Inequalities in Triangles

Saturday, February 1, 2025 8:22 PM

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Geo Inequalities

Lesson 6.4/6.6/6.7 Inequalities in Triangles

MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.

Content Objective
Students solve problems using inequalities in the angles and sides of a triangle.

Content Objective
Students prove and apply the Triangle Inequality Theorem.

Content Objective
Students solve problems using the Hinge Theorem and its converse.

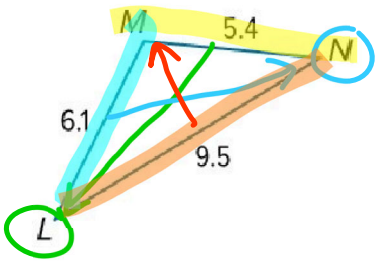
Florida's B.E.S.T. Standards for Mathematics

MA.912.GR.1.3 Prove relationships and theorems about triangles. Solve mathematical and real-world problems involving postulates, relationships and theorems of triangles.

Example 2
Order Triangle Angle Measures

List the angles of △*LMN* in order from smallest to largest.

∠L, ∠N, ∠M

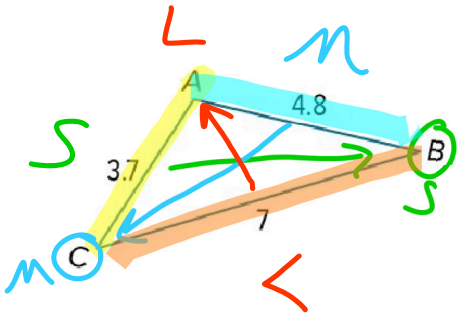


Example 2
Order Triangle Angle Measures

Check

List the angles of △*ABC* in order from smallest to largest.

∠B, ∠C, ∠A

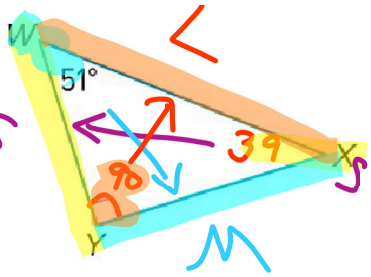


Example 3
Order Triangle Side Lengths

List the sides of △*WXY* in order from shortest to longest.

$180 - 141 = 39$

$51 + 90 = 141$



$\overline{WY}, \overline{YX}, \overline{WX}$

*The smallest angle is across from the shortest side

*The largest angle is across from the longest side.

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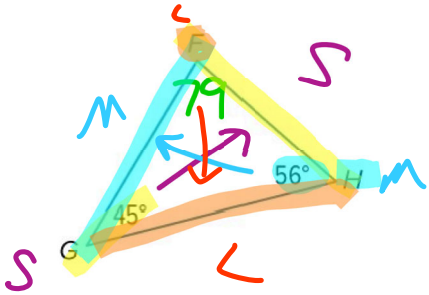
Example 3
Order Triangle Side Lengths

Check

List the sides of △*FGH* in order from shortest to longest.

$180 - 101 = 79$

$45 + 56 = 101$



$\overline{FH}$ $\overline{GF}$ $\overline{GH}$

$\overline{HF}$ $\overline{FG}$ $\overline{HG}$

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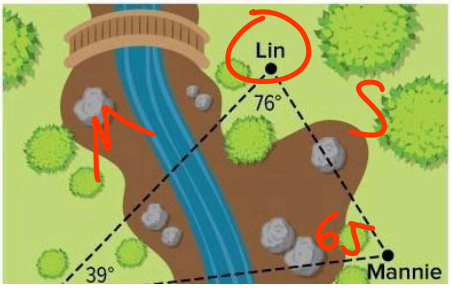
Example 4
Use Angle-Side Relationships

PAINTBALL During a game of paintball, opposing teams try to eliminate players on the opposite team. Mannie and Lin are on the same team and want to eliminate Logan from the



game. If Mannie, Lin, and Logan are located at the positions shown on the diagram, who is closer to Logan? Explain your reasoning.

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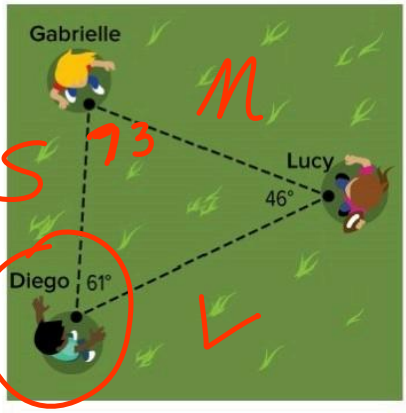
Example 4
Use Angle-Side Relationships

Check

SPORTS Gabrielle, Diego, and Lucy are passing a football. Lucy wants to practice throwing the ball long distances. Which player should she throw the ball to next if she wants to pass the football the farthest distance?



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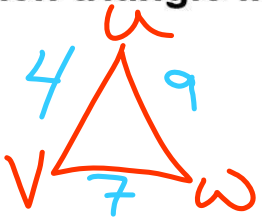
Exit Ticket

Given the side lengths, list the angles of each triangle in order from smallest to largest.

1. $\triangle UVW$: $UV = 4$, $VW = 7$, $WU = 9$

2. $\triangle RST$: $RS = 7.6$, $ST = 5.9$, $TR = 4.3$



Given the angle measures, list the sides of each triangle in order from smallest to largest.

