

Math 153 - Test 2a
March 10, 2016

Name key
Score _____

Show all work. Supply explanations where necessary. Unless otherwise indicated, you may use your calculator for all statistical computations.

1. (5 points) The standard deviation is sometimes well-approximated by the range divided by four. Compute and compare the sample standard deviation and the range divided by four.

0.38, 0.55, 1.54, 1.55, 0.50, 0.60, 0.92, 0.96, 1.00, 0.86, 1.46

From calculator:

$$s \approx 0.4229$$

$$\text{Range} = 1.55 - 0.38 = 1.17$$

$$\frac{\text{Range}}{4} = 0.2925$$

They are somewhat close, but I wouldn't call

2. (5 points) The five-number summary for a data set is:

min = 13.4, $Q_1 = 32.5$, Med = 48.7, $Q_3 = 54.0$, max = 83.8.

$s \approx \text{Range}/4$ A great approximation.

Find the cutoff values for outliers. Does the data set have any outliers?

$$\text{IQR} = 54 - 32.5 = 21.5$$

$$Q_1 - 1.5 \times \text{IQR} = 0.25$$

$$Q_3 + 1.5 \times \text{IQR} = 86.25$$

} The min & max values are between these \Rightarrow
No outliers.

3. (5 points) Listed below are the lengths of time (in years) it took for a random sample of college students to earn bachelor's degrees. Based on these results, is it unusual for someone to earn a bachelor's degree in 12 years?

4 4 4 4 4 4 4.5 4.5 4.5 4.5
4.5 4.5 6 6 8 9 9 13 13 15

From calculator:

$$s \approx 3.5056$$

$$\bar{x} = 6.5$$

$$\begin{aligned} \bar{x} + 2s &\approx 6.5 + 2(3.5056) \\ &= 13.5112 \text{ years} \end{aligned}$$

It is not unusual to
take 12 years.

4. (14 points) The numbers below show the weights, in pounds, of 15-day-old piglets that are being raised on different brands of food.

Feed A: 5.8, 7.2, 8.4, 9.8, 9.8, 9.9, 10.0, 11.5, 11.6, 12.2, 12.3, 12.3, 13.1, 13.3

Feed B: 5.8, 6.2, 6.8, 7.5, 7.9, 8.5, 9.2, 9.5, 10.1, 11.3, 11.7, 13.3

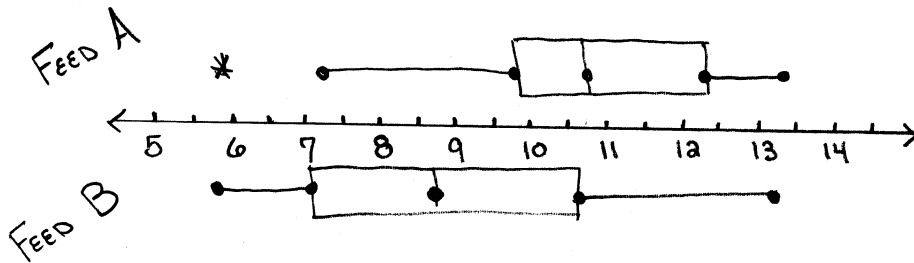
Compute the five-number summary and outlier cutoffs for each data set. Then ~~using~~ ^{using} one number line, sketch the modified boxplot for each data set (two boxplots in all).

FEED A
 $M_{IN} = 5.8$
 $Q_1 = 9.8$
 $MED = 10.75$
 $Q_3 = 12.3$
 $MAX = 13.3$

$IQR = 2.5$
 $Q_1 - 1.5 \times IQR = 6.05$
 $Q_3 + 1.5 \times IQR = 16.05$
 $* 5.8 \text{ IS AN OUTLIER.}$

FEED B
 $M_{IN} = 5.8$
 $Q_1 = 7.15$
 $MED = 8.85$
 $Q_3 = 10.7$
 $MAX = 13.3$

$IQR = 3.55$
 $Q_1 - 1.5 \times IQR = 1.825$
 $Q_3 + 1.5 \times IQR = 16.025$
 No outliers.



5. (5 points) Refer to Feed A in the problem above.

(a) What value is at the 60th percentile?

$$\frac{L}{14} = 0.60 \Rightarrow L = 8.4 \Rightarrow$$

THE 9TH VALUE IS AT THE 60TH PERCENTILE.

11.6

(b) At what percentile is the value 9.8?

$$\frac{3}{14} \approx 0.214 \Rightarrow \text{21ST PERCENTILE}$$

6. (6 points) Over a 30-year period, the annual precipitation in Atlanta had a mean of 49.8 in and with a standard deviation of 7.6 in. Over the same period, the mean annual temperature was 62.2° F with a standard deviation of 1.3° F.

(a) Compute the CV's and determine whether precipitation or temperature has greater relative spread.

Precip:

$$CV = \frac{7.6}{49.8} \approx 15.26\%$$

Temp:

$$CV = \frac{1.3}{62.2} \approx 2.09\%$$

Temp HAS SMALLER RELATIVE SPREAD.

- (b) In this problem, would it have made sense to simply compare the standard deviations or were CV's required?

SINCE DIFFERENT TYPES OF QUANTITIES ARE BEING COMPARED, CV'S ARE PROBABLY BEST. HOWEVER