Due Date: First Day of Class, September 2023

Welcome to AP Statistics! I am happy that you have elected to take this course! In order for you to succeed in this course, it is a good idea to review some concepts you have learned in Algebra 2 as they apply in the field of Statistics. These include:

- Normal Distributions and Percentiles
- Probability
- Regression
- Samples and Populations
- Types of Data Collection (Observational Studies, Experiments, Surveys)

Even if your Algebra 2 course did not cover these topics, you are still required to complete this assignment.

Answer the following questions. If you are stuck on one or more questions, see the list of websites at the end of this document for help!

1. You are told that your score on an exam is at the 55th percentile of the distribution of scores. Which of the following is a correct interpretation of this information?
   a.   Approximately 55% of test takers scored the same as you.
   b.   Approximately 55% of test takers scored at or below you.
   c.   You answered 55% of the questions correctly.
   d.   If you took this test (or one like it) again, you would score as well as you did this time 55% of the time.
   e.   55% of test takers scored above your score.

1._____

2. The 35th percentile of a population is the number x such that
   a.   35% of the population scores are above x.
   b.   65% of the population scores are above x.
   c.   35% of the population scores equal x.
   d. x is 35% of the population median.
   e. x is 35% of the population mean.

3. The five-number summary (min, q1, median, q3, and max) of the distribution of scores on the final exam in Psych 001 last semester was: 18   39   62   76   100.   Which of the following best describes the location of the 80th percentile?
   a.   76
   b.   We cannot tell where the 80th percentile would be.
   c.   between 62 and 76
   d.   between 76 and 100
   e.   probably between 39 and 76, since most of the class scored between these two numbers.

4. A score's percentile is a measure of
   a.   center
   b.   spread
   c.   relative location
   d.   skew
   e.   relative frequency

5. Here is a list of exam scores for the 14 students in Mr. Farrow's calculus class:

    60 61 61 65 72 75 75 78 81 81 85 89 91 98

    What is the closest percentile of the person whose score was 85?
    a.   15%
    b.   21%
    c.   29%
    d.   79%
    e.   85%

6.   The Empirical Rule states that in a normal distribution:

     a. Approximately 68 % of the data falls within _____standard deviations of the mean.

     b. Approximately 95 % of the data falls within _____standard deviations of the mean.

     c. Approximately 99.7 % of the data falls within _____standard deviations of the mean.

7. The Normal curve below describes the death rates from heart disease per 100,000 people in developed countries in the 1990's.


Heart disease death rate, per 100,000
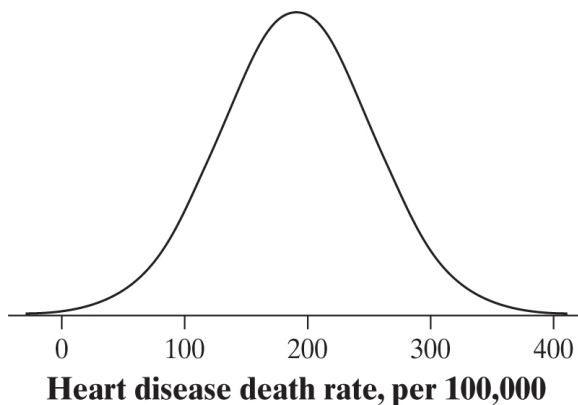
    The mean and standard deviation of this distribution are approximately
    a.   Mean = 100; Standard Deviation = 65
    b.   Mean = 100; Standard Deviation = 100
    c.   Mean = 190; Standard Deviation = 65
    d.   Mean = 190; Standard Deviation = 100
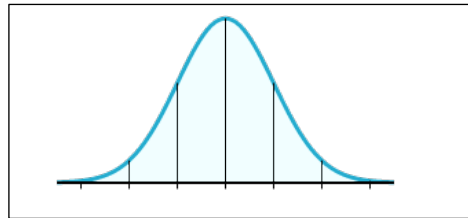   e.   Mean = 200; Standard Deviation = 130

8. Items produced by a manufacturing process are supposed to weigh 90 grams. The manufacturing process is such, however, that there is variability in the items produced and they do not all weigh exactly 90 grams. The distribution of weights can be approximated by a Normal distribution with mean 90 grams and a standard deviation of 1 gram. About what percentage of the items will weigh between 87 and 93 grams?

   a.   0.15%
   b.   0.3%
   c.   .997%
   d.   94%
   e.   99.7%
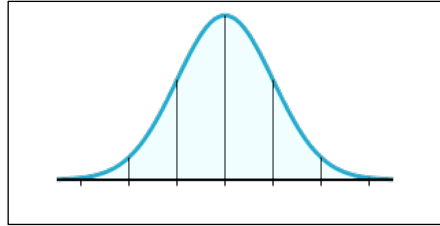
9. Birthweights at a local hospital have a Normal distribution with a mean of 110 oz. and a standard deviation of 15 oz. Which of the following is the proportion of infants with birthweights under 95 oz.?
   a.   0.160
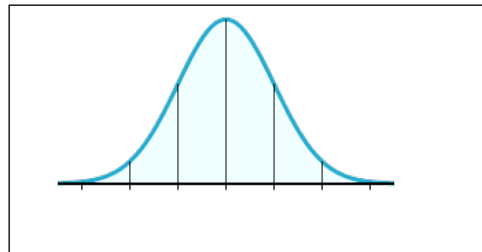   b.   0.025
   c.   0.340
   d.   0.500
   e.   0.815

