Math 115 - Test 2

October 16, 2014

Name key

Score _____

Show all work to receive full credit. Supply explanations where necessary.

1. (10 points) Determine whether each statement is true (T) or false (F).

   (a) F The coefficient of variation is used to measure the ~~center~~ SPREAD OR VARIATION of a data set.

   (b) F The 50th percentile is the same as the ~~3rd~~ 2ND quartile.

   (c) T All probabilities must be between 0 and 1.

   (d) T About one-quarter of a data set falls below Q_1.

   (e) F A ~~subjective~~ THEORETICAL probability is assigned by counting possible outcomes.

   (f) F An outlier is any number above Q_3 or below Q_1. THAT LIES ^ MORE THAN $1.5 \times IQR$

   (g) T In a probability experiment, an event is any subset of the sample space.

   (h) F The 2nd quartile of a data set is always equal to the ~~mean~~ MEDIAN.

   (i) F It is impossible to have a z-score of zero. Z-SCORE = 0 FOR MEAN

   (j) T If the probability of an event is close to 1, then the event is very likely.

2. (5 points) State whether each probability is theoretical, experimental, or subjective.

   (a) Sabrina didn't want to drive in the snowstorm because she thought she had a 90% chance of getting stuck in a ditch.

   SUBJECTIVE

   (b) The probability that a flipped coin will land heads up is 1/2.

   THEORETICAL

   (c) In rolling a pair of dice 50 times, a double was rolled 10 times. The probability of rolling doubles is 1/5.

   EXPERIMENTAL

   (d) After 1500 cars had driven through an intersection, there had been 37 accidents. The probability of an accident is 37/1500.

   EXPERIMENTAL

   (e) Oscar has 7 coins in his pocket, and two of them are quarters. If he grabs a coin at random, the probability that it will be a quarter is 2/7.

   THEORETICAL

3. (3 points) Without attempting to compute anything, which do you think would be greater: the coefficient of variation (CV) of adult American men's heights or the CV of their weights? Briefly explain why you think so?

THE CV IS A MEASURE OF SPREAD. SINCE ADULT MEN'S WEIGHTS HAVE GREATER VARIATION (PROBABLY MUCH GREATER) THAN ADULT MEN'S HEIGHTS, I WOULD EXPECT THE CV FOR WEIGHTS TO BE GREATER.

4. (10 points) Sammy Sosa was a major league baseball player from 1989 to 2007. His numbers of yearly regular season home runs are shown below in the order in which they occurred.

4 15 10 8 33 25 36 40 36
66 63 50 64 49 40 35 14 21

Compute the five-number summary, the interquartile range (IQR), and the cutoff values for outliers. Then sketch the boxplot on graph paper.

LOWER HALF | UPPER HALF

4, 8, 10, 14, 15, 21, 25, 33, 35, 36, 36, 40, 40, 49, 50, 63, 64, 66

$Q_1 = 15$

MEDIAN = $\frac{35+36}{2} = 35.5$

$Q_3 = 49$

FIVE-NUMBER SUMMARY:

MIN = 4, $Q_1 = 15$, MEDIAN = 35.5, $Q_3 = 49$, MAX = 66

$IQR = Q_3 - Q_1 = 49 - 15 = 34$

CUTOFFS:

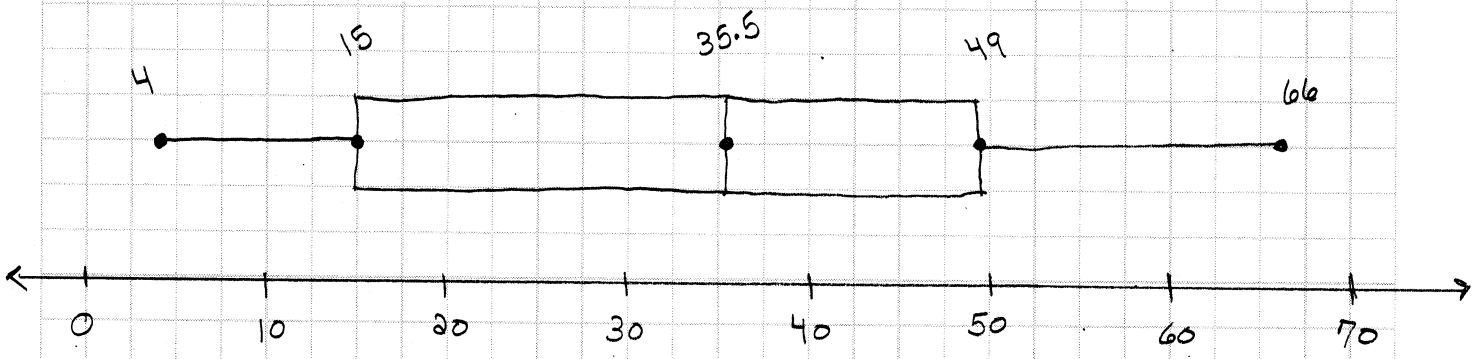
$Q_1 - 1.5 \times IQR = 15 - (1.5)(34) = -36$

$Q_3 + 1.5 \times IQR = 49 + (1.5)(34) = 100$

BOXPLOT IS ON ATTACHED SHEET.

