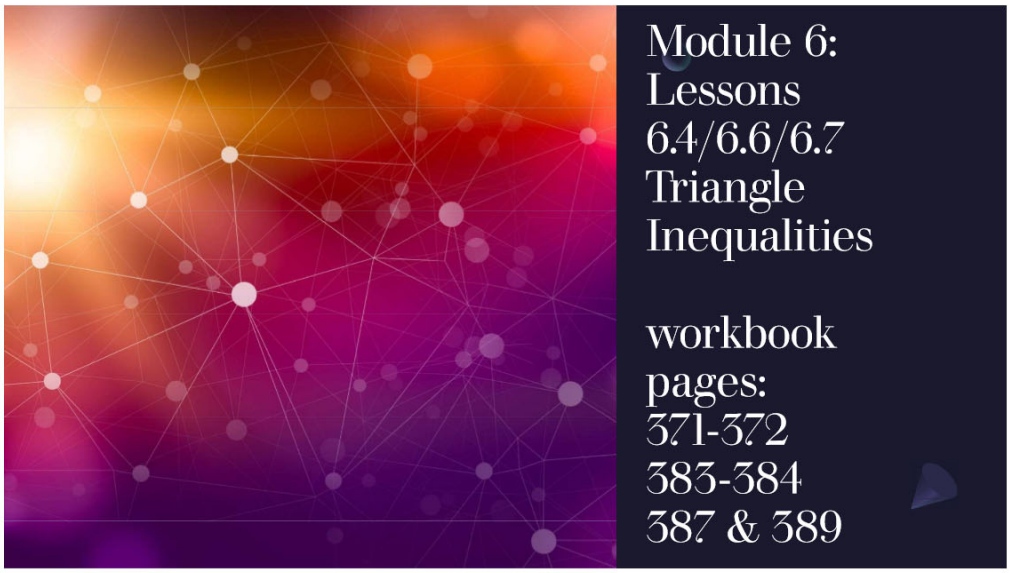
Lesson 6.4/6.6/6.7 Triangle Inequalities

Wednesday, January 31, 2024 7:58 PM

Click Link Below to Open the Interactive Pear Deck PowerPoint
https://app.peardeck.com/student/tsmomfxaz

Module 6
Triangle



Content Objective
Students prove and apply the Triangle Inequality Theorem.

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

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.

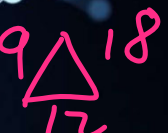
Theorem 6.11: Triangle Inequality Theorem

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

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



Check

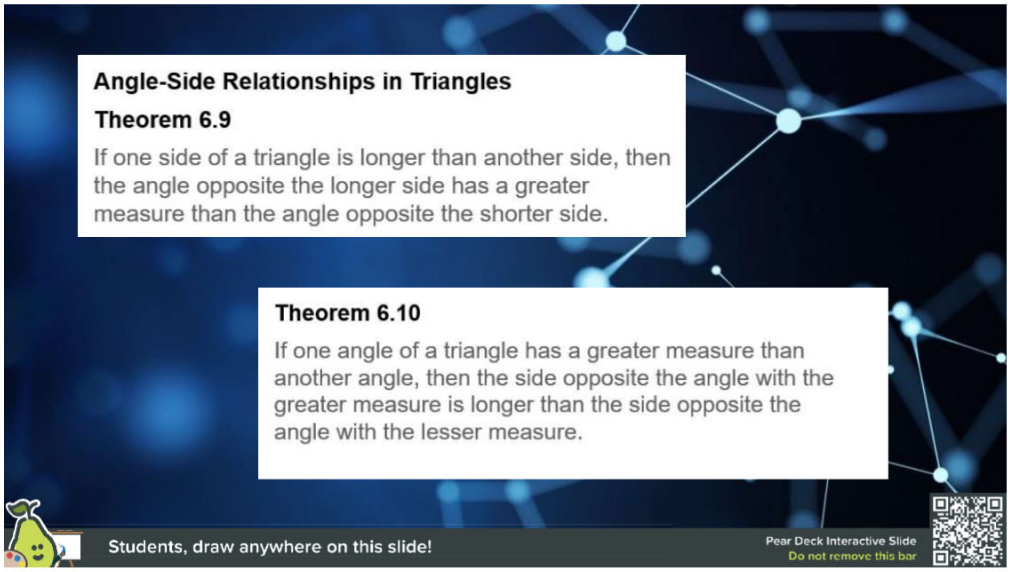
Is it possible to form a triangle with the given side lengths? If not, explain why not.

a. 2 mm, 5 mm, 6 mm yes

b. 3 yd, 4 yd, 8 yd NO

Students, draw anywhere on this slide!

