Student: _____Period: ___ Date _____

AP STATISTICS & ACT MATH PREP

SUMMER ASSIGNMENT / PACKET

The purpose of this assignment is to get us off to a strong start by covering some pre-requisites including Statistics vocabulary. This will ensure that we have sufficient time to cover all of the material in the course and ample time to review for the end-of-year exams.

Please read the directions carefully and contact me by email at amadouidea@scsk12.org if you have any questions about the assignment or require clarification about my expectations of the work that you do. I will check my email periodically throughout the summer.

In this class (AP Statistics, DC Statistics or Statistics Honors) you will learn to describe and analyze sets of data and use that analysis to draw conclusions in context about the situation that gave the data. You find relationships between variables, design and carry out experiments, and quantify the reliability of the conclusions they draw. Starting from the basics that virtually every student already knows about Statistics – like mean and median, bar graphs and scatter plots – the students in this class will explore deeply into the less known realms of analysis. There is much to learn, and each class session will require students to work diligently, both during and outside of class.

This summer assignment/ packet is designed for you to review some algebra skills, refresh your knowledge or learn about basic descriptive statistics, graphs, and general information enabling you to "hit the ground running" when school begins.

Please write neatly.

The assignment / packet is due the first day back to school and will be graded.

There will also be a summer packet test by the end of the first week.

Have a great summer and I look forward to seeing you in the fall

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Definitions: **Statistics** is the science of planning studies and experiments; obtaining data; and then organizing, summarizing, presenting, analyzing, and interpreting those data and then drawing conclusions based on them.

Part 1: Vocabulary & Background Information

Q.1 Write in your own words a definition for the following terms

Bivariate Data: ……

Categorical Variables: ……

Census: ……

Cluster sample: ……

Confounding variable: ……

Continuous variables: ……

Control group: ……

Convenience sample data: ……

Data set: ……

Data value or datum: ……

Dependent variable: ……

Descriptive statistics: ……

Discrete variables: ……

Experimental study: ……

Explanatory variable: ……

Hawthorne effect: ……

Hypothesis testing: ……

Independent variable: ……

Inferential statistics: ……

Interval level of measurement: ……

Measurement scales: ……

Nominal level of measurement: ……

Observational study ordinal level of measurement : ……

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Outcome variable: …….

Outliers: …….

Parameter : ……

Population : ……

Probability: ……

Qualitative variables: …….

Quantitative variables: ……

Quartiles: ……

Quasi-experimental study: …….

Random sample: ……

Random variable: …….

Ratio level of measurement: …….

Sample: ……

Skewness: ……

Statistic: …….

Stratified sample: ……

Systematic sample: …….

Treatment group: …….

Variable: …….

Q.2 Answer (in your own words) the following questions

a. What is Statistics?

……

b. What Do Statisticians Do?

……

c. How Do I Become a Statistician?

……

d. What Industries Employ Statisticians?

……

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Q.3 Define the following words / expressions

Categorical Variable - _____

_____

Examples: 1. _____ 2. _____ 3. _____

Quantitative Variable - _____

_____

Examples: 1. _____ 2. _____ 3. _____

(Time it takes to get to school, Hair color, Teacher salaries, Gender, Jellybean flavors, Amount of oil spilled, Age of Oscar winners, Type of Depression medication, Number of shoes owned, Country of origin, Type of Meat, Number of students in a class, Height of students in a class, Temperature in a classroom, Republican, Democrat, or Neither, Grade you are in)

Part 2: Math Skills Review Section 1

Q.4 Write equations of the horizontal and vertical lines that pass through the point (-3, 4). Please label which equation is horizontal and which is vertical.

Q.5 Find the slope and y-intercept of the line. Sketch the line.

a. $y=\frac{2}{3}(2x-4)$

b. $\frac{1}{3}y-6x=4$

Q.6 Find the slope & write the equation of the line containing the points (6, -2) and (0, 5)

Q.7 Solve and graph each inequality. Graph each.

a. $|4x-6|\le 4$

b. $\left|x+\frac{3}{2}\right|>\frac{3}{2}$

c. $-2x+3y>x+9$

d. $-y>3x-1$

Q.8 Plot the data using a scatter plot then decide if the data is linear, exponential, quadratic, or absolute value.

a. (-3, 4) (-2, 3.5) (-1, 3) (0, 2.5) (1, 2) (2, 1.5) (3, 1)

b. (-3, 4) (-2, 3) (-1, 2) (0, 1) (1, 2) (2, 3) (3, 4)

c. (-3, 4) (-2, 2) (-1, 1) $(0, \frac{1}{2})$ $(1, \frac{1}{4})$ $(2, \frac{1}{8})$ $(3, \frac{1}{16})$

d. (-3, 4) $(-2, \frac{7}{3})$ $(-1, \frac{4}{3})$ (0, 1) $(1, \frac{4}{3})$ $(2, \frac{7}{3})$ (3, 4)

Q.9 There are 25 students in your English class. To determine the speaking order for presenting oral reports, slips of paper numbered from 1 to 25 are place in a box. Each student draws a number to determine his or her speaking order.

a. What is the probability that the number you draw will be odd?

b. What is the probability that the number you draw will be even?

c. Five oral reports will be given on each day. What is the probability that you will have to give your report on the first day?

d. What is the probability that you will be the last person to give your report?

Q.10 For the function $f(x) = 3x^2$ find the requested values.

f(-3) =

f(0) =

f(2) =

Q.11 Evaluate g[f(-2)] and f[g(3)] for the following function. f(x) = – x ; g(x) = x² + 5

Q.12 Solve:

a. $2\sqrt{x} + 9 = 21$

b. $\sqrt{2x+10} = x+1$

c. $2|x-1| = 14$

d. $4(x-2) = 3^2 - x$

e. $\frac{1}{3}n + 3 = n - 2$

f. $9(2p+1) - 3p > 4p - 6$

Q.13 Write the equation of the line containing the given points:

a. (6, –2) and (0, 5)

b. perpendicular to: y = 2x – 1, contains (2, 7)

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Part 3: Math Skills Review Section 2

The prerequisite for AP Statistics is Algebra II. You will find very much equation solving in this course, but some quick review of Algebra I and Algebra II content will be helpful.

Here is a formula that is used often in AP Statistics: $z = \frac{x - \bar{x}}{s}$

Q.14 If z = 2.5, x = 102, and $\bar{x}$ = 100. What is s? Show your work.

Q.15 If z = -3.35, x = 60, and s = 4, what is $\bar{x}$? Show your work.

Q.16 Solve $0.05 = 1.96\sqrt{\frac{0.5^2}{n}}$ for n

Q.17 If $-1.64 = \frac{60 - \mu}{\sigma}$ and , $1.96 = \frac{95 - \mu}{\sigma}$ solve for μ and σ.

Part 4: Descriptive Statistics – Measures of Central Tendency and Graphs

Q.18 STATISTIC – What is that?

A statistic is a number calculated from data. Quantitative data has many different statistics that can be calculated. Determine the given statistics from the data below on the number of homeruns Mark McGuire has hit in each season from 1982 – 2001.

70	52	22	49	3	32	58	39
39	65	42	29	9	32	9	33

Mean	Q1
Minimum	Q3
Maximum	Range
Median	IQR

Q.19 State the difference between a bar chart and histogram, draw a sketch of each.

Q.20 Draw a plot of the data. Then calculate the sample mean, median, and standard deviation.
3, 3, 4, 7, 7, 1, 5, 9, 8, 7, 9, 4, 1, 2, 6, 1, 9, 6, 6, 4

Q.21 Calculate the sample mean, standard deviation, the five-number summary and IQR. Then draw a box plot of the data.
19, 22, 23, 23, 23, 26, 26, 27, 28, 29, 29, 31, 32

Q.22 Make a pie chart for each of the following
Diego loves to play video games. His parents added a feature to his gaming system that tracks the total time on each game and send them an email every week. In the past week he played a total of 470 minutes. The email reported that Fortnite was played 180 minutes, PUBG was played 40 minutes, 38 minutes were used in The Show, Madden 2017 was played 94 minutes, God of War was played 91 minutes, and Rock Band was played 27 minutes.

Items Sold	Quantity
Cheeseburger	16
Milkshake	4
Chicken Fingers	5
Box of Fries	13
Egg Salad	2

Q.23 New Grading Policy
A new grading policy has been proposed by the dean of the College of Education for all education majors. All faculty and students in the college were asked to give their opinions about the new policy. The results are given below.

	Favor	Neutral	Opposed	Row Total
Students	353	75	191	619
Faculty	11	5	18	34
Column Total	364	80	209	653

a. State the variables and if they are categorical or quantitative.

b. What percent of responses were from students favoring the policy change?_____

What percent of students favored the policy change?_____

What percent favoring the policy change were students?_____

c. What is the marginal distribution of the grading policy change?

d. What is the distribution of the grading policy among just students?

e. What is the distribution of the grading policy among just faculty?

f. Create a segmented bar graph of students and faculty and their view on the proposed grading policy change.

Q.24 Suppose a set of data consists of 33 whole number observations. Its five number summary (Min, Q1, Median, Q3, Max) = (16, 20, 22, 30, 46).

a. What is the range of the data?

b. How many observations are less than 22?

c. Is it possible that there is no observation equal to 22? Explain your answer.

d. How many observations are less than 20?

e. Is it possible that there is no observation equal to 20? Explain your answer.

Part 5: Study

"Teen Automobile Crash Rates Are Higher When School Starts Earlier"

ScienceDaily (June 10, 2010) — Earlier school start times are associated with increased teenage car crash rates, according to a research abstract presented June 9, 2010, in San Antonio, Texas, at SLEEP 2010, the 24th annual meeting of the Associated Professional Sleep Societies LLC.

Results indicate that in 2008 the teen crash rate was about 41 percent higher in Virginia Beach, Va., where high school classes began at 7:20 a.m., than in adjacent Chesapeake, Va., where classes started more than an hour later at 8:40 a.m. There were 65.4 automobile crashes for every 1,000 teen drivers in Virginia Beach, and 46.2 crashes for every 1,000 teen drivers in Chesapeake.

"We were concerned that Virginia Beach teens might be sleep restricted due to their early rise times and that this could eventuate in an increased crash rate," said lead author Robert Vorona, MD, associate professor of internal medicine at Eastern Virginia Medical School in Norfolk, Va. "The study supported our hypothesis, but it is important to note that this is an association study and does not prove cause and effect."

The study involved data provided by the Virginia Department of Motor Vehicles. In Virginia Beach there were 12,916 drivers between 16 and 18 years of age in 2008, and these teen drivers were involved in 850 crashes. In Chesapeake there were 8,459 teen drivers and 394 automobile accidents. The researchers report that the two adjoining cities have similar demographics, including racial composition and per-capita income.

Q.25 Answer the following questions regarding the above excerpt:

a. Who is being studied?

b. What about those individuals is being recorded / analyzed (i.e. what are the variables?)? Do you think the variables are categorical or quantitative in nature?

c. When was the data collected?

d. Where was the data collected (more accurately: what geographical area is associated with the data)?

e. Why do you think this data was collected and analyzed?

f. How was the data collected and analyzed? In other words, what methods were used?

g. Why do you think the authors of the study mentioned that "it is important to note that this is an association study and does not prove cause and effect?"

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Q.26 Find the mean, median, mode, and range of the following collection of scores on a test.

32, 72, 81, 95, 58, 77, 75, 83, 97, 45, 89, 93, 57, 82, 97, 52, 75, 79, 78, 99, 98, 54, 75, 85, 61, 55, 86

Q.27 Find the first, second, and third quartiles of the collection of data above.

Q.28 Construct a box and whisker plot of the data

Q.29 Complete #1-3 for the following set of data. The weights (in pounds) of eleven children are as follows: 39, 52, 40, 45, 46, 55, 48, 40, 43, 47, 44

Q.30 You want to measure the physical fitness of students at your school. Suggest 3 variables that you might use to measure fitness. (Be sure that your choices of variables are specific and measurable)

Q.31 The histogram shows the number of major hurricanes that reaches the East Coast of the United States from 1944 – 2000. Describe the shape, center, and spread of the distribution.

Q.32 Hallux abducto valgus (call it HAV) is a deformation of the big toe that is not common in youth and often requires surgery. Doctors used X-rays to measure the angle (in degrees) of deformity in 38 consecutive patients under the age of 21 who came to a medical center for surgery to correct HAV. The angle is a measure of the seriousness of the deformity. Here are the data:

28 32 25 34 38 26 25 18 30 26 28 13 20 21 17 16 21 23 14

32 25 21 22 20 18 26 16 30 30 20 50 25 26 28 31 32 21 38

Make a stemplot (with a key) and describe the data in terms of center, shape and spread. Remember to write in context to the problem.

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Part 6: What is statistics?

Watch the following videos:

• What is Statistics https://www.youtube.com/watch?v=wG8L_C2OMu8

• How Statistics can be Misleading https://www.youtube.com/watch?v=sxYrzzy3cq8

and read the following article:

• What's the Difference Between Mathematics and Statistics?

https://luckytoilet.wordpress.com/2017/09/06/whats-the-difference-between-mathematics-and-statistics/

Then, answer the following questions in complete sentences. You may hand-write or type your work.

Q.33 In your own words, what is the purpose of statistics?

Q.34 What is the difference between inferential statistics and descriptive statistics?

Q.35 List at least 5 examples from the videos of how statistics is present in our everyday lives.

Q.36 Why should you not trust a statistic by itself?

Q.37 Explain Simpson's paradox in your own words.
Find another example not shown in the videos of this paradox arising.

Q.38 Based on the article "What's the Difference Between Mathematics and Statistics?" give 6 reasons that some argue statistics is too different from mathematics to categorize it as a branch of mathematics. Are you convinced statistics is not an area of mathematics?

Q.39 In mathematics, we aren't typically concerned with the ethics of research because no harm comes to the participants. Ethical data collection, however, must always remain the number-one priority of any statistician. Find and describe two historical examples of statistical research that was tainted by ethics violations.

Due Date: first day of school – Summer packet test by the end of the first week.

Have a great summer and I look forward to seeing you in the fall

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