Ramp It Up!

Strands:

Quantitative Situations	X
Unit Analysis	X
Measurement	X
Logic & Proof	
Figures & Properties	
Relationships Among Figures	
Transformations	

Materials:

- Colored pencils
- Ruler (tape measure for extension problem)

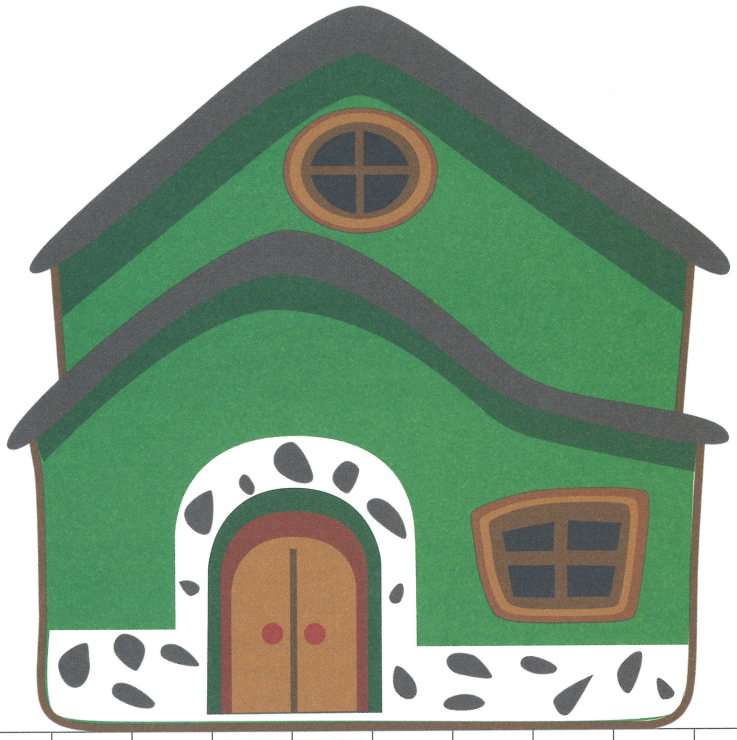
Where?

Outside	X
Inside	X
On-line	
On-site	

Do you know anyone who uses a wheelchair? A lot of consideration goes into the design of an accessibility ramp. Few houses are built to accommodate such a ramp. Use the worksheets that follow to help Scott design a ramp for his house then consider what you would need to do to build a ramp for your house.

A State of Michigan law designates that any accessibility ramp must have a slope of at most 1/12. That is, for every 12 feet of horizontal distance, the ramp can elevate no more than 1 foot.

1. Draw a diagram to represent this information and find the distance (hypotenuse) a person would travel up the ramp if the ramp conforms to state law and has on elevation of 1 foot.
2. Find each ratio for the ramp in problem 1, then find the value of θ where θ is the angle between the ground and the ramp. For each, also state whether a higher or lower ratio makes the ramp easier to climb and why.
   a. $\tan \theta$ b. $\sin \theta$ c. $\cos \theta$
   d. θ (in degrees to the nearest hundredth)
3. Before building his ramp, Scott wanted to test the state standards at a local store so he used a mileage wheel on a particular ramp. The length he traveled up the ramp was 28 feet. Scott also measured the height of the ramp and found it to be 2 feet 4 inches. Does this ramp meet state requirements? Why or why not?
4. There is a training ramp at the hospital that has an angle of 4° with the ground. It is a long ramp built to simulate a hill. Scott measured the horizontal length of the ramp to be 120 feet.
   a. What is the height of the ramp?
   b. What is the greatest elevation change (to the nearest hundredth) the ramp can have to comply with state law?
   c. Is the hospital ramp in compliance with state law?
5. Scott's family is moving and found a nice new house but there was no ramp! Scott will have to build one. Scott prefers an easier climb so he wants to build a ramp with an angle of 3°. The height of the doorway is 40 inches.
   a. To build the shortest ramp possible with an angle of elevation of 3°, how much lawn space does Scott need?
   b. Scott's lawn is 36 feet long and 30 feet wide. Does he have enough lawn to make a straight ramp (no turns)?
   c. Can you design a ramp that still meets the state requirements? Make a scale drawing of the ramp using an overhead view and 2-dimensional side views with detailed measurements. The ramp should be at least 54 inches wide. Any turns must have a flat section 54 in by 54 in. Otherwise, be creative!



Driveway

Scott's Front Yard

Sidewalk

Driveway Side View

Right Side View

Sidewalk Side View