Part 1A: Data Gathering (Homework)
For three minutes, write everything you know about water.

Typical Water Use and Recommendations at Home (modified from https://water.usgs.gov/edu/ga-home-percapita.html)

Bath	A "full tub" varies, of course, but 36 gallons is good average amount. Tip: Taking a shower instead of a bath should save a good bit of water.	
Shower	Find out whether you have a regular or water saving showerhead. Record the number of minutes you spend for a shower and how many times per week. Old showers used to use up to 5 gallons of water per minute. Standard showerheads use 2.5 gallons per minute. Water-saving showerheads produce about 2 gallons per minute.	
Teeth brushing	 Identify whether your faucet is new or old. Record the number of times you wash/brush your hands per day and average wash time in minutes. ・Newer bath faucets use about 1 gallon per minute ・Older models (without aerators) use over 2 gallons.	Tip: Simply turn the faucet off when brushing teeth.
Hands/face washing		Tip: Simply turn the faucet off before drying your hands and face. If you don't mind a brisk wash, don't run the faucet until it gets hot before using it.
Dishwasher	Identify the model of your dishwasher and record how frequently your family runs the dishwasher per week. • Older dishwashers might use up to 16 gallons per cycle. • EnergyStar (~2010) models use 6 gallons or less per wash cycle. Tip: EnergyStar dishwashers not only save a lot of water but also save electricity.	
Dish washing by hand	Identify whether your kitchen faucet is new or old. Record the number of minutes you spend on washing dishes. • Older kitchen faucets use about 2.5 gallons per minute. • Newer kitchen faucets use about 1.5-2 gallons per minutes. Tip: Efficient hand-washing techniques include installing an aerator in your faucet head and scraping food off, soaking dishes in a basin of soapy water before getting started, and not letting the water run while you wash every dish. And it's best to have two basins to work in--one with hot, soapy water and the other with warm water for a rinse.	
Clothes washer	Identify the gallon usage of your laundry machine and how many times you do your laundry per week. • Older models use about 40 gallons per load. • Energystar washers (~2010) use about 25 gallons/load. Tip: EnergyStar clothes washers not only save a lot of water but also save electricity.	
Toilet flush	Find out whether you have regular or low flow toilet. Record the number of times you flush the toilet in a day. • Older toilets used about 4 gallons. • Most all new toilets (after 1990s) use 1.6 gallons per flush, Tip: Check for toilet leaks! Adjust the water level in your tank. Also consider installing a new low-flow toilet.	
Glasses of water you drank or used for cooking	8 oz. per small glass (not counting water for Yoshie or your cats). Also, note that you will be using water for cooking. (1 small glass averages 8 oz, 1 regular bottled water is around 16.9 oz,1 gallon = 128 oz)	

The chart on the first page shows the typical water usage in a household. What are some other important functions of water in our daily lives?

Over the course of one week, you will record your personal water usage and fill out the table below:
Before you fill out the table, make a prediction of which activity will consume most water in your life in a week. Write out the activities from the chart in the order from the greatest water consumption to the least water consumption.

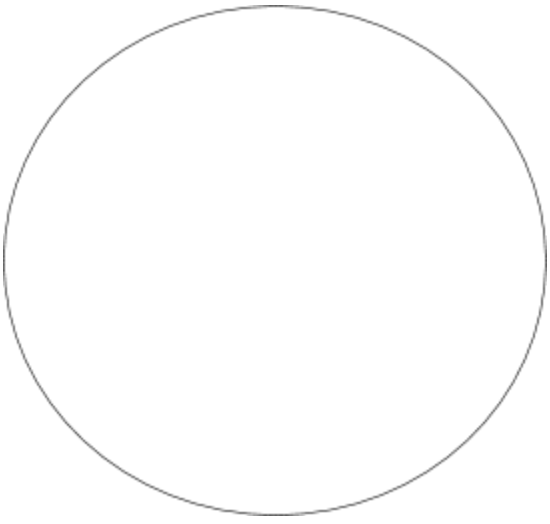
	Daily usage average count	# of times per week	Weekly Total frequency: daily usage * # of times per week	Multiply the Weekly Total Frequency by the amount of GALLONS as explained in the Typical Water Use at Home Chart (Show your math)
Bath	NA			
Shower (# of mins*freq)				
Teeth brushing (# of mins*freq)				
Hands/Face Washing (# of mins*freq)				
Dishwasher	NA			
Dish washing by hand (# of mins*frequency)				
Laundry/Clothes washing	NA			
Toilet Flush (how many times)				
Glasses of water drank or used for cooking				
Others 1: _____				
Others 2: _____				

