**WATER DOWN THE DRAIN**  
  
The U.S. Geological Survey estimates that leaky faucets in U.S. homes waste over $10,000,000 worth of water each year! Do you have a leaky faucet in your house? How much water do you think is wasted? How much water do you think a leaky bathroom sink faucet wastes compared to a leaky tub faucet? How would the U.S. Geological Survey reach the conclusion reported?  
  
Use the materials given to you by your instructor to create a physical model of the situation of a leaking faucet and a leaking bathtub. You should have a water source, two different sized paper clips, two paper cups, a ruler, a stopwatch, and a graduated cylinder.  
  
1.) Describe how you initially plan to set up your model. What jobs do each of the materials play? Might you use other materials not provided by your instructor? If so, what are they? What are your assumptions?

**Leading Question**  
How would you design an experiment to estimate how much water is wasted in U.S. homes?

2.) Use the model that you have created to fill in the values in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Leaky Bathroom Sink Faucet** | | **Leaky Tub Faucet** | |
| **Time (in seconds)** | **Volume (millimeters)** | **Time (in seconds)** | **Volume (millimeters)** |
| 10 |  | 10 |  |
| 20 |  | 20 |  |
| 30 |  | 30 |  |
| 40 |  | 40 |  |
| 50 |  | 50 |  |
| 60 |  | 60 |  |
| 70 |  | 70 |  |
| 80 |  | 80 |  |
| 90 |  | 90 |  |
| 100 |  | 100 |  |
| 110 |  | 110 |  |
| 120 |  | 120 |  |
| Number of drips  during the first 10 second interval: \_\_\_\_\_\_ | | Number of drips  during the first 10 second interval: \_\_\_\_\_ | |

3.) Was your model efficient in its original plan, or did you alter it based on the data you collected?

4.) Plot both sets of data and draw a line of best fit for both sets of data. Copy your plots directly into this document and display below.  
  
  
Use the data you collected in the previous day to help answer the following questions:  
  
5.) Find the equation of the line of best fit.  
Sink Faucet data set equation:  
  
Tub Faucet data set equation:

6.) How did you find the line of best fit?  
  
7.) Using the best fit line equations, describe a method of estimating the amount of water in *gallons* wasted in one day?  
  
a.) Using your method, how much water does the leaky bathroom sink faucet waste in one day?  
  
b.) How much water does the leaky tub faucet waste in one day?  
  
8.) How much water is wasted in one month (30 days) and one year for both faucets?  
  
9.) How many households do you think have at least one leaky faucet? The data from *Census 2010* suggests that there are 114.8 million households in the United States. How much water is wasted in one day from all households in the country?  
  
10.) A family is going on vacation and accidentally left the leaky bathroom sink and tub drains plugged in  
  
 The sink has dimensions: **Sink depth (in): 19.125  
 Sink length (in): 19.125  
 Sink width (in): 8.0**

The tub has dimensions: **Tub depth (in): 8.625  
 Tub length (in): 60  
 Tub width (in): 30.25**  
  
 How long will it take to fill the sink completely? The tub? Show your work.  
  
11.) The U.S. Geological Survey has a drip accumulator calculator that can be found online (http://ga.water.usgs.gov/edu/sc4.html). How do your estimates compare to their calculations? How many drips/minute did you calculate in your experiments?  
  
 Using the drip accumulator calculator, how many gallons per day are wasted in  
 a.) Five homes, two faucets each, with 60 drips/minute?  
 b.) 10,000 homes, four faucets each, with 20 drips/minute?  
  
12.) On average, one gallon of tap water costs one cent. How much money is waster per day from the two examples in Question 11?  
  
13.) What specification (households, faucets, drips per minute) would you give the estimate that U.S. homes waste over $10,000,000 worth of water each year?

14.) Write a concluding paragraph addressing the strengths and weaknesses of your model. Address authentic alternative scenarios and/or the need for future work.