6 – 9 – 12 Lab

Learning to Weigh

Grade 6 Lab

1. Vocabulary

a. Scale
b. Balance
c. Calibration
d. Accuracy
e. Precision

2. Equipment

Four digital scales (0 grams, 0.1 grams, 0.01 grams, 0.001 gram), 30 glass blobs, calibration mass set (M2 rated)

3. Procedure

Determine the most appropriate scale based on the objects to be weighed. Measure 5 objects on each scale and look at the variation. Make a determination which should be used for all 30 blobs.

4. Analysis

a. Find the mean, median, and mode of the selected set of 30 numbers.
b. Which "average" number would you say best describes all of them?
c. Use the sorted data to plot a histogram.

5. Conclusions

a. Of fact. State the reason(s) you picked the scale. What was the mean of the 30 numbers. How do they vary? Range of values?
b. Of inference. Was the precision and accuracy sufficient to characterize the 30 numbers. Should you go back and redo based on the histogram?

Grade 9 Lab

6. Vocabulary

a. Scale
b. Balance
c. Calibration masses M2
d. SI unit mass
e. Appropriate units
f. Histogram
g. Box and Whisker Plot
h. Distribution
i. Outlier

7. Equipment

Four digital scales (0 grams, 0.1 grams, 0.01 grams, 0.001 gram), 30 glass blobs, calibration mass set (M2 rated)

8. Procedure

Discuss the method to select the appropriate scale for determining the variation in masses of the glass blobs. Sample the blobs and make a final scale selection. Record data.

9. Analysis

a. Find the mean, median, and minimum/maximum/quartiles for the set of blobs.
b. Plot a histogram and the Box and Whisker plot, which one best conveys the data set properties?
c. Are there any outliers in this data?

10. Conclusions

a. Of fact. Why didn't we have to calibrate the counting experiment? What would be wrong with assuming the scale is working if it reads zero with no weight on it?
b. Of inference. Histograms change very much by how you group the data. Discuss how "bin size" affects your histograms. Discuss how the histograms would change if another scale was used.

Grade 12 Lab

11. Vocabulary

a. Scale
b. Balance
c. Calibration masses
d. Calibration curve
e. Accuracy
f. Precision
g. Box and Whisker Plot
h. Distribution
i. SI units of mass
j. American units of mass
k. Data tables and presentation of information

12. Equipment

Geiger counter, Software and computer, Uranium glass, Orange Fiesta Ware. Four digital scales (0 grams, 0.1 grams, 0.01 grams, 0.001 gram), 30 glass blobs, calibration mass set (M2 rated)

13. **Procedure**

Carefully weigh five masses on each scale and determine which is the most appropriate for these 30 blobs. What would change to select a more/less accurate scale. Is calibration essential if the scale reads zero with no mass?

14. Analysis

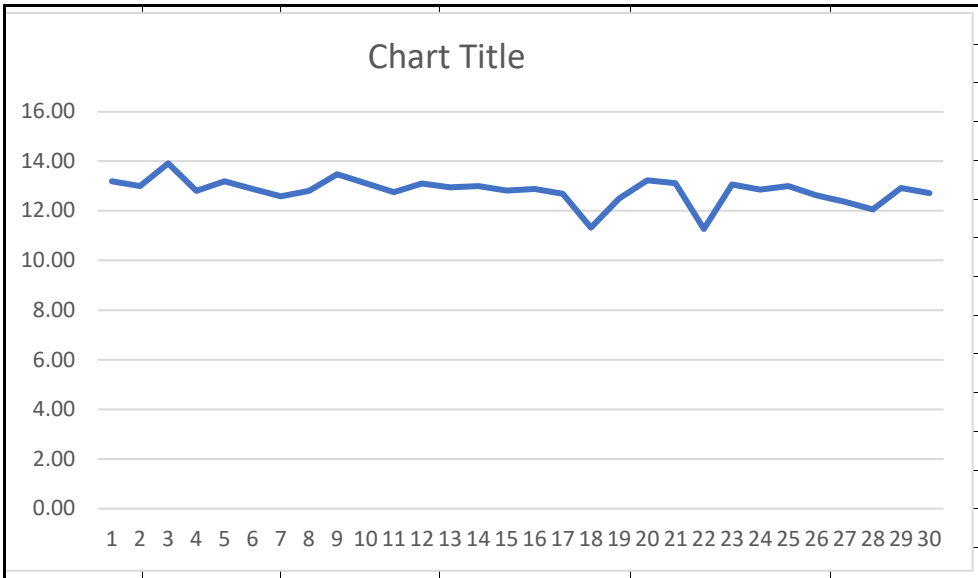
a. Find the mean and standard deviation of each set of numbers.
b. Inspect the range of numbers in this experiment and compare to the counting experiment. Discuss differences and why. Is the mean related to the standard deviation here?
c. Are there any outliers in this data?