Part 1B: Alien Apocalypse: Death by Water (or lack thereof)

Oh snap! The aliens realized how water is extremely precious to human beings and decides to attack our water source! All the reservoir and treatment plants are blown to pieces and there's no way to recycle water. Luckily, your house has this secret water storage tank that you decide to keep to yourself. The 5000 gallon water tank has clean, potable water filled to its brim. Assuming that you cannot reuse greywater at all, how many weeks do you have before you run out of water?

To help you figure out how long you will survive based on your current consumption, below is a chart for your data. Input your total water consumption from the homework in this pre-made Google Spreadsheet to help you figure out your percentage:

	Total Weekly Usage in gallons (from chart)	Percentage indicated in pie chart	Maximum allotted for activity (% * 5000 gallons)
Bath			
Shower			
Teeth brushing			
Hands/Face Washing			
Dishwasher			
Dish washing by hand			
Laundry/Clothes washing			
Toilet Flush			
Glasses of water drank			
_____			
_____			



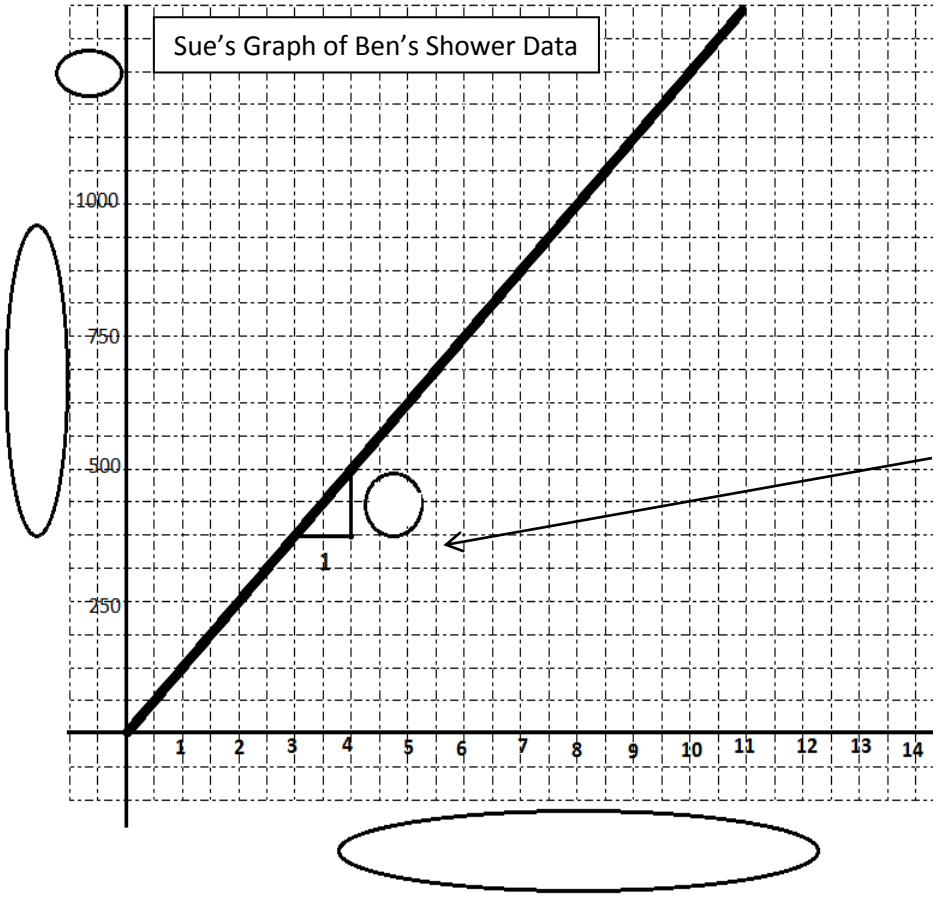
Sketch out the pie chart from your spreadsheet.