#4

Sammy Sosa's Home Runs



5. (3 points) For Yellowstone's Old Faithful geyser, the mean time between eruptions is 1.55 hr with a standard deviation of 0.11 hr. For Yellowstone's Lone Star geyser, the mean is 3.00 hr with a standard deviation of 0.16 hr. Compute the coefficient of variation (CV) for each geyser. Which geyser's eruption cycle has more variation?

OF:

$CV = \frac{0.11}{1.55} \approx 7.1\%$

LS:

$CV = \frac{0.16}{3.00} \approx 5.3\%$

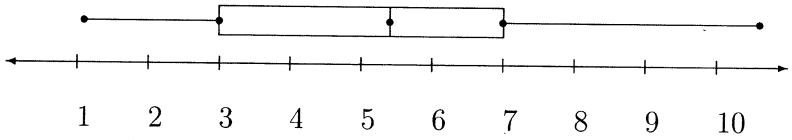
THERE IS MORE VARIATION IN OLD FAITHFUL'S CYCLE.

6. (3 points) A test has mean score 73.4 and standard deviation 4.9. Sally scored 75 on the test, and Jake scored 72. Without actually computing their z-scores, state whose z-score is greater. Explain why you think so.

SALLY'S SCORE IS GREATER THAN THE MEAN. HER Z-SCORE WILL BE POSITIVE. JAKE SCORED BELOW THE MEAN. HIS Z-SCORE IS NEGATIVE.

$\Rightarrow$ SALLY'S Z-SCORE IS GREATER.

7. (3 points) The boxplot shown below describes a certain collection of data. Find approximate values for the five-number summary and the interquartile range (IQR).



$MIN \approx 1$, $Q_1 \approx 3$, MEDIAN ≈ 5.3,

$Q_3 \approx 7$, MAX ≈ 10.7

$IQR \approx 7 - 3 = 4$

8. (6 points) Believe it or not, *zenzizenizenic* is an actual word. Suppose a letter is selected at random from this word.

(a) Give a possible sample space for this experiment.

$\{z, e, n, i, c\}$

(b) Are the outcomes in your sample space equally likely? Explain.

No, there are not the same numbers of letters. See Part (c)

(c) Find the probability of each outcome in your sample space.

$P(\{z\}) = \frac{4}{14}$

$P(\{e\}) = \frac{3}{14}$

$P(\{n\}) = \frac{3}{14}$

$P(\{i\}) = \frac{3}{14}$

$P(\{c\}) = \frac{1}{14}$

(d) Are the probabilities that you gave above above theoretical, experimental, or subjective?

Theoretical - computed by counting letters

9. (4 points) The data below show the maximum daily air temperatures (in °F) measured at the DeKalb, IL weather station in January 2014.

19.2	1.5	18.8	30.3	20.7	-6.9	2.2	8.5	25.4	37.2	36.4
38.7	38.9	34.4	19.7	34.0	15.6	19.3	41.1	35.0	10.5	14.5
4.4	27.9	33.0	30.1	1.5	3.5	21.5	30.8	17.1		

(a) Arrange the temperatures in order from least to greatest.

-6.9, 1.5, 1.5, 2.2, 3.5, 4.4, 8.5, 10.5, 14.5, 15.6, 17.1, 18.8, 19.2, 19.3, 19.7, 20.7, 21.5, 25.4, 27.9, 30.1, 30.3, 30.8, 33.0, 34.0, 34.4, 35.0, 36.4, 37.2, 38.7, 38.9, 41.1

(b) Find the percentile for 35°F.

$$\frac{\#\text{ OF VALUES} < 35}{31} \times 100\% = \frac{25}{31} \times 100\% \approx 81\%$$

81ST PERCENTILE

(c) What temperature is at the 50th percentile?

MEDIAN = 16TH VALUE = **20.7°**

10. (3 points) In January 2014, the mean maximum daily temperature was 21.8°F with a standard deviation of 12.8°F. Compute the z-score for −6.9°F. Do you think that −6.9°F was an unusually low temperature? Explain.

$$\frac{-6.9 - 21.8}{12.8} = \frac{-28.7}{12.8} \approx -2.24$$

-6.9 IS MORE THAN 2 STD. DEVIATIONS BELOW THE MEAN. IT IS AN UNUSUALLY LOW TEMP!