15. Conclusions

a. Of fact. What is the average weight of a blob, what is the variation and range of weights.

b. Of inference. What confidence would you have in assigning means and standard deviations to these data? What if I wanted to be twice as certain, or ten times as certain? Discuss the value in collecting data for longer periods of time, i.e., more data points.

			Glass Blobs				
	Count	**1 gram**	**0.1 gram**	**0.01 gram**	**0.001 gram**		**Order**
	1	12	13.2	13.19	13.184		11.28
	2	12	13.0	13.00	12.988		11.32
	3	13	12.9	13.92	12.919		12.06
	4	13	12.8	12.80	12.795		12.36
	5	13	13.2	13.19	13.181		12.49
	6			12.88			12.58
	7			12.58			12.63
	8			12.81			12.69
	9			13.48			12.72
	10			13.11			12.75
	11			12.75			12.80
	12			13.10			12.81
	13			12.94			12.82
	14			13.00			12.85
	15			12.82			12.88
	16			12.88			12.88
	17			12.69			12.92
	18			11.32			12.94
	19			12.49			13.00
	20			13.23			13.00
	21			13.11			13.00
	22			11.28			13.06
	23			13.06			13.10
	24			12.85			13.11
	25			13.00			13.11
	26			12.63			13.19
	27			12.36			13.19
	28			12.06			13.23
	29			12.92			13.48
	30			12.72			13.92
			sum	**384.17**			
			mean	**12.81**			
			st. dev.	**0.53**			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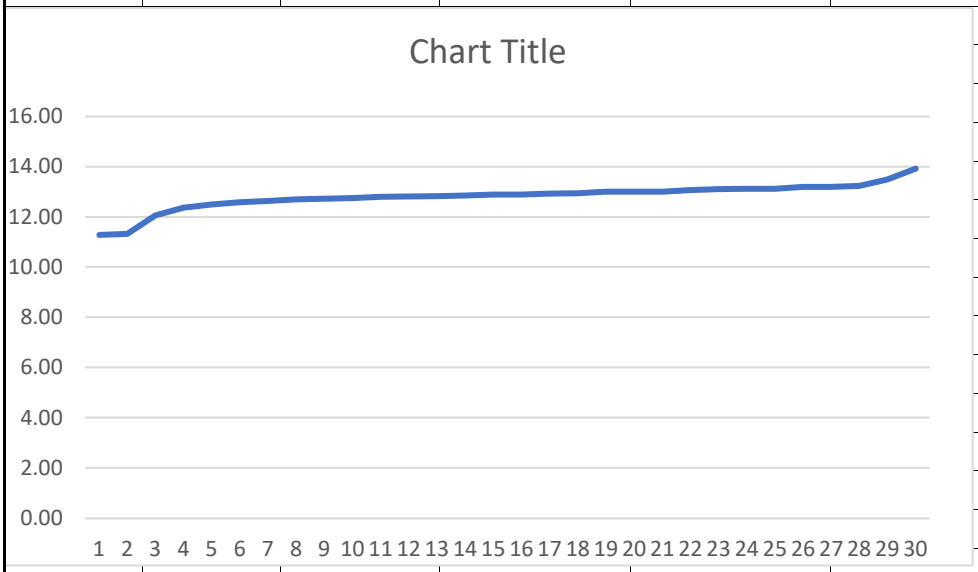
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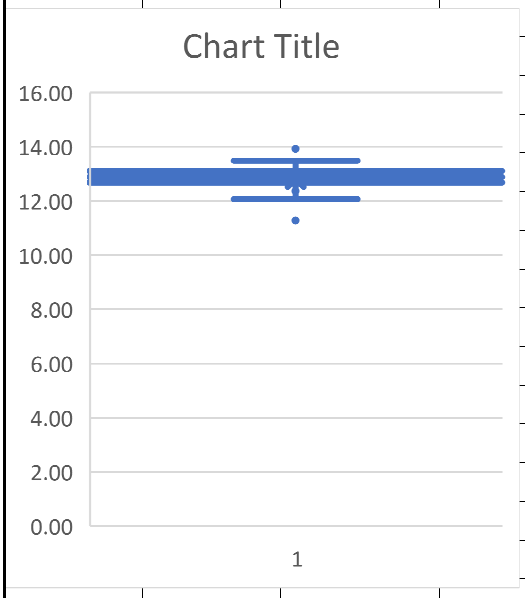
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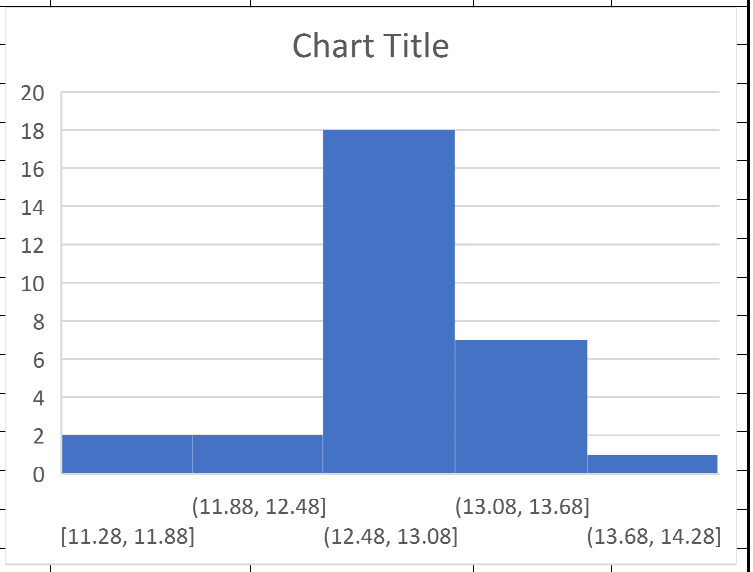
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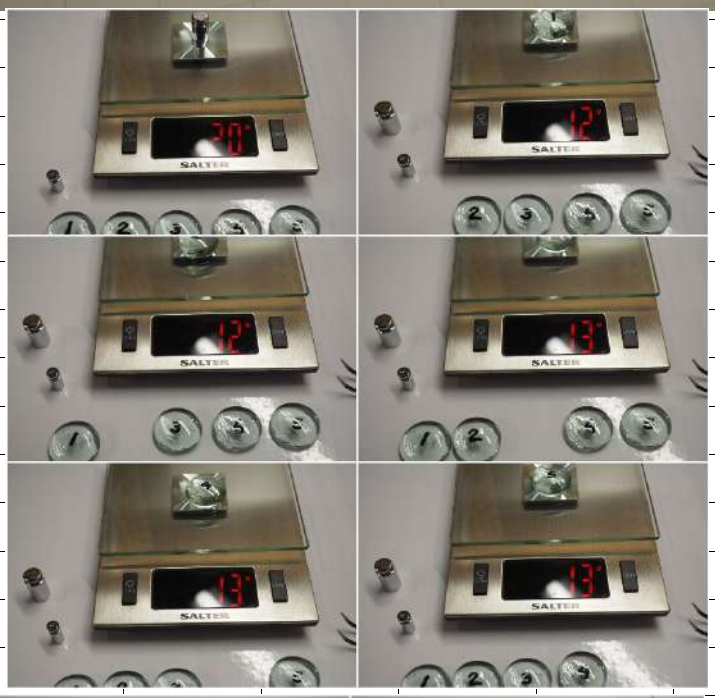
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