AP Statistics– Prerequisite Summer Work

Summer 2017

To all students enrolled in AP Statistics and their parents/guardians,

Congratulations on your decision to enroll in AP Statistics! You have decided to take a course that is often a requirement in many college majors in the fields of health science, social science, and business. This course will also have you thinking about how you interpret data to make informed decisions as a consumer.

Although AP Statistics requires only an Algebra II prerequisite, it is not an easy course. As for all AP courses, it does require a great deal of commitment within and outside the classroom. AP Statistics is a special course that combines both mathematical and verbal skills. You will be required to write descriptive paragraphs and concluding sentences to prepare you for the AP Exam. You will have to explain the reasoning behind the method you choose and the conclusions you find.

AP Statistics will expose you to four central themes: exploring data, research design, probability and simulation, and statistical inference. The AP Exam contains questions from each of these 4 clusters. Each chapter test and the AP Exam are comprised of multiple choice and open ended questions.

How can we prepare for this class? Although many of the concepts in the Course are introduced for the first time in this class there are some concepts to review to help you prepare for this course. Complete this summer packet before the first day of class. <u>This packet will be collected on the first day</u>. It will be graded and count as a 100 point test. I will be starting class assuming you have completed the packet.

****All AP Statistics students are required to have a graphing calculator.** I **recommend the TI-84 CE.** I look forward to seeing you next school year!
Sincerely,

Mrs. Whitt

AP Statistics Teacher
swhitt@lvhs.org

(Email me over the summer if you have any questions as you work through the packet.

Name:_____

SHOW ALL WORK WHERE POSSIBLE IN SPACES PROVIDED.

Part 1:

1. This table shows the median US family income (in 2003 dollars) for selected years. ***Let x be the number of years since 1940.***

Year	Median Family Income ($)
1947	21,201
1973	43,219
1979	45,989
1989	49,014
1995	48,679
2000	54,191
2003	52,680

a. Enter the data into your graphing calculator and create the scatter plot for this data. **Draw the scatter plot on 8 ½ by 11 inch graph paper drawn to scale.**

b. Find the linear regression line using your graphing calculator. (See calculator user's guide if needed.)

c. Superimpose the regression line on the scatter plot.

d. Use your regression line to predict the median US family income in 2013.

e. Calculate the mean, median and mode of the family income.

2. Using 20th century US census data, the population of New York can be modeled by:

$$P(t) = \frac{19.875}{1 + 57.993e^{-0.035005t}}$$

where P is the population in millions and t is the number of years since 1800. Based on the model,

a. What is the population of New York in 1852?

b. What will the population be in 2015?

c. What is New York's maximum sustainable population (limit to growth)?

3. A projectile is launched straight up from ground level with an initial velocity of 288 feet/second.

Projectile motion: $s = -16t^2 + v_0 t + s_0$

Where :
S_0 = initial height
V_0 =initial velocity
s = vertical position t seconds after launch

a. When will the height of the projectile be 1152 feet above the ground?

b. When will the height of the projectile be **at least** 1152 feet above the ground?

4. When a ball is bouncing up and down on a flat surface, its height with respect to time can be modeled using a quadratic function. One form of a quadratic function is the vertex form: y= $a(x-h)^2+k$. In this equation, y represents the height of the ball and x represents the elapsed time. The following is sample data of a bouncing ball over time.

Elapsed Time (seconds)	Height of the Ball (meters)
0.688	0
0.731	0.155
0.774	0.309
0.817	0.441
0.860	0.553
0.903	0.643
0.946	0.716
0.989	0.773
1.032	0.809
1.075	0.828
1.118	0.828
1.161	0.811
1.204	0.766
1.247	0.721
1.290	0.650
1.333	0.563
1.376	0.452
1.419	0.322
1.462	0.169

a. Enter this data into your graphing calculator and create a scatter plot. **Draw the scatter plot on 8 ½ by 11 inch graph paper drawn to scale.**

b. Find the value of a, h and k so the equation $a(x-h)^2+k$ fits one of the bounces in the data. Do this by approximating the vertex (h,k) from the scatter plot and graph on your graphing calculator and solving algebraically for a. Give the equation.

c. Change the values of a, h and k in the model found above and observe how the graph of the function is affected on your graphing calculator. Explain how each of these changes affects the graph.

d. Represent the equation you found in '4b' in standard quadratic form:

$$y = ax^2 + bx + c$$

e. Use quadratic regression in your graphing calculator to find a model for the data set above. Explain how the model compares with the standard quadratic form found in '4d'.

5. Enter the following data into your graphing calculator. Create a scatter plot of the data. Draw the scatter plot on graph paper drawn to scale.