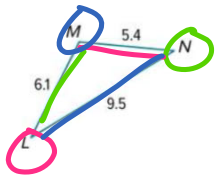
Pear Deck Interactive Slide
Do not remove this bar


Angle-Side Relationships in Triangles
Theorem 6.9
If one side of a triangle is longer than another side, then the angle opposite the longer side has a greater measure than the angle opposite the shorter side.
Theorem 6.10
If one angle of a triangle has a greater measure than another angle, then the side opposite the angle with the greater measure is longer than the side opposite the angle with the lesser measure.
Students, draw anywhere on this slide!
Pear Deck Interactive Slide
Do not remove this bar

Example 2
Order Triangle Angle Measures

List the angles of $\triangle LMN$ in order from smallest to largest.

L, N, M

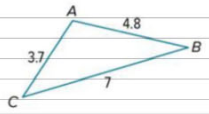


Example 2
Order Triangle Angle Measures

Check

B, C, A

List the angles of $\triangle ABC$ in order from smallest to largest.



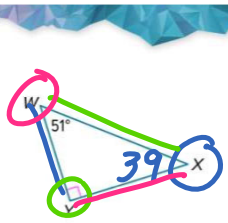
Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

Example 3
Order Triangle Side Lengths

List the sides of $\triangle WXY$ in order from shortest to longest.

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

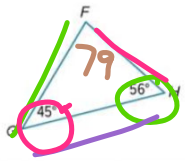


Example 3
Order Triangle Side Lengths

Check

List the sides of $\triangle FGH$ in order from shortest to longest.

$\overline{FH}, \overline{FG}, \overline{GH}$



Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

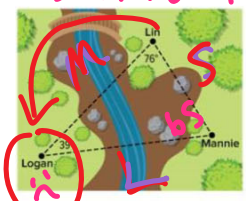
Example 4
Use Angle-Side Relationships

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.

Lin

Longest side is from Mannie

39+76=115



180-115=65

Students, draw anywhere on this slide!

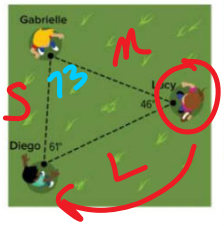
Pear Deck Interactive Slide
Do not remove this bar

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?

Diego



Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

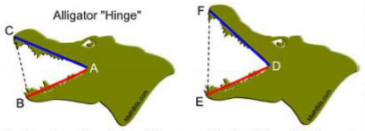
We have seen how inequalities can be applied to the sides and angles of a single triangle. Now, we will take a look at how inequalities can be put to work between two triangles.

THEOREM:
Hinge Th^{m}

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, then the third side of the first triangle is longer than the third side of the second triangle.
(May also be referred to as the SAS Inequality Theorem)

The "included angle" is the angle formed by the two sides of the triangle mentioned in this theorem.

This theorem is called the "Hinge Theorem" because it acts on the principle of the two sides described in the triangle as being "hinged" at their common vertex.
Consider the alligator jaws at the right.



The sides described in this theorem are the jaw lengths of the alligator with the "hinge" being at he corner of the alligator's mouth (point A or D). While the jaw lengths of the alligator will not change, the jaw "hinge" does allow the alligator to open, or close, its mouth with varying angular degrees (at point A or D).

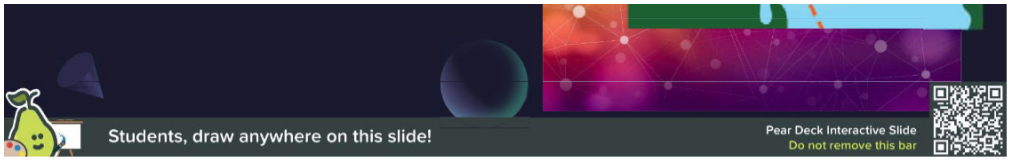
As the size of the angle at the "hinge" (point A or D) increases, the longer that opposite side becomes.
If m∠D > m∠A, then EF > BC.

