

Activity 2: How Big? Worksheet

Your engineering team's goal for this activity is to determine the size of your cavern(s). Just like activity 1, discuss each question with your team and write your answers below.

- Let's use the classroom size to help us determine how much space people need for sleeping. Measure the length, width and height of your classroom in meters. Record the measurements in the table below. Talk to your teacher about ways to measure the classroom height.

A	B
	Classroom dimensions in meters
length	
width	
height	

- Use the length, width and height measurements to calculate the area and volume of your classroom. Round your answers to the nearest whole number.

A	B	C
		Classroom dimensions in meters
area	length × width	
volume	length × width × height	

Info tip: Units of length, width and height are in meters (m). Units of area are in meters squared (m^2). Units of volume are in meters cubed (m^3). *Have you labeled your measurements correctly?*

- Next, determine how many beds can fit in the classroom. It is helpful to use graph paper to draw a layout of the classroom and beds. Assume that each graph paper square represents 1 m x 1 m and that a typical single bed is 2-meters long by 1-meter wide (area of one bed = _____ m^2).
Remember to leave room between the beds for people to walk!

How many beds could your classroom hold? _____

If you use bunk beds, how many beds could your classroom hold? _____

How many students are in your class? _____

What is the total area your class needs for sleeping? _____ m^2

How many classes would be able to sleep in your classroom with bunk beds? _____

4. Fill in the table below with your information from Question 3 on the total of classrooms and total area needed for sleeping. *That's just for sleeping!* What about space for eating, playing, food and water storage, closets and bathrooms? Fill in how many of your classrooms your class would need for eating, playing, etc.

Activities	Classrooms required	Area required (m ²)
sleeping		
eating		
playing		
food/water		
closets		
bathrooms		
TOTAL		

5. Now add up the area required. The total area required for _____ people is _____ m². How much area is needed for each person?
_____ per person

We visited with agricultural and biological engineers Maya and Brannon to help us design an underground farming system. Creative engineers like Maya and Brannon help people around the world by designing new crops, fertilizers and irrigation systems. These engineers design ways to grow crops in deserts, keep weeds out of fields, and get energy from plants. To learn more about agricultural engineering careers, go to <http://www.asabe.org/> > *Career Resources*.

Maya and Brannon have developed an underground farming system design for us. They estimate that the underground farming system will require an extra 22 m² of area for each person.

6. Using the data from Question 4 and the agricultural engineers, calculate the total area required per person.

7. The entire state of Alabraska has 10 million people; that's 10,000,000! Since your team has determined the area required per person, calculate the total cavern area required for 10 million people in m².

8. Convert the total required area in m² (from Question 7) to square kilometers. Round your answer to the nearest whole number. Use your conversion chart.

_____ km²

9. Looking at your answer to Question 8, think about how large an area is required. Compare the required area with some areas in your neighborhood. Is it a similar-sized area to your school campus, city block or soccer field? Discuss with your team whether your answers make sense! Write your explanation and conclusions below.