10. Birthweights at a local hospital have a Normal distribution with a mean of 110 oz. and a standard deviation of 15 oz. Which of the following is the proportion of infants with birthweights between 125 oz. and 140 oz.?
   a.   0.135
   b.   0.270
   c.   0.475
   d.   0.680
   e.   0.815

11. If the heights of 99.7% of American men are between 5′ 3″ and 6′ 8″, what is your estimate of the standard deviation of the height of American men?
   a.   1″
   b.   3″
   c.   4″
   d.   6″
   e.   12″
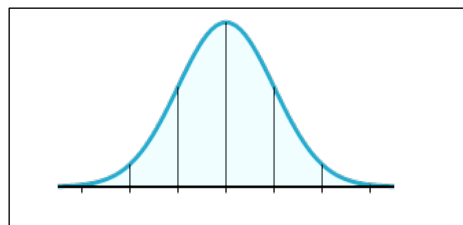
12. IQs among undergraduates at Mountain Tech are approximately Normally distributed. The mean undergraduate IQ is 110. About 99.7% of undergraduates have IQs between 80 and 140. The standard deviation of these IQs is about
   a.   5.
   b.   10.
   c.   15.
   d.   20.
   e.   25.
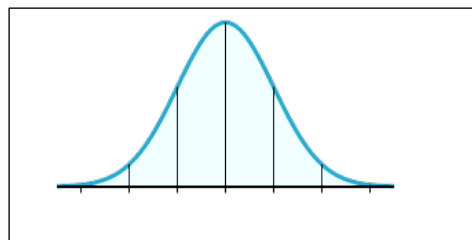
Mrs. Vaccaro wants to know how well her AP Statistics students have done on the Math portion of either the SAT or ACT. She stands outside of her classroom before her AP Statistics class and asks the first 20 students on their way into class what their highest math score was (on either the ACT or SAT).

13. The intended *population* for this survey is
      a.   all Eastern students.
      b.   all AP Statistics students.
      c.   all students at Eastern who take AP Statistics.
      d.   the 20 people who gave their scores on the way into class
      e.   all high school students.

14. The *sample* for the survey is
      a.   all Eastern students.
      b.   all AP Statistics students.
      c.   all students at Eastern who take AP Statistics
      d.   the 20 people who gave their score on the way into class.
      e.   All high school students.

15. The school newspaper asks you to comment on the sampling method used by Mrs. Vaccaro. You respond:
      a.   This is a simple random sample. It gives very accurate results.
      b.   This is a simple random sample. The results are not biased, but the sample is too small to have high precision.
      c.   This is a census, because all students had a chance to be asked. It gives very accurate results.
      d.   This is a convenience sample. It will almost certainly underestimate the true mean math score on the SAT or ACT by AP Stats students at Eastern .
      e.   This is a convenience sample. There is bias in this data collection because Mrs. Vaccaro was asking students verbally on the way into class.

16. A *simple random sample* is
      a.   any sample selected by using chance.
      b.   any sample that gives **every individual** the same chance to be selected.
      c.   a sample that gives **every possible sample of the same size** the same chance to be selected.
      d.   a sample that selects equal numbers of individuals from each stratum.
      e.   a sample that contains the same percent of each subgroup in the population.

Note: See https://library.fiveable.me/ap-stats/unit-3/random-sampling-data-collection/study-guide/nQz8XwRMmIKKBS59qrew

17. Simple random sampling
      a.   reduces bias resulting from poorly worded questions.
      b.   offsets bias resulting from undercoverage and nonresponse.
      c.   reduces bias resulting from the behavior of the interviewer.
      d.   reduces variability.
      e.   None of the above.

18. I toss a penny and observe whether it lands heads up or tails up. Suppose the penny is not fair, i.e., the probability of heads is 1/3 and the probability of tails is 2/3. This means that

    a.   every occurrence of a head must be balanced by two tails in the next two or three tosses.
    b.   if I flip the coin 10 times, it would be almost impossible to obtain 7 tails and 3 heads.
    c.   if I flip the coin many, many times the proportion of heads will be approximately 1/3, and this proportion will tend to get closer and closer to 2/3 as the number of tosses increases.
    d.   regardless of the number of flips, 1/3 will be heads and 2/3 will be tails.
    e.   all of the above.

19. When two coins are tossed, the probability of getting two tails is 0.25. This means that
    a.   of every 100 tosses, exactly 25 will have two tails.
    b.   the odds against two tails are 4 to 1.
    c.   in the long run, the average number of tails when two coins are tossed is 0.25.
    d.   in the long run two tails will occur on 25% of all tosses of two coins.
    e.   if you get two tails on each of the first five tosses of the coins, you are unlikely to get tails the fourth time.