Remember that the key fact in applying this theorem is that the two sides forming the angle will be of the same length in both triangles.

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

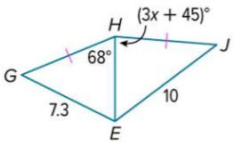
BOATING Two families set sail on their boats from the same dock. The Nguyens sail 3.5 nautical miles north, turn 85° east of north, and then sail 2 nautical miles. The Griffins sail 3.5 nautical miles south, turn 95° east of south, and then sail 2 nautical miles. At this point, which boat is farther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

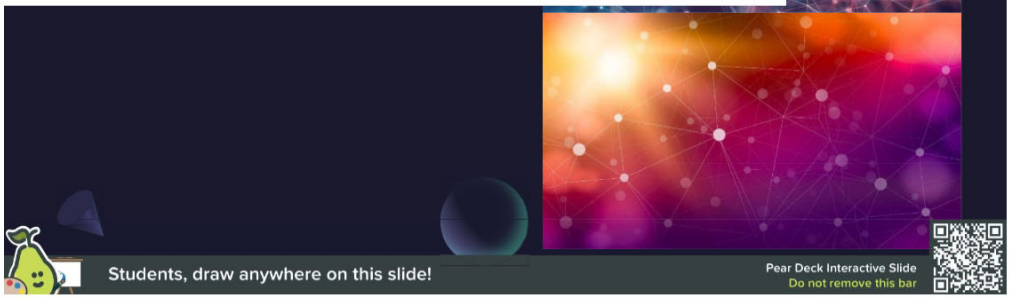


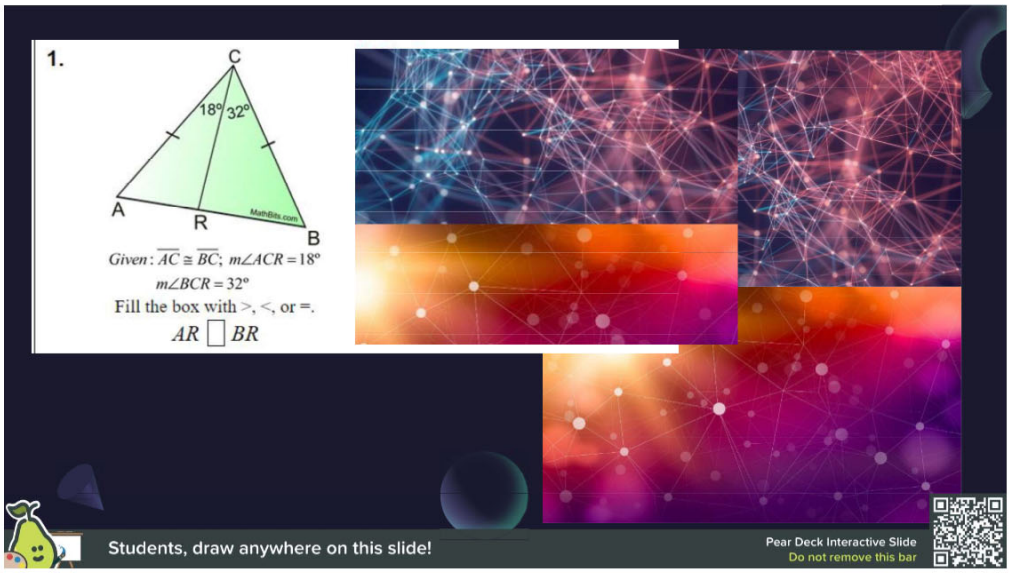
Example 3

Apply Algebra to Relationships in Triangles

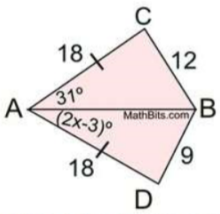
Find the range of possible values for *x*.






1.
C
18°
32°
A
R
B
MathBits.com
Given: $\overline{AC} \cong \overline{BC}$; $m\angle ACR = 18°$
$m\angle BCR = 32°$
Fill the box with >, <, or =.
$AR \square BR$
Students, draw anywhere on this slide!
Pear Deck Interactive Slide
Do not remove this bar

2.



Given $AC = 18$, $AD = 18$, $m\angle CAB = 31°$, $m\angle BAD = (2x - 3)°$
Write an inequality, or set of inequalities, to describe the possible values for x.

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar