match the opposite side lengths.		
Add the two shorter sides and subtract the two longer sides. Compare them to the indicated side using an inequality.		
Add the 2 shorter sides:	>, <, or =	Longest Side Length
Subtract the 2 longer sides:	>, <, or =	Shortest Side Length

Part II: Patterns & Observations

1. Discuss your observations with your partner, including any patterns that you notice.

2. Without collaborating with your partner, write down any patterns you notice about the relationship between the **biggest side** and the **biggest angle**. Also write any relationships between the **smallest side** and the **smallest angle**.

All angles add up to 180°
bigger side is always opposite to the bigger angle and vise versa same with smallest

3. Without collaborating with your partner, write down any patterns you notice about the **sum** of the **two shorter sides** and the **difference** between the **two longer sides**.

The sum of smaller is always greater than the longest.
The difference of longest sides is smaller than the shortest.

Part III: Rule

1. Use your explanation from question 2 in part II to write a rule about the relationship between the sides and angles in a triangle. The rule does not need to be in if, then form.

The biggest angles are opposite the biggest sides

2. Discuss your theorem with your partner. Then, we will share answers as a group. In the space below, write a revised theorem:

If there is a triangle with three angles shown, the biggest side is opposite the biggest angle.

Triangle Inequality Theorem

3. Use your explanation from question 2 in part II to write a rule about the sum of the two shorter sides of a triangle or the difference between the two longer sides.

The sum of ~~smaller~~ two sides is always bigger than the ~~longest~~ third side.

4. Discuss your theorem with your partner. Then, we will share answers as a group. In the space below, write a revised theorem:

The difference of two sides is always less than the third side.

$a + b > c$

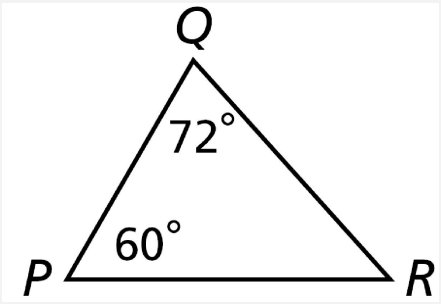
$a - b < c$

Part IV: Test & Check

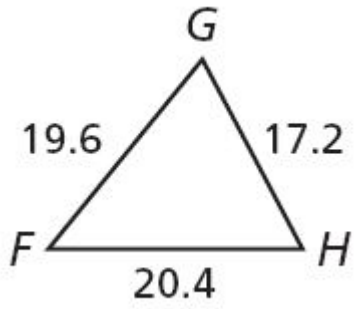
Showing Two Triangles are Similar

Use AA~ Postulate, SSS~ Theorem, or SAS~ Theorem to verify the triangles are similar. Then, write a similarity statement. **Show your work.**

1. In the triangle below, list the sides in order from largest to smallest.



2. In the triangle below, list the angles in order from smallest to largest.



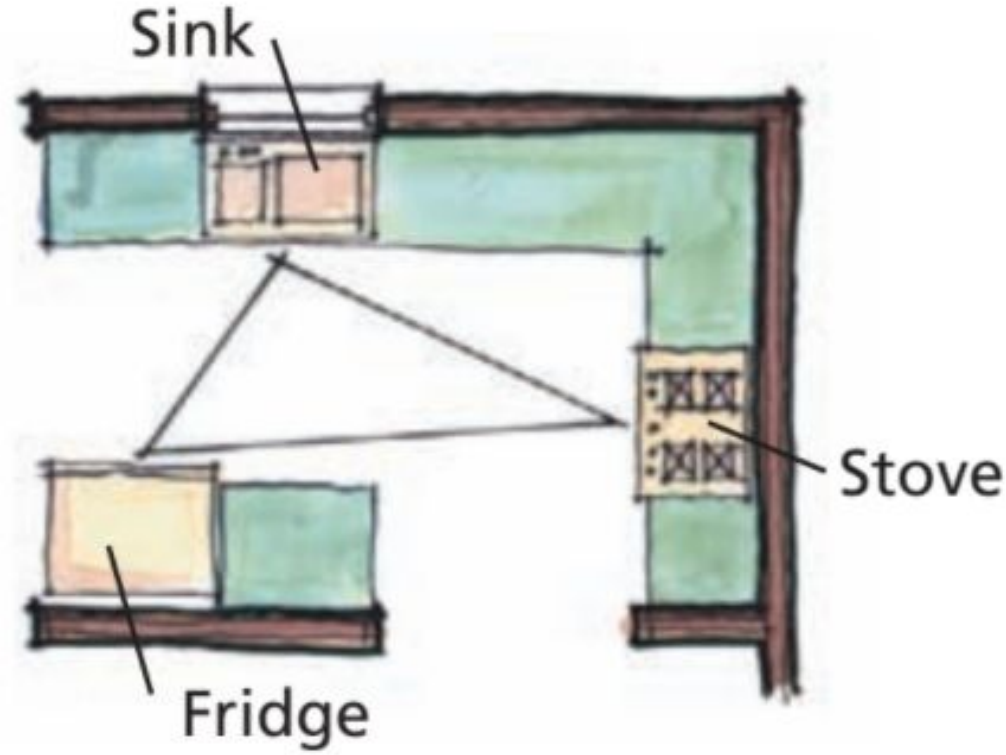
Tell whether a triangle can have the given side lengths. Then, use this applet to check your work.

