Lab 4: Measuring the Room and Bear Grylls' Formula

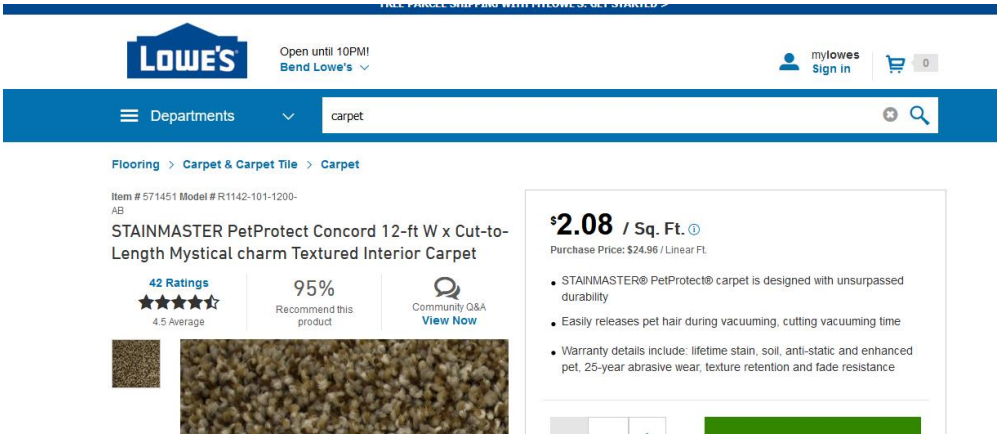
Today, we're going to put some of what we've been doing to use!.

How many square feet of flooring are in your room?

1. **(1 point)** Write down some things you'd need to know/have in order to answer this question. (One of them might be a measuring implement—if you don't have a measuring tape, be creative! For example, a sheet of paper measures about 12" on its longer edge. 😊)

2. **(2 points) (w)** Find (or estimate) the square footage of your room. Part of your work should include a drawing of the room, labeled with measurements. In case you need some visual help with how to measure a floor, here ya go! And here's one where I figure the square foot age of that floor.

This is how much DuPont StainMaster carpet costs:



3. **(2 points) (w)** How much would it cost to carpet your room with the above carpet?

How many cubic feet of air are in your room?

4. **(1 point)** Write down some things you'd need to know/have in order to answer this question.

5. **(2 points) (w)** Go ahead and calculate it! Again, a basic drawing should be included in your work. In case you need an example to work off of, here's me doing the volume of the same office from before.

6. **(2 points) (w)** Now convert that to ***liters*** of air. (You can look up the conversion factor.)

7. **(2 points) (w)** A person at rest inhales and exhales about 8 liters of air per minute. How long would it take a person at rest to inhale and exhale all the air in your room?

Let's shift gears and use these ideas in another applied context. Ever head of Bear Grylls? He's that guy who runs the show *Man Versus Wild*. It's a fun show about "how to survive if you get dropped off with next to nothing in really inhospitable natural places[1]."

Bear claims that, if you drop a stone from the top of a cliff, and time how long it takes to hit the ground, you can figure out the height of the cliff by using this shortcut:

cliff's height (in feet) = amount of time the rock falls (in seconds) * 30

Let's look at that **formula** in a little more detail. We'll start by assigning a few **variables**.

- Let's call the **"cliff's height (in feet)"** the variable "**h**"**.**
- And then, the **"amount of time the rock falls (in seconds)"**, we'll call **"t".**

Then the sentence

cliff's height (in feet) = amount of time the rock falls (in seconds) * 30

can be more succinctly written as

$$h = t*30$$

Let's talk about a couple definitions before we go any further.

- A **variable** in mathematics is any value that can (surprise!) vary.
- A **formula** in mathematics is just an equation that has two or more variables involved.

Let's start by analyzing Bear's formula with a **t-table**.

[1] This often involves drinking water from animal dung.

t = time the rock falls (in seconds)	h = height of cliff (in feet) = t*30

"t" is an example of an *in*dependent variable….that is, a variable that we start with to get the value of a second variable.

"h" is an example of a *de*pendent variable….that is, a variable whose value we get after we evaluate an expression involving the independent variable.

8. **(2 points)** Start by filling in some sensible values for ***t*** in the gray cells above. Just make 'em up!

9. **(2 points)** Now, fill in the corresponding ***h*** cells next to your ***t*** cells.

10. **(3 points)** Remember that ***t*** is measured in seconds, and ***h*** in feet. What unit must be on that "**30**" up there? In case you get stuck, check this out!

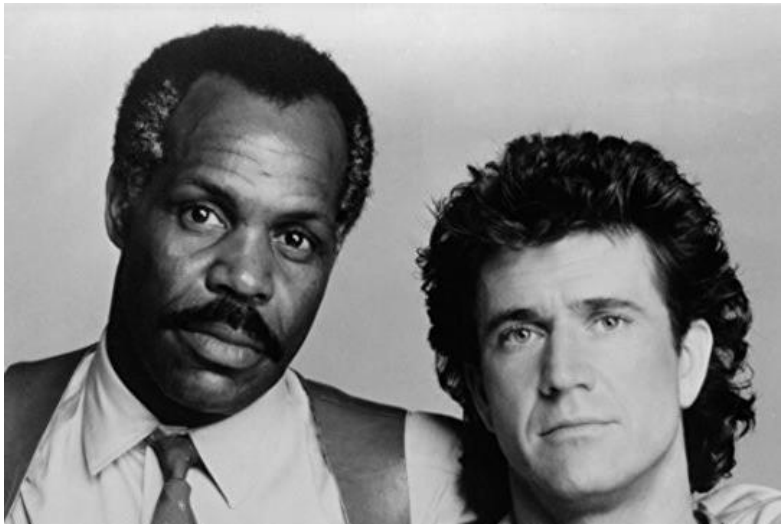
Now…let's test Bear's formula out! We'll start by collecting the time that it takes various objects to drop, using our cell phone stopwatches to time them.

I've created a little playlist of 5 videos showing things dropping and hitting the ground; you can find the videos here (if you need the link: **https://youtube.com/playlist?list=PLT9lV-YdYZj1ZJlh6ChAYxEs-i68Ese1p)** You might want to watch each one first to get used to the start and stops I count you off; the object always launches at "three." [2]☺ and stop your stopwatch. The chart below will help you keep organized!

11. **(3 points)** Fill the first column out with your times, and then we'll use the second column to test out Bear's formula.

	Time (seconds)	**Height = t*30**
Rule Garage Drop		
Grandview Drop		
David Letterman Drop		
Thomas Creek Drop		
HUGE Rock Drop		

Once you have those, head over to the next page!

[2] Because 

Here are the ***actual*** heights those things were dropped from:

	Actual Height
Rule Garage Drop	**24'8"**
Grandview Drop	**42'6"**
David Letterman Drop	**100'**
Thomas Creek Drop	**345'**
HUGE Rock Drop	**467'**

12. **(3 points)** How did Bear's formula do? Write a few sentences…did it work ***all*** the time? ***Fail*** all the time? Work better for certain heights than others? [Optional: Do you have any idea why that is?]