

LessonTitle: Solving with Square Roots		Alg 8.1
Utah State Core Standard and Indicators Algebra Standard 2.2, 3 Process Standards 1-5		
Summary		
In this lesson, students find sight-distances and heights using the formula $S = 3.532 \sqrt{h}$. S is the maximum distance you can see across flat land and h is the height above the ground.		
Enduring Understanding	Essential Questions	
In solving equations, we apply inverse operations—this includes square roots for equations involving exponents.	What are some math contexts for solving equations which involve the use of exponents and roots?	
Skill Focus	Vocabulary Focus	
Solving equations using exponents and roots.		
Assessment		
Materials: Worksheets from reference books, see below. Computers		
Launch		
Explore		
Summarize		
Apply		

Directions:

1) Tower Views is taken from Utah Core Curriculum Performance Assessment Program, Elementary Algebra. In the Tower Views activity, students are introduced to a context which involves an equation with square roots. They should be able to proceed on their own.

Other possible activities involving square root equations are:

Armillaria Bulbosa Fungus. (below) This activity requires students to access the internet for information. The internet part could be given as an outside assignment or done in class. The idea for this assignment came from Mathematics in Context, Building Formulas.

Stopping Distances: Access this activity from TI Interactive Math for High School, pages 59-63. This is a great application using a square root equation. Students examine the distances required to stop a moving vehicle as related to reaction time and speed of a vehicle. Data for this activity is accessed via the internet.

Alg 7.1a

Tower Views

Name _____

A popular tourist attraction in a large city is often a trip to the top of its tall buildings. In New York, this means the Empire State Building or at one time, the World Trade Center. In Chicago it is the Sears Tower or the John Hancock Building. One goal in visiting these tall buildings is to get a view of the city as far as the eye can see.

The greatest or maximum distance you can see across flat land is a function of your height above the ground. If h is the height in meters of your viewing place, then S , the distance in kilometers you can see, can be given by this rule: $S = 3.532 \sqrt{h}$

- 1) Discuss with your group how to use the equation above to find out how far you could see if you were on top of a 100 foot building.
Write the equation you would use to solve _____
Solve and write your answer. Show all steps

- 2) Now discuss with your group how you might find out the height of a mountain in New Jersey if (on a good day), you could once see the World Trade center 60 miles away.
Write the equation you would use to solve _____
Solve and write your answer. Show all steps

- 3) Here is a list of some of some of the world's tallest buildings and free-standing towers. Calculate the viewing distance from the top of each to the nearest whole kilometer.

Building	Location	Height	Viewing Distance
CN Tower	Toronto, Canada	555 meters	
Sears Tower	Chicago, USA	443 meters	
World Trade Center	New York, USA	419 meters	
Empire State Bldg	New York, USA	381 meters	
Eiffel Tower	Paris, France	300 meters	

- 4) The CN Tower in Toronto, Canada is 555 meters tall. It is near the shore of Lake Ontario, about 50 Kilometers across the lake from Niagara Falls. On a clear day, can one see as far as the Falls from the top of the Tower? **Explain your reasoning.**

5) What factors, other than building height, influence viewing distance?

6) To improve your understanding of the relation between height and viewing distance, first copy and complete the table below. Express each output value to the nearest whole number; then plot the data points on an appropriately labeled graph. Do not connect the points.

H	0	50	100	150	200	250	300	350	400	450	500



7) The Washington Monument in D>C> is 170 meters tall. How far can one see from its top?

Estimate _____ Equation _____

Solution (show work)

8) How high must a tower be in order to see at least 60 kilometers?

Estimate _____ Equation _____

Solution (show work)

9) Advertising for Queen’s Dominion Amusement Park claims you can see 40 kilometers from the top of its observation tower. How high is the tower?

Estimate _____ Equation _____

Solution (show work)

Alg 6.2b

Humongous Fungus

Apparently Utah is in the running for having the most humongous fungus. What is this humongous fungus? How big is it? Where is it? Who else is in the running?

In this activity you will research what is believed to be the world's largest living organisms, *Armillaria bulbosa* and *Armillaria ostoyae* fungus. Then you will examine their sizes and solve problems related to it.

1. Homework: Access the internet and search *Armillaria bulbosa* fungus (this search will probably also give you info about *Armillaria ostoyae*). Answer these questions: What is this humongous fungus? How big is it? Where is it? Who else is in the running? Each group will have 2 minutes to report their findings. Be prepared before class as you will have only a short time to get ready to present.

Summarize your presentation here.

2. If the humongous fungus in Michigan covers 154,000 square meters, what are some possible rectangle dimensions? (Remember the Garden Problem) Show all work.

If the fungus was in the shape of a square, what would the length of the side of this square be? Show your thinking.

How many football fields would fit on this humongous fungus? Show your thinking.

3. If the same humongous fungus is in the shape of a circle, how big would the radius of this circle be. (Hint: you will need to use the formula for the area of a circle) Write the equation you will use to solve this problem. Then solve it.

4. Compare Michigan's fungus with other places which have humongous fungus (Utah and Washington state) You may have to find out what a hectare is and consider depth and weight factors.

	Michigan	Utah	Washington state
Surface Area in meters ²			
Surface Area in hectares			
Square side length			
Circle radius			
Weight (if given)			

Which state has the

most Humongous fungus? Explain your thinking.

Are there any other factors we should consider? If so what?