Does your pie chart match your prediction of order of water consumption? If not, what was different?

Part 2A: Ben's Dilemma

Ben and his friends also had their own individual water storage tank of 5000 gallons. Below is Ben's weekly water consumption in terms of showering (he doesn't shower often 🤔). He wanted to use linear equation to help him figure out how many weeks can he shower before the water runs out (=1500 gallons) but got confused. His friend Sue tried to help him and drew a graph for him based on his data. Unfortunately, he spilled some water and some parts got erased. Help Ben out by filling in the empty spaces on the graph below.

	Total Weekly Usage in gallons	% in pie chart	Maximum allotted for activity (%* 5000 gallons)
Shower	125	30%	1500



Answer the following questions based on Sue's graph to the left:

1. What is the independent variable and how do you know?

2. What is the dependent variable and how do you know?

3. What is the value of the vertical change of the line? What does it represent in the situation?

4. What is Sue's equation based on her graph? Make sure to identify each variable and parameter.

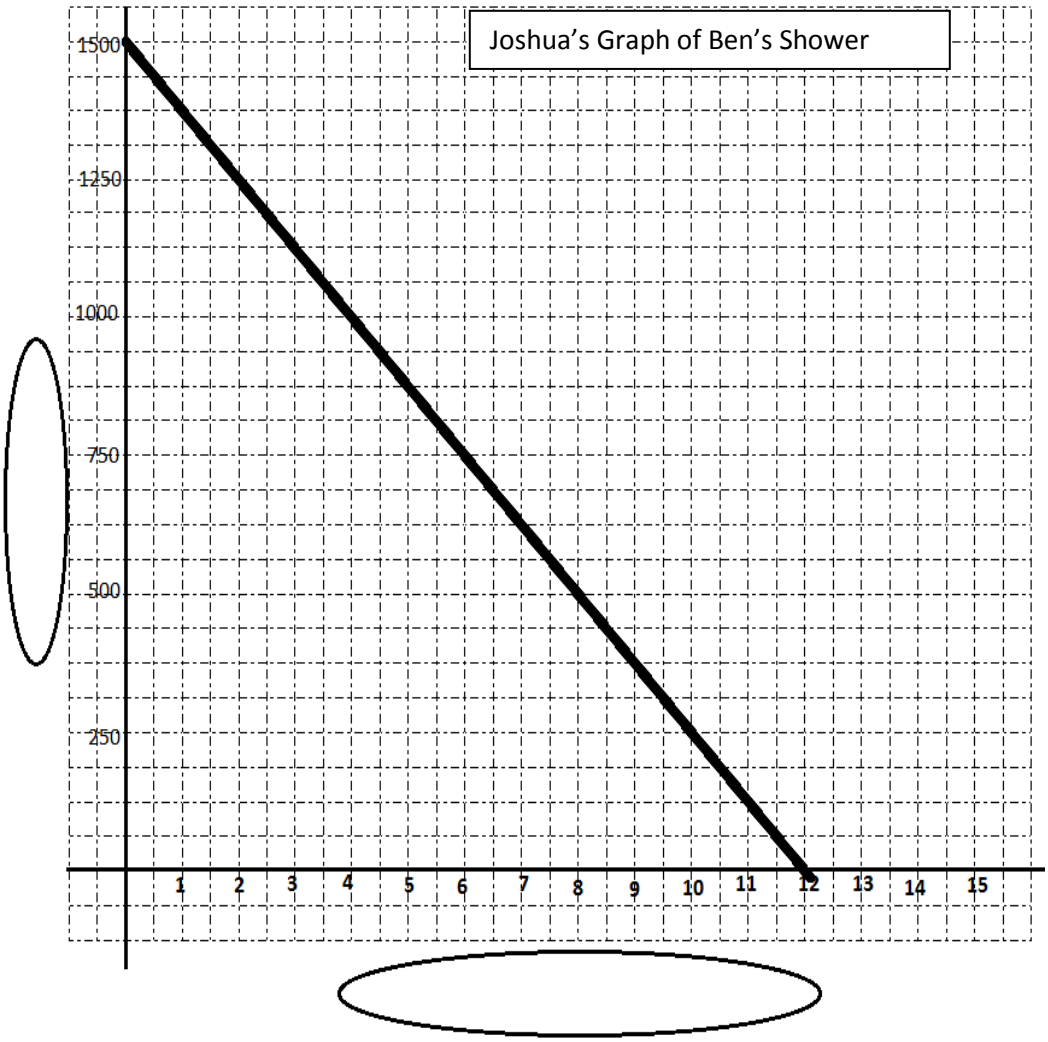
As a group, discuss then write down:

1. Why did Sue scale her axis by 250?

2. Is Sue's graph is helpful for Ben? Justify your answer.

STOP HERE! Do not turn page without getting a stamp!

Part 2B: His other friend Joshua saw Sue's graph and found it confusing and problematic. He thinks his graph of Ben's data makes more sense. Look at his graph, fill in the empty spaces and answer the questions.



1. Draw a growth triangle and identify the slope. What is his unit rate?

2. Why is the line going down?

3. What is the equation for this line? Identify the parameters based on the situation.

4. What does the y-intercept represent in this situation? How is it different from Sue's y-intercept?

5. As a group, discuss and agree on who has the better graph. Why does your team think so?

6. In Sue's graph, graph y=1500. What do you notice?

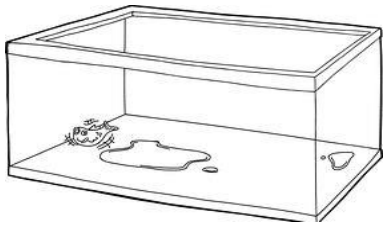
7. Pretend that Ben's water consumption is similar to your data and he decided to graph all his water usage, which activity do you think will have the steepest line? Which activity will be least steep?

Part 3: After helping Ben figure out his data, it's your turn to figure out how many weeks you can survive based on your current consumption. Fill in the tables below based on your recorded data from Part 1B of this packet:

	Total Weekly Usage in gallons	Maximum allotted for activity (% * 5000 gallons)	Linear Equation	x-intercept (x,0)	y-intercept (0,y)
Bath					
Shower					
Teeth brushing					
Hands/Face Washing					
Dishwasher					
Dish washing by hand					
Laundry					
Toilet Flush					
Glasses of water drank/for cooking					
_____					
_____					

Now, graph all the lines into the coordinate graph below. Make sure to color code!

You made a prediction in part 2B about steepness in Ben's graph. Did your prediction match your graph? How did you know/not know?



Write everything that you noticed about the key features (x-intercepts, y-intercepts, slope) of your lines.

Based on your equations and graphs of your current water consumption, how many weeks can you survive? How do you know this?