1. Determine if the side lengths 7, 10, and 19 can form a triangle.

2. Determine if the side lengths 6.2, 7, and 9 can form a triangle.

Problem Solving

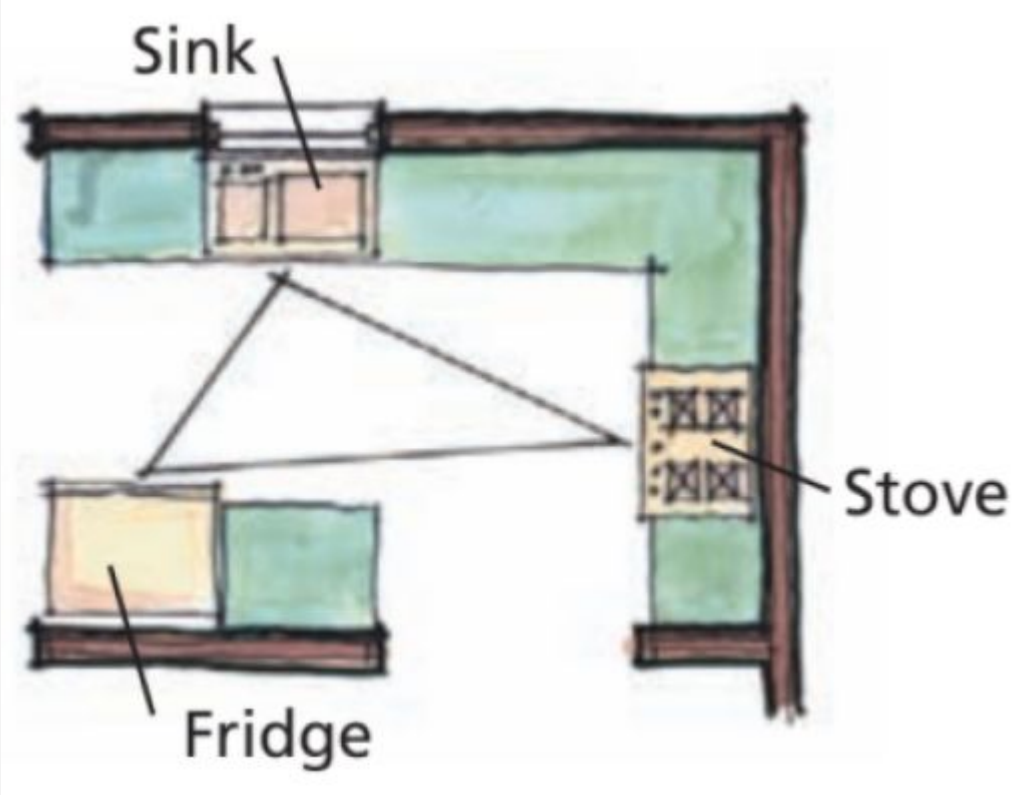
The refrigerator, stove, and sink in a kitchen are at the vertices of a path called the work triangle. While designing my kitchen, I want to make sure that the shortest distance is between the sink and the fridge.



1. If the angle at the sink is the largest, which side of the work triangle will be the longest?

2. If distance between the sink and the fridge is the smallest, where is the smallest angle?

3. The designer wants the longest side of the triangle to be 9 feet long. If the shortest side is 4 feet, what are the possible lengths for the middle side?



4. One of the sides in the triangle above is (x^2 - 10) feet. Another side is (x + 14) ft. Assuming that x^2 - 10 is longer than (x + 14) and x is a positive number, what are the possible lengths of the third side in terms of x?

Rubric

	Below Expectations	Approaching Expectations	Meeting Expectations	Exemplifying Expectations
Modes of Inquiry 16.9-10.MAT.MI.001 16.9-10.MAT.MI.002 16.9-10.MAT.MI.003 16.9-10.MAT.MI.004	Student cannot order a triangles' sides and angles by length. AND Student cannot use rules to find distances or angles.	Student can order a triangles' sides and angles by length. AND Student can use rules to find distances or angles.	Student can order a triangles' sides and angles by length. AND Student can determine the possible lengths of sides in triangles.	
Comments:				
Synthesis and Evaluation 16.9-10.MAT.SE.001 16.9-10.MAT.SE.002 16.9-10.MAT.SE.003 16.9-10.MAT.SE.004 16.9-10.MAT.SE.005	Student is unable to use results from tests to revise rules.	Student is able to use results from tests to revise rules.	Student is able to use results from tests to revise rules.	
Comments:				

16.9-10.MAT.MI.001 Student recognizes terms in patterns
16.9-10.MAT.MI.002 Student selects and applies general rules and mathematical problem-solving techniques to solve problems in familiar situations.
16.9-10.MAT.MI.003 Student uses appropriate mathematical concepts and skills to solve problems in unfamiliar situations.
16.9-10.MAT.MI.004 Student discovers patterns as relationships or general rules.
16.9-10.MAT.SE.001 Student draws conclusions consistent with findings.
16.9-10.MAT.SE.002 Student predicts and uses different forms of mathematical representations.
16.9-10.MAT.SE.003 Student recognizes reasonableness of results in the context of the problem.
16.9-10.MAT.SE.004 Student relates the importance of findings in connection to real life.
16.9-10.MAT.SE.005 Student suggests improvements and revisions to methods when necessary.