3. $\triangle FGH$: $m\angle F = 36°$, $m\angle H = 104°$

4. $\triangle LMN$: $m\angle L = 90°$, $m\angle N = 50°$

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Example 1

Identify Possible Triangles Given Side Lengths

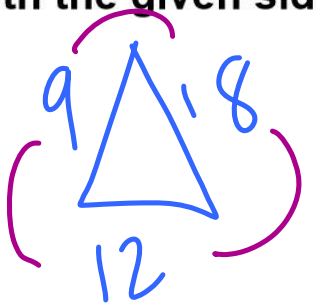
Is it possible to form a triangle with the given side lengths? If not, explain why not.

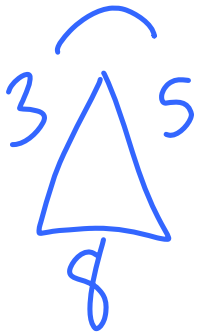
a. 9 cm, 12 cm, 18 cm Yes

b. 3 in., 5 in., 8 in.

NO $3+5=8$

$8=8$





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Example 1

Identify Possible Triangles Given Side Lengths

Check

Is it possible to form a triangle with the given side lengths? If not, explain why not.

a. 2 mm, 5 mm, 6 mm Y

b. 3 yd, 4 yd, 8 yd N

$3+4=7$

$7<8$

$=$

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Example 2

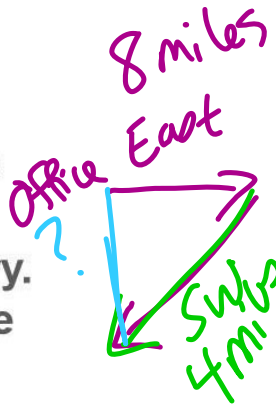
Find Possible Side Lengths

When the lengths of two sides of a triangle are known, the third side can be any length in a range of values.

5 miles

$4 < x < 12$

DRONES A delivery company uses drones to make speedy deliveries around the city. A drone leaves the home office and flies 8 miles east to its first delivery and then 4 more miles southwest to a second delivery. What is the *least* possible whole-number distance the drone will fly to return to the home office?



$8+4=12$ $8-4=4$

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Learn
Hinge Theorem

Theorem 6.12: Hinge Theorem

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

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Example 1
Use the Hinge Theorem

BOATING Two families set sail on their boats from the same dock. The Nguyens sail 3.5 nautical miles north, turn 85° east of north, and then sail 2 nautical miles. The Griffins sail 3.5 nautical miles south, turn 95° east of south, and then sail 2 nautical miles. At this point,

which boat is farther from the dock? Explain your reasoning.

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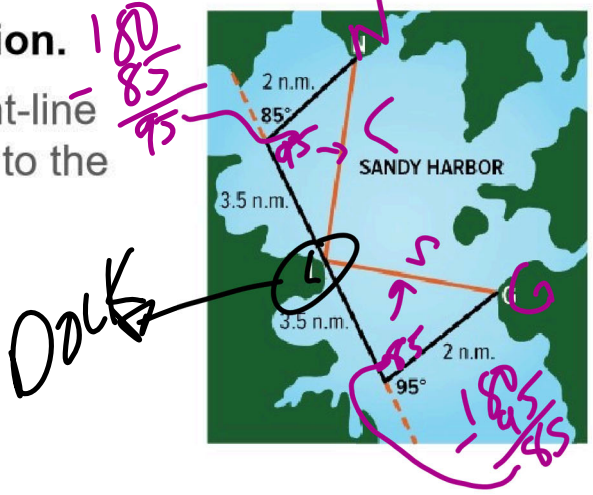
Example 1

Use the Hinge Theorem

Step 1 Draw a diagram of the situation.

The course of each boat and the straight-line distance from each stopping point back to the boat dock form two triangles.



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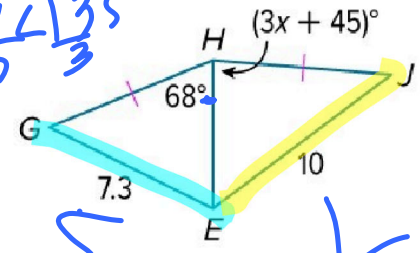
Example 3

Apply Algebra to Relationships in Triangles

Find the range of possible values for *x*.



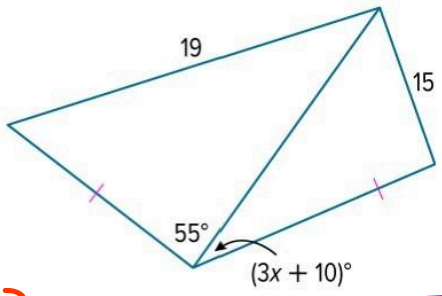
Example 3

Apply Algebra to Relationships in Triangles

$3x + 10 < 55$
$-10 \quad -10$
$\frac{3x}{3} < \frac{45}{3}$
$x < 15$

Check

Find the range of possible values for x.



$3x + 10 > 0$
$-10 \quad -10$
$\frac{3x}{3} > \frac{-10}{3}$
$x > -3.3$

$-3.3 < x < 15$

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