(0,15) (1,40) (1,35) (2,45) (2,55) (2,60) (3,45) (3,40) (4,56) (5,60) (6,72) (7,80) (7,85) (8,96) (8,92) (9,85)

a. This (x,y) data represents the final exam scores and the number of hours studied for the Honors Chemistry Final Exam. Which variable represents the number of hours studied? Which variable represents the Final Exam grade?

b. (It's time to do some writing.) Describe the scatter plot in as much detail as possible. Does the data suggest a linear, quadratic, exponential or another relationship? Describe the slope. Draw a conclusion about the number of hours studied and the Final Exam grade. Estimate the number of hours necessary needed to study to get a 100% on the test.

6.

a. Create and list your own set of data (16 ordered pairs) and describe what the data represents in a real life setting. Enter the data into your calculator.

b. Create a scatter plot on your calculator. **Draw the scatter plot on graph paper drawn to scale.**

c. Does the data suggest a linear, quadratic, exponential or another relationship?

d. Find a regression model to represent your data.

e. Draw a conclusion about the data in the context of the problem.

7.

a. Create a set of data containing 10 values so the mean is greater than the median but less than the mode. State the mean, median, mode and range.

b. Draw a box and whisker chart for this data on graph paper. Draw the chart to scale.

Part 2- Algebra Review

1. Evaluate z if $z = \frac{x - \mu}{\sigma}$ where x = 20, $\mu = 10,$ and $\sigma = 2.$

2. Given: $z = \frac{x - \mu}{\sigma}$, solve for $\sigma.$

3. Given: $z = \frac{x - \mu}{\sigma}$, solve for μ.

4. Given: $0.05 = 1.96\sqrt{\frac{0.5^2}{n}}$, solve for n.

5. Given: $-1.64 = \frac{60 - \mu}{\sigma}$ and $1.96 = \frac{95 - \mu}{\sigma}$, solve for μ.

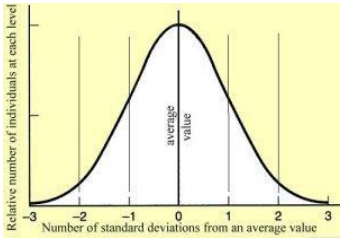
6. Given: $-1.64 = \frac{60 - \mu}{\sigma}$ and $1.96 = \frac{95 - \mu}{\sigma}$, solve for $\sigma.$

7. Find the equation of the line in slope intercept form (y=mx + b) that goes the points (-2,4) and (5,7)

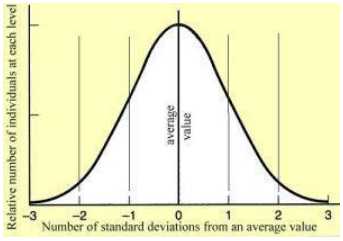
8. Given: $\log_{10} 100 = x$ evaluate $10^x =$ _____

9. Given: $\ln 100 = x$ evaluate $10^x =$ _____

10. Shade the area under curve where $z \geq 1$ (Z is the horizontal axis at the bottom of the curve)



11. Shade the area under the curve where $z \leq -1$



Part 3**- Types of Data (Notes and Practice Problems):**

Quantitative *(or numerical) Data*

There are data that take on numerical values that actually represent a measurement such as size, weight, how many, how long, score on a test, etc. Some quantitative variables take on **discrete** (counting) values, such as shoe size $(6, 6\frac{1}{2}, 7,...)$ or the number of soup cans collected by a school. Other quantitative variables take on **continuous** (measurement) values, such as height (60 inches, 72,999923 inches, 64.039 inches, etc) or how much water it takes to fill up your bathtub (73.293 gallons, or 185.3 gallons or 99 gallons, etc). For these data, it makes sense to find things like "average" or "range" (largest value – smallest value).

Categorical (or qualitative) data

There are data that take on values that describe a characteristic such as color of shirts or gender. Some qualitative variables take on **binary** values , such as gender (M or F) or an answer to the question, "Are you going to the prom?" (yes or no). For these data, it makes no sense to find things like "average" or "range". To analyze these data, you count the number of Males or Females, the number of Yes responses and No responses. Categorical data can sometimes have more than 2 answer choices. An example might include "World language studied in high school". These data could take on the values, Spanish, French, Chinese, Russian, etc.

Two types of variables:

Quantitative Categorical

Continuous Binary More than 2 categories

Exercises: Answer the following questions and then decide if the data is quantitative or categorical. (Q or C) If the variable is quantitative, then **also state** whether it is discrete or continuous. (D or C)

		Answer	Type
1.	In what grade did you take Algebra 1?	_____	_____
2.	Do you own more than 20 pairs of shoes?	_____	_____
3.	How old was your father when you were born?	_____	_____
4.	How many pets do you have?	_____	_____
5.	What is your hair color?	_____	_____
6.	How many siblings do you have?	_____	_____
7.	In what state were you born?	_____	_____
8.	How tall are you measured in inches?	_____	_____
9.	How many AP classes will you take this year?	_____	_____
10.	What is your gender?	_____	_____
11.	What is your GPA?	_____	_____
12.	How long have you lived in this area?	_____	_____
13.	Are you enrolled in Honors English this year	_____	_____