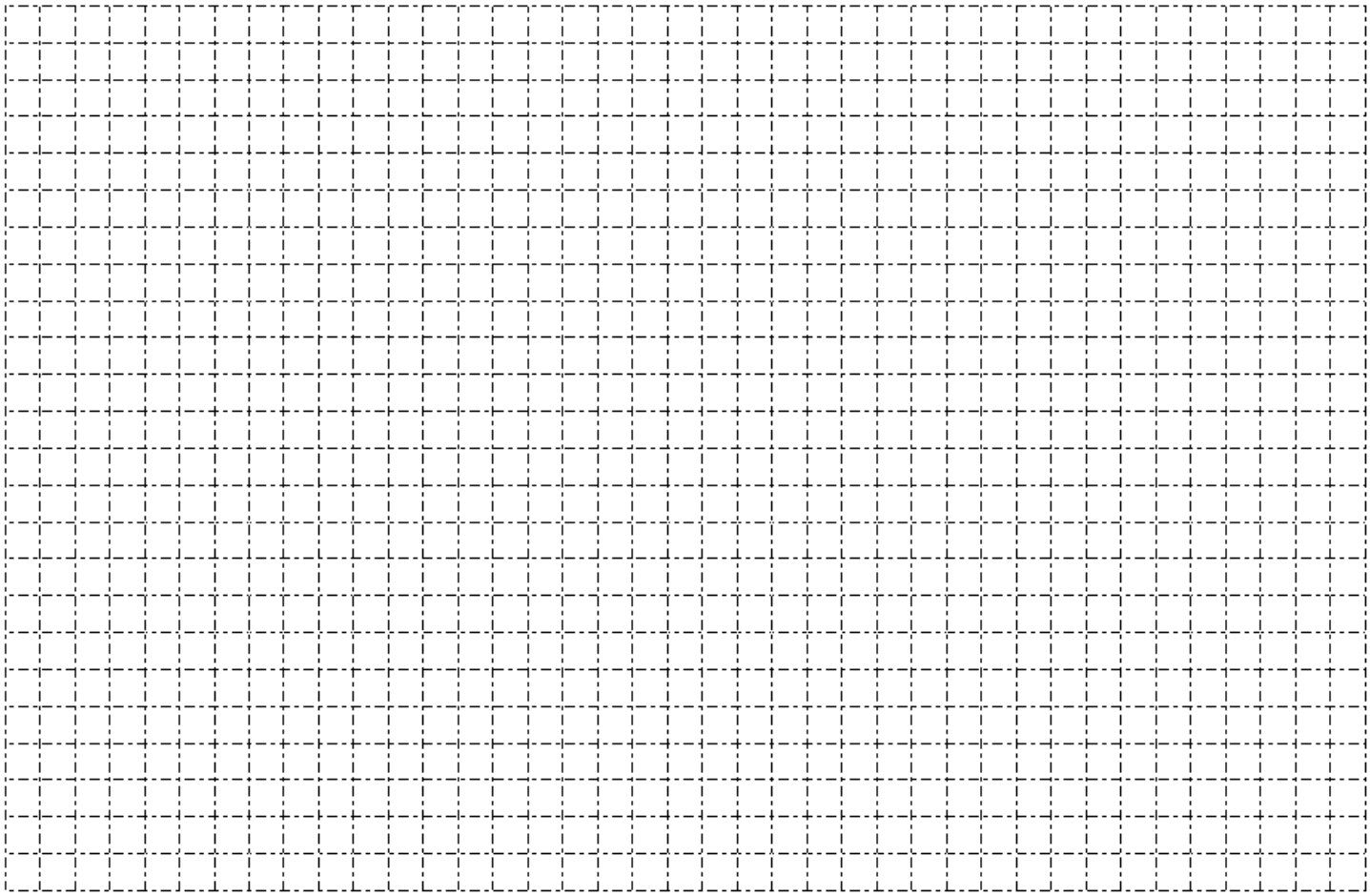
Part 4A: Space Doom! (Disclaimer: No fact check has been done for the following scenario.)
It is year 20XX. You and your crew mates are aboard a spaceship bound for Mars to be part of its terraforming crew. Unfortunately, the maintenance crew was unable to properly install the water recycling station for your ship, so used water is automatically discharged into space! By the time your crew realized this, you only have a total of 1200 gallons of water left, and you still have 4 months of your journey.

As a group, come up with ways to make adjustments to make sure everyone is alive by the time you reach Mars. Make sure that you don't give up on hygiene since it is important that no one gets sick. You will need to come to a consensus and produce identical charts. (Note: Make sure to share 1200 gallons evenly between each crew members!)

	Daily usage average count	# of times per week	Weekly Total frequency	Multiply Weekly Total Freq. by amount of gallons	% in pie chart	Maximum allotted for activity [y-intercept] (% * 5000 gallons)	Linear Equation	x-intercept
Shower (# of mins*freq)								
Teeth brushing (# of mins*freq)								
Hands/Face Washing (# of mins*freq)								
Dish washing by hand (# of mins*frequency)								
Laundry/Clothes washing	NA							
Toilet Flush (how many times)								
Glasses of water drank or used for cooking								
Others 1: _____								
Others 2: _____								

What are some significant changes in your water consumption? How did your adjustments affect the key features (x-intercepts, y-intercepts, slope) of your equations?

Part 4B: Graph your new linear equations and make sure each line is color coded.



Based on your adjustments, how much time does your crew have before water runs out? Will you be able to reach Mars in time?

Aside from adjusting your own water usage, what else can you do to survive any water shortage scenario as long as possible?