20. A basketball player makes 160 out of 200 free throws. We would estimate the probability that the player makes his next free throw to be
    a.   0.16.
    b.   50-50; either he makes it or he doesn't.
    c.   0.80.
    d.   1.2.
    e.   80.

21. The collection of **all** possible outcomes of a random phenomenon is called
    a.   a census.
    b.   the probability.
    c.   a chance experiment
    d.   the sample space.
    e.   the distribution.

22. I roll 2 standard number cubes and record the product of the number of "pips" (dots) that land face up. What is the appropriate sample space for this?
    a. $S = \{2,3,4,5,6,7,8,9,10,11,12\}$
    b. $S = \{1,2,3,4,5,6,7,8,9,10,11,12\}$
    c. $S = \{1,2,3,4,5,6\}$
    d. $S = \{1,2,3,4,5,6,8,9,10,12,15,16,18,20,24,25,30,36\}$.
    e.   All of the above.

23. If the knowledge that an event A has occurred implies that a second event B **cannot** occur, the events A and B are said to be
    a.   independent.
    b.   disjoint.
    c.   mutually exhaustive.
    d.   the sample space.
    e.   complementary.

24. Event *A* has probability 0.4. Event *B* has probability 0.3.   If *A* and *B* are disjoint (mutually exclusive), then the probability that both events occur is
      a.   0.0.
      b.   0.1.
      c.   0.2.
      d.   0.7.
      e.   0.9.

25. Event *A* has probability 0.4. Event *B* has probability 0.5.   If *A* and *B* are independent, then the probability that both events occur is
      a.   0.0.
      b.   0.1.
      c.   0.2.
      d.   0.7.
      e.   0.9.

Questions 26-28 use the following scenario. If you draw an M&M candy at random from a bag of the candies, the candy you draw will have one of six colors. The probability of drawing each color depends on the proportion of each color among all candies made. The table below gives the probability that a randomly chosen M&M had each color before blue M & M's replaced tan in 1995.

Color	Brown	Red	Yellow	Green	Orange	Tan
Probability	0.2	0.4	?	0.1	0.1	0.1

26. The probability of drawing a yellow candy is
      a.   0.
      b.   .1.
      c.   .2.
      d.   .3.
      e.   impossible to determine from the information given.

27. The probability that you do not draw a red candy is
      a.   .2.
      b.   .6.
      c.   .7.
      d.   .8.
      e.   impossible to determine from the information given.

28. The probability that you draw either a brown or a green candy is
      a.   0.1
      b.   0.3
      c.   0.4
      d.   0.6
      e.   0.7

29. Students at University *X* must have one of four class ranks—freshman, sophomore, junior, or senior. At University *X*, 35% of the students are freshmen and 30% are sophomores. If a University *X* student is selected at random, the probability that he or she is either a junior or a senior is
    a.   30%
    b.   35%
    c.   65%
    d.   70%
    e.   89.5%

30. The card game Euchre uses a deck with 32 cards: Ace, King, Queen, Jack, 10, 9, 8, 7 of each suit (there are 4 suits). Suppose you choose one card at random from a well-shuffled Euchre deck. What is the probability that the card is a Jack, given that you know it's a face card?
    a.   1/3
    b.   1/4
    c.   1/8
    d.   1/9
    e.   1/12

The following table compares the hand dominance of 200 Canadian high-school students and what methods they prefer using to communicate with their friends.

	Cell phone/Text	In person	Online	Total
Left-handed	12	13	9	34
Right-handed	43	72	51	166
Total	55	85	60	200

Suppose one student is chosen randomly from this group of 200.

31. What is the probability that the student chosen is left-handed or prefers to communicate with friends in person?
    a.   0.065
    b.   0.17
    c.   0.425
    d.   0.53
    e.   0.595

32. If you know the person that has been randomly selected is left-handed, what is the probability that they prefer to communicate with friends in person?
    f.   0.065
    g.   0.153
    h.   0.17
    i.   0.382
    j.   0.53

Define the following terms:

33. Observational Study

34. Experiment

35. Survey

36. Sampling

37. Population vs. Sample

38. Use your calculator to find the equation of the regression line for the following data

Final Grade	AP Stats Exam Grade
90	4
87	3
77	4
90	4
95	5
81	3
97	5
86	4
83	3
87	4
89	5
89	5
94	5
88	4
87	3
83	3
84	3
93	5
74	3
94	5
65	1

a. Equation of Linear Regression: (round to 3 decimals)

   _____

b. Use the equation to predict the AP Exam score for a student who earns a 70% in AP Statistics. Show your work!

   _____

   (round to 3 decimals)

c. Use the equation to predict the final grade for a student who gets a 4 on the AP Exam. Show work.

   _____(round to 3 decimals)

Websites to refer to:

http://stattrek.com/

http://mathbits.com/MathBits/TISection/Statistics2/normaldistribution.htm

http://stattrek.com/probability/what-is-probability.aspx?Tutorial=AP

http://www.sw.wednet.edu/cms/lib7/WA01001164/Centricity/Domain/139/AP%20Stats/Notes%20for%20Experimental%20Design.pdf

Summer packets will be graded upon **correctness**. You will be able to resubmit any incorrect answers for credit. See you in September!

Mrs. Vaccaro