

Please print this document and write your answers directly on it. The more detail the better, but you must fit your answers in the space provided. Please use blue or black ink. You will be watching videos and answering questions about the videos.

INTRO TO AP BIOLOGY & STATISTICS Part 1:

Watch the following videos (links in each question) and answer the questions on this paper.

1. [Bozeman- A Beginner's Guide to Graphing](#) (**MUST know when to use each type appropriately!*)

- a. What type of graph uses a 'best fit' line?
- b. Explain the difference in a bar graph and a histogram.
- c. What type of graph shows a change over time?
- d. What type of graph displays a correlation of variables?
 1. Distinguish between the independent variable and dependent variable and where they are placed on a graph.
- e. Which type of graph is best for comparing 2 or more different groups?
- f. Which type of graph is better for showing distribution of data?
- g. Explain when a pie graph should be used and give (draw) any example.
- h. State at least 5 elements that any graph should **always** display.

2. [Bozeman- Statistics for Science](#)

- a. What is n ?
- b. What is \bar{x} ?
- c. What is M ?
- d. What was the range of the sample he gave?
- e. Explain 'Degrees of Freedom' (with any example) and why the formula is $n-1$.

3. [Bozeman- Standard Deviation](#)

- a. What is meant by normal distribution?
- b. What does standard deviation (SD) measure?
- c. Can 2 sets of data have the same mean but a different SD? Explain.
- d. 1 SD means _____% of the population falls within this range; while 2 SD means _____% falls in this range.
- e. Pause the video and calculate the SD from the 2nd set of data given BY HAND. Show your work.

4. [Bozeman- Standard Error](#) and Kevin Piers [Standard Deviation & Standard Error of Mean](#)

- a. From Bozeman: Explain the significance of standard error among 2 different sets of data with different sample sizes that have the same Mean (in terms of precision).

b. From Piers:

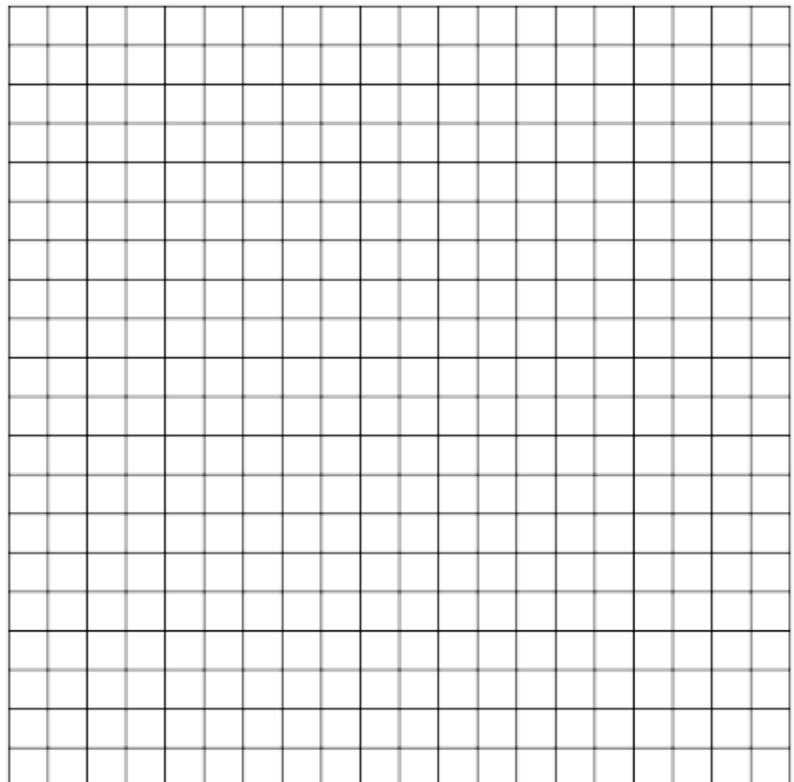
1. What do SEM bars that have overlapping Means on a graph indicate?
2. Explain the significance if SEM bars overlap, but the Means do not overlap.
3. Explain the significance if there is no overlap between SEM bars.

