

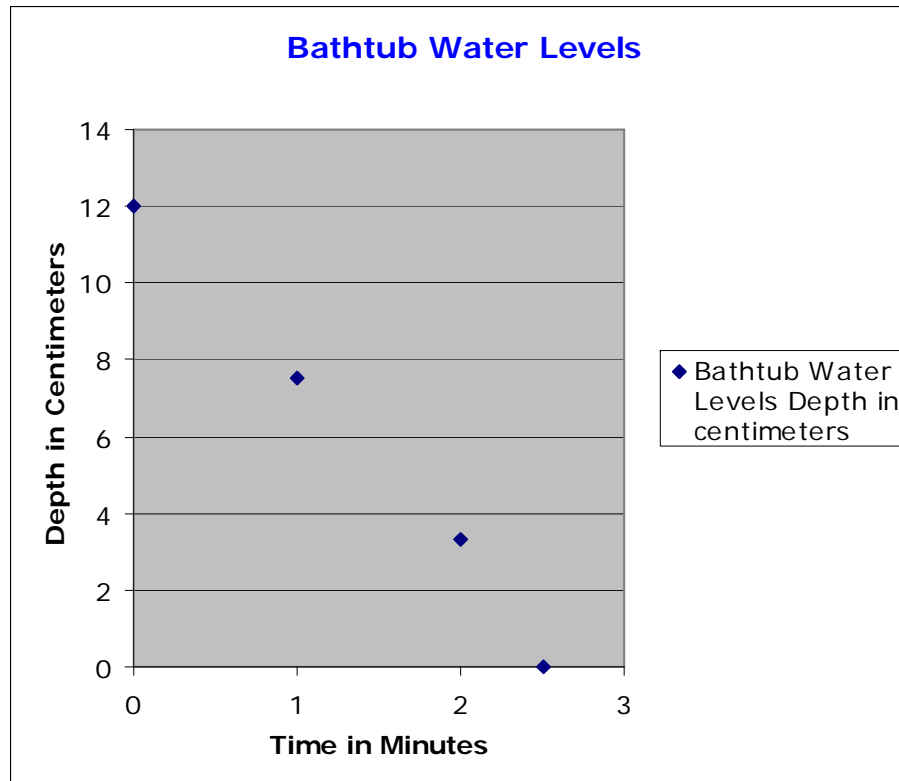
# Bathtub Water

## Linear Regression Graphs

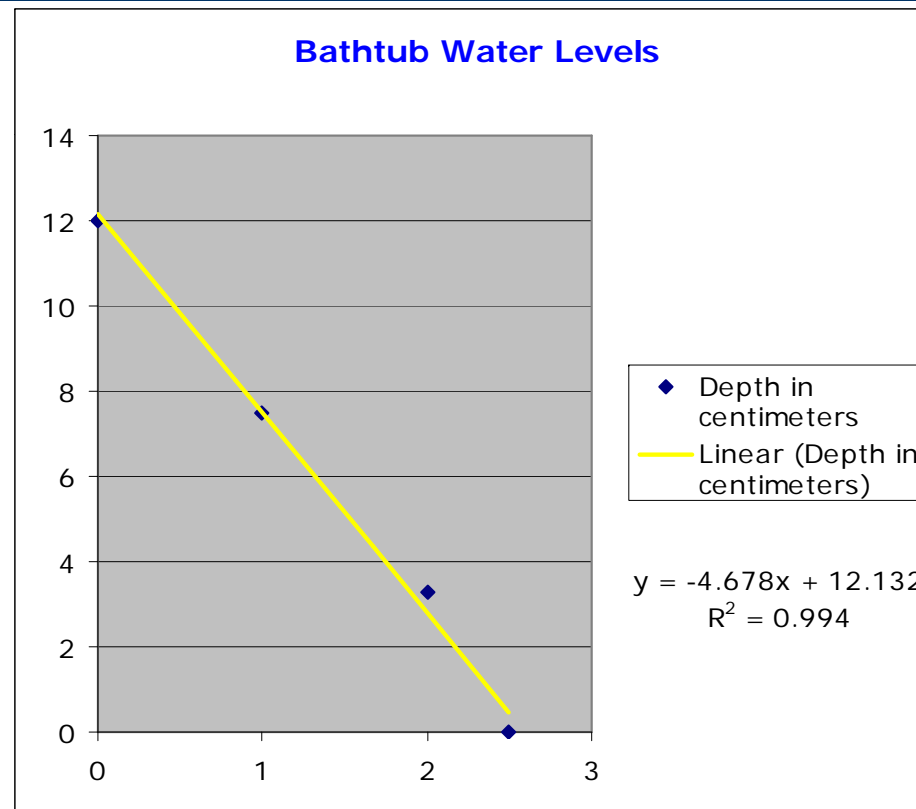
# The Experimental Design That We Used

- Since we couldn't use a bathtub at school, we used the sink in the science lab.
- We put the drain in the sink and filled it with water. We measured the height of the water in centimeters. Then we set a timer for 1 minute, started the timer, and opened the drain plug. At the end of 1 minute, we closed the drain plug and measured the height of the water in centimeters. We measured the water near the center of the sink, away from the sides.
- We recorded our data and continued the process until the sink was empty.

# The Graphical Representation of the Data



# A Linear Trendline Fit the Data



# How Do We Find the Function or Equation of the Graph?

- The R-squared value is 0.994, which is a good fit of the line to the data (a trendline is most reliable when its R-squared value is at or near 1)
- The equation  $y = -4.678x + 12.132$  represents the linear trendline and can be found:
  - Through the graph--looking at the y-intercept (12.132) and the slope of the line (-4.67)
  - Using the “show equation” feature of Excel

# What other types of phenomena produce the same graphic results?



Losing Weight shows the same linear relationship with a similar negative slope. The starting point (or y-intercepts) are different however.

# Is there a function that generalizes this type of motion?

- Linear function with a negative slope--a function that has a starting point and a constant rate of decay.

# Why is it important to study this type of change?

- Linear functions are common and so it is important to understand that they usually show that something is increasing or decreasing at a steady rate.
- However, it is important to also understand that not all functions are linear. There are many types of functions that may fit the trend of your data, such as logarithmic, periodic, polynomial, power, exponential and/or moving average.
- You need to collect enough data so that you are confident that the type of trend/regression function you choose is a reliable representative of your real world data.