(AP Statistics) Summer Packet

Dear Student,

Welcome to Sayreville War Memorial High School and your math course for the year! There is much to learn this year, and each class session during school will require students to work diligently, both during and outside of class. This summer Math packet addresses the material that you should be comfortable with before the start of **AP Statistics.** This Math packet serves 2 purposes:

1)   It will allow you to remain mathematically fresh during the summer and

2)   It will enable you to "hit the ground running" when this course begins.

This packet should be completed and brought with you on the first day of school. Use the answer key provided to check your work. If you come across questions that you are unsure of, make note and bring that up to your teacher during the review. It would be a mistake to complete this packet immediately upon the completion of this past school year as well as waiting until just before the next school year begins. Take some time off and look towards beginning the packet come mid-summer. It is important that the techniques practiced in this packet are fresh in your mind come the first day of school.

You will be assessed on this content within the first week or so of school.

Good luck!

Name:_____

Dear AP Statistics Student:

Congratulations on your decision to be a part of the AP Statistics program at Sayreville High School. This is a fastpaced, college-level math course that requires substantial work. In addition, you will be challenged to use your writing, reading comprehension, and critical thinking skills as you never have before in a mathematics course. AP Statistics is a course in which the concepts build upon one another from the beginning. Your success in this class will be the result of your consistent attention to reading, discussion, and homework. As a student, your responsibility is to put forth an earnest effort to be the best student that you can be!

During the semester, we will be learning many new concepts in AP Statistics. However, because of the pace and rigor of the course, there will not be a lot of time to spend reviewing topics that you were exposed to in previous math courses. This packet represents topics that are considered to be a review of the statistics concepts taught in those courses.

Work all of the problems neatly and legibly on <u>notebook paper</u>. Be sure to number your work and <u>CIRCLE</u> your answers. Be sure to make a note of the problems that you have difficulty solving. You must show your work for ALL problems, including multiple choice questions. Be sure to write all final answers on the answer sheet.

The completed packet represents your first graded assignment in AP Statistics, and will count as a quiz. All work and answer sheets are due on <u>September 6th, 2019</u>.

Although we will begin the course with new material, during the first two weeks there will be time for you to ask questions that you may have about problems in the packet.

I look forward to working with each of you in the upcoming school year.

Sincerely,

Mrs. Sachar,
AP Statistics Teacher

AP Statistics: Book resources: http://www.macmillanlearning.com/Catalog/studentresources/tps5e

Stattrek.com, http://www.stattrek.com/, is a useful website for reviewing concepts that you may have forgotten.

Types of Data

You are expected to know the difference between categorical (qualitative) and numerical (quantitative) data.

Determine if the variables listed below are quantitative or categorical.

1. Time it takes to get to school
2. Number of people under 18 living in a household
3. Hair color
4. Temperature of a cup of coffee
5. Teacher salaries
6. Gender
7. Smoking
8. Height
9. Amount of oil spilled
10. Age of Oscar winners
11. Type of Depression medication
12. Jellybean flavors
13. Country of origin
14. type of meat
15. number of shoes owned

Charts and Graphs

You are expected to know how to create a histogram, boxplot, and stemplot.

SHOPPING SPREE!

A marketing consultant observed 50 consecutive shoppers at a supermarket. One variable of interest was how much each shopper spent in the store.

Here are the data (round to the nearest dollar), arranged in increasing order:

3	9	9	11	13	14	15	16	17	17
18	18	19	20	20	20	21	22	23	24
25	25	26	26	28	28	28	28	32	35
36	39	39	41	43	44	45	45	47	49
50	53	55	59	61	70	83	86	86	93

16. Create a histogram of these data. Be sure to use appropriate scales. Be sure to include axis labels and a title.

17. Create stemplot using tens of dollars as the stem and dollars as the leaves. Be sure to include labels, title, and key.

Shape of a distribution

You are expected to be able to determine the shape – symmetric, skewed left, or skewed right – of a distribution from its graph.

18. Describe the shape of the graph you created in question 17.

19. Draw a graph with the following shapes:
    a. Symmetric
    b. Skewed left
    c. Skewed right

Numerical descriptions of data

• You are expected to know how to calculate measures of center for a data set (mean and median) • In addition, you are expected to know how to find measures of spread – range, IQR, and standard deviation – of a data set

• You are expected to know how to find the 5-number summary for any data set

Listed below is data which represents the
number of homeruns Mark McGuire has hit in each season from 1986 – 2001.

Year	86	87	88	89	90	91	92	93
# of HR	3	49	32	33	39	22	42	9

Year	'94	'95	'96	'97	'98`	'99	'00	'01
# of HR	9	39	52	58	70	65	32	29

Determine the given statistics:

20. Mean ($\bar{x}$)
21. Median (M)
22. Range
23. Standard deviation (s)
24. Minimum

26. Maximum
25. Q1
27. Q3
28. IQR

29. Create a boxplot for the distribution of homeruns hit by Mark McGuire. Remember to include scales, labels, and a title.