* One good site for additional review is <https://www.mathsisfun.com/>.

5. Solve the following problems **IN PENCIL**. You must show **ALL WORK**. Make sure graphs have **Titles** and are properly labeled **WITH UNITS**: (Click here for [AP Bio Formulas Sheet](#))

- a. Graph the following sample data set showing the number of leaf disks that rise in a solution over time as photosynthesis occurs.

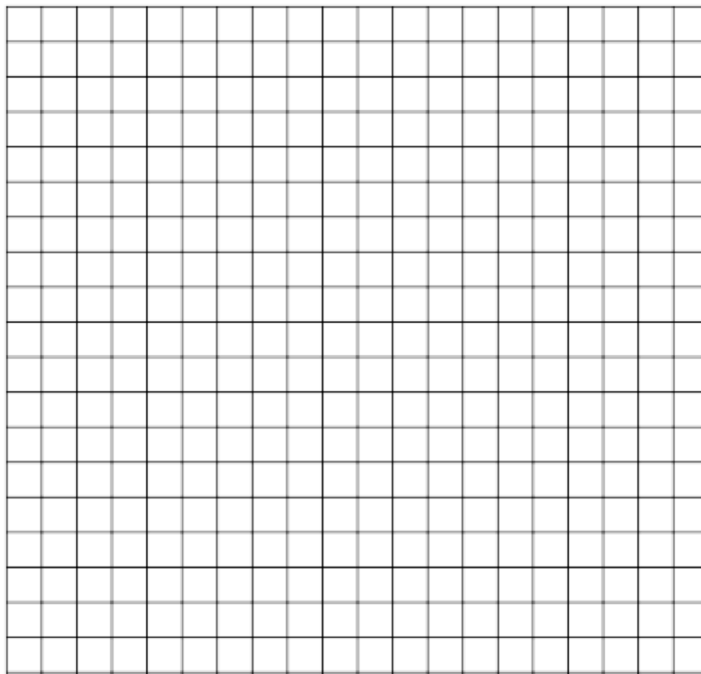
Time (min)	Number of Disks
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	1
8	1
9	1
10	2
11	5
12	8
13	10
14	14
15	14
16	15
17	20
18	20
19	20
20	18



- b. Calculate the mean for the data set of annual monthly rainfall. Use the data to sketch the appropriate type of graph.

Mean = _____

Month	Ave Rainfall (cm)
Jan	2.0
Feb	1.8
Mar	1.2
Apr	5.7
May	6.2
Jun	5.9
Jul	1.0
Aug	1.1
Sep	1.1
Oct	2.3
Nov	2.7
Dec	2.5



- c. Below are 2 samples of data that were collected (*we will ignore Units & Graph Title for this one):

Sample A: 12, 13, 14, 15, 16, 17, 18

Sample B: 10, 15, 20

Calculate the mean for Sample A _____

Calculate the mean for Sample B _____

Are the calculated means sufficient in explaining the data? Why or why not? (*Be specific!)

d. Describe the difference in enzyme activity between the control and treated groups in Experiment 1

Do the bars overlap?

Do the means overlap?

Explain whether or not there are 'significant' differences between the 2 populations.



6. A student noticed that the ivy leaves growing on the shady side of a building were larger than ivy leaves growing on the sunny side of the same building. The student collected and measured the maximum width, in centimeters, of 30 leaves from each habitat.

- Use statistical analysis to determine if it's likely that there is a significant difference in leaf size between the shady and sunny ivy plants with 95% confidence (± 2 SE).
- Graph the data and indicate error bars.
- Using the data given and constructed graph, justify the significance between the two samples.

Calculated Results (from collected data):

	Shady Leaves	Sunny Leaves
Mean	7.43	5.88
Standard Deviation	1.63	1.32
<i>N</i>	30	30
Standard Error	0.30	0.24

