(A) Lesson Context

BIG PICTURE of this UNIT:	• How do I determine the measure of angles in geometric shapes, without direct measurement? • How do I solve for sides or angles in right triangles? • How do I model real world scenarios using right triangles?		
CONTEXT of this LESSON:	Where we've been You know how to use triangle trig to find the measure of sides and angles	Where we are If we can use triangles to model solutions to problems, then we can use trig in our math analysis	Where we are heading How can I solve problems that involving geometric models with right triangles?

(B) Lesson Objectives:

a. Use the trig ratios to solve for sides or angles involving multiple triangles
b. Use trig ratios to solve for sides and angles in word problems involving triangles

(C) FAST FIVE

1. The angle of elevation to the top of the Empire State Building in New York is 11° from a point on the ground 1 mile from the base of the building. Find the height of the Empire State Building in feet.

2. A plane is flying at an elevation of 35, 000 feet within sight of the Gateway Arch in St. Louis, Missouri. The pilot would like to estimate her distance from the Arch. She finds that the angle of depression to a point on the ground below the arch is 22°.
(a) What is the distance between the plane and the arch?
(b) What is the distance between a point on the ground directly below the plane and the arch? (along the ground)

3. From the top of a 200 foot lighthouse, the angle of depression to a ship on the ocean is 23°. How far is the ship from the base of the lighthouse?

4. A 20 foot ladder leans against a building so that the angle between the ground and the ladder is 72°. How high does the ladder reach on the building?

5. A 96 foot tree casts a shadow that is 120 feet long. What is the angle of elevation of the sun?

6. A man is lying on the beach, flying a kite. He holds the end of the kite string at ground level and estimates the angle of elevation of the kite to be 50°. If the string is 450 feet long, how high is the kite above the ground?

7. The altitude of an equilateral triangle is 5 cm. What is the length of a side of the triangle?

8. Find the altitude of an isosceles triangle with base 4.24 feet. The vertex angle of the triangle measures 85°.

(D) **Applications of Triangle Trig – Example #1**

Example 1

To evacuate some refugees, a bridge needs to be built across a river. The first step is to find out how wide the river is. A surveyor is on one side of the river, with a transit mounted on a tripod 1.2 m above the ground. An assistant stands on the other side of the river, holding a 3 m pole vertically. The angle of elevation from the transit to the top of the pole is 8.5°. How wide is the river?

Diagram: to visualize the problem and organize the given info

Step 1: What needs to be done??

Step 2: What needs to be done???

Final Answer(s):

(E) Applications of Triangle Trig – Example #2

Believe it or not, Mr. S. is a superhero in his spare time (when he is not busy writing lessons for his beloved "other favorite" class of course). So one night (it was a Thursday I recall), I was standing on top of a building (as is my superhero duty - watching over the city of course), when I happen to notice the evil Dr. MathNoLikius on top of a building, close to the one I was on. So I quickly used my InfraRed Supervision and I quickly determined that the angle of elevation of my line of sight to Dr. MathNoLikius was 12°. I also quickly determined that the angle of depression to the base of the building upon which Dr. MathNoLikius was standing happened to be 34°. Amazingly enough, I also knew that the two buildings where 150 meters apart (Wow, imagine that!!)

(A) So being a superhero, I was able to use my trig knowledge to determine the height of the building that the evil Dr. MathNoLikius was standing upon to be 356.6 m. Was I correct? Correct me if I was wrong (HAHAHAHAHAHA)

(B) But I also needed to know exactly the direct distance between me and the evil Dr. M. (as of course I would FLY there – or at least jump in a single bound – well, maybe attempt to anyway). Anyway, once again, I used my super trig powers to calculate that distance to be 600 meters. Was I right???

Diagram: to visualize the problem and organize the given info

Step 1: What needs to be done??

Step 2: What needs to be done???

Final Answer(s):

(F) **Applications of Triangle Trig – Example #3**

The angle of elevation from the top of a 16 m building to the top of a second building is 48°. The buildings are 30 m apart. What is the height of the taller building?

Diagram: to visualize the problem and organize the given info

Step 1: What needs to be done??

Step 2: What needs to be done???

Final Answer(s):

(G) **Applications of Triangle Trig – Example #4**

Two watch towers at an historic fort are located 375 m apart. The first tower is 14 m tall, and the second tower is 30 m tall.

a) What is the angle of depression from the top of the second tower to the top of the first tower?

b) The guards in the towers simultaneously spot a suspicious car parked between the towers. The angle of depression from the lower tower to the car is 7.7°. The angle of depression from the higher tower is 6.3°. Which guard is closer to the car? Explain how you know.

Diagram: to visualize the problem and organize the given info

Step 1: What needs to be done??

Step 2: What needs to be done???

Final Answer(s):