Outliers

You are expected to know how to detect the presence of outliers in a data set, using the 1.5 IQR Rule.

30. Determine if Mark McGuire hit an unusual number of homeruns in any given year. Which years were unusual?

Written Description:

You are expected to be able to describe a data set in context. This means that you should tell the story of what the data shows.

The important features of a data set are its Shape, Outliers, Center, and Spread. The acronym SOCS is used to help remember these.

31. Write a paragraph describing the important features of the distribution of Mark McGwire's homeruns.

Z-scores & Normal Distributions

You are expected to have a working understanding of z-scores, the Empirical Rule, and Normal distributions.

A distribution of quiz scores has a mean of 35 and a standard deviation of 4.

32. Beryl's score was 40.
    a. What was her z-score?
    b. What information does this give you?

33. Suppose these scores follow a normal distribution. According to the Empirical Rule,
    a. What percentage of scores will fall between 31 and 39
    b. What percentage of scores will fall above 43?
    c. What percentage of scores will fall below 23?

34. Use a Normal distribution table to find the Beryl's percentile. Is her score unusual? Explain.

Linear Functions

You are expected to have a thorough understanding of linear functions.

The USDA reported that in 1990 each person in the United States consumed an average of 133 pounds of natural sweeteners. They also claim this amount has decreased by about 0.6 pounds each year.

35. Write a linear equation that relates years since 1990 to the average consumption of natural sweeteners. Define your variables.

36. What is the slope and what is the y-intercept?

37. Predict the average consumption of sweeteners per person for the year 2005.

The following equation can be used to predict the average height of boys anywhere between birth and 15 years old: $y = 2.79x + 25.64$, where x is the age (in years) and y is the height (in inches).

38. What does the slope represent in this problem? Interpret it in context.

39. What does the y-intercept represent in this problem? Interpret it in context.

<u>**Samples & Experiments**</u>

You are expected to have a basic understanding of sample design and experimental design.

40. You are doing a research project on attitudes toward fast food and decide to use as your sample the first 25 people to enter the door at the local Five Guys restaurant. What type of sample is this? (Choose one)

    a. Systematic sample
    b. Convenience sample
    c. Random sample
    d. Simple random sample
    e. Voluntary response sample

41. Will this sampling method result in bias? Explain.

42. You want to do a survey of members of the senior class at your school and want to select a simple random sample. You intend to include 40 students in your sample. Which of the following approaches will generate a simple random sample? (Choose one)

    a. Write the name of each student in the senior class on a slip of paper and put the papers in a container. Then randomly select 40 slips of paper from the container.
    b. Assuming the classes have not been named, select two classes at random and include those students in your sample.
    c. From a list of all seniors, select one of the first 10 names at random. Then select every nth name on the list until you have 40 people selected.
    d. Select the first 40 seniors to pass through the cafeteria door at lunch.
    e. Randomly select 10 students from each of the four senior calculus classes.

43. How does an experiment differ from an observational study?

Probability

You are expected to have a basic knowledge of probability principles.

For questions 44 – 46, choose the best answer for each question.

44. A special lottery is to be held to select the student who will live in the only deluxe room in a dormitory. There are 100 seniors, 150 juniors, and 200 sophomores who applied. Each senior's name is placed in the lottery 3 times; each junior's name, 2 times; and each sophomore's name, 1 time. What is the probability that a senior's name will be chosen?

    a. 1/8
    b. 2/9
    c. 2/ 7
    d. 3/8
    e. 1/2

45. If a coin is tossed twice, what is the probability that on the first toss the coin lands heads and on the second toss the coin lands tails?

    a. 1/6
    b. 1/3
    c. $\frac{1}{4}$
    d. $\frac{1}{2}$
    e. 1

46. If a coin is tossed twice what is the probability that it will land either heads both times or tails both times? a. 1/8
    b. 1/6
    c. 1/4
    d. $\frac{1}{2}$
    e. 1

47. Calculate each of the following probabilities and arrange them in order from least to greatest.
    I. The probability that a fair die will produce an even number.
    II. A random digit from 1 to 9 (inclusive) is chosen, with all digits being equally likely…the probability that when it's squared it will end with the digit 1.
    III. The probability that a letter chosen from the alphabet will be a vowel.
    IV. A random number between 1 and 20 (inclusive) is chosen…the probability that its square root will not be an integer.

About Statistics

You should know something about the field of statistics.

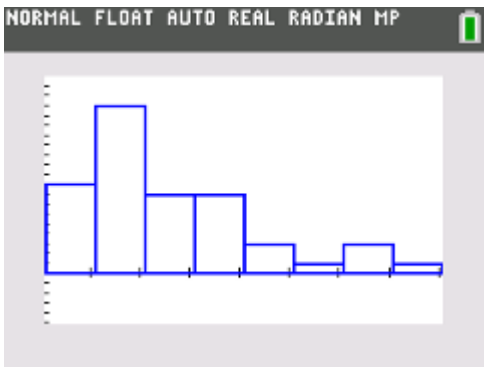Visit the Career Center of the American Statistical Association website:
http://www.amstat.org/careers/index.cfm

For the following subtopics listed in the Career Center, give three ideas that intrigued you:
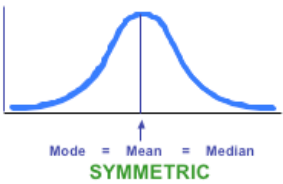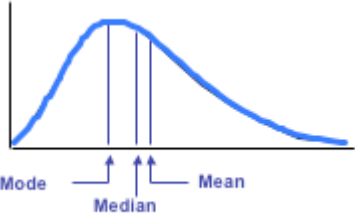
48. What is Statistics?

49. What do statisticians do?

50. Which industries employ statisticians?

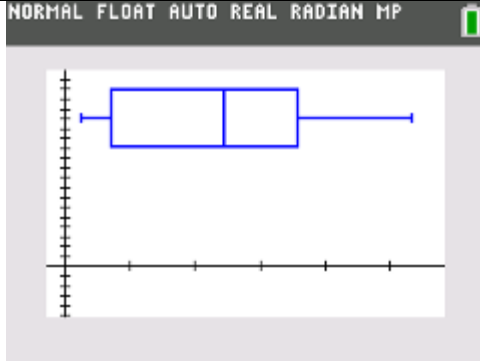| Types Of Data		
1. Quatitative	2. Quatitative	3. Categorical
10. Quatitative	11. Categorical	12. Categorical
13. Categorical	14. Categorical	15. Quatitative

16.

17

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0 | 3 9 9
1 | 1 3 4 5 6    7 7 8 8 9
2 | 0 0 1 2 3    4 5 5 6 6 8 8 8 8
3 | 2 5 6 9 9
4 | 1 3 4 5 5    7 9
5 | 0 3 5 9
6 | 1
7 | 0
8 | 3 6 6
9 | 3
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18. Distribution of the graph is skewed to the right. There are no apparent outliers. On average a shopper would spent around $34.8 with lowest amount spent $3 or largest amount spent is $ 93.

19a)

B)

c)

20. 36.4375	21. 36	22. 70 – 3 = 67	23. 19.65
24. 3	25. 70	26. 25.5	27. 50.5

28. 50.0 – 25.5 = 25	NORMAL FLOAT AUTO REAL RADIAN MP 29.	

4. Quatitative	5. Quatitative	6. Categorical
7. Categorical	8. Quatitative	9. Quatitative

Charts and Graphs

Numerical descriptions of data

Shape of a distribution

Outliers

30. IQR = 25
1.5* IQR = 37.5, Any observation below Q1- 1.5* IQR and above Q3 + 1.5* IQR would be an outlier.
  Q1- 1.5* IQR = 25.5 – 37.5 = -12.5
   Q3 + 1.5* IQR = 37.5 + 50.5 = 88
As there are no observations below or above -12.5 and 88 respectively, so McGuire has no unusual homeruns in any given year.

Written Description

31.
 Distribution of McGuire's homerun is approximately normal with no outliers. On average MCGuire hits approximately 36.4 homeruns. His least numbers of homeruns is 3 and his maximum # of homeruns is 70

Z-scores and Normal Distributions		
32. a) 1.25	32. (b) Beryl's score is 1.25 above average class score in this quiz.	
33. a) 68%	33. b) .25%	33. c) .25%

34.

  89th percentile, it is not unusual as there are 16% of the students who had score better than Beryl.

Linear Functions		
35. y =-.6x +133	36. Slope = .6, y-intercept =(0, 133)	37. 124 pounds per person

38. m = 2.79 represent - height of a boy increase by 2.79 feet per year.

39. At birth on average the height of a boy is 25.64 feet

Samples & Experiments	
40. b	41. Yes, because the first 25 people who entered the five guys might be its employee or the customers who enjoys Five-Guys food. So their opinion would be bias towards fast food.

| 42. a | 43. In an experiment, a treatment is assigned to the individuals in the sample and then the response is observed and measured. |
| | Whereas in an observation, the individuals are just observed and measures variables of interest but does not attempt to influence the responses. |

Probability

44. e	45. c	46. d

47. (I) 1/2	47. (II) 2/9	47. (III) 5/26	47. (IV) 4/5

Order for probabilities:

_____5/26_____,   ____2/9_____,   _____1/2_____,   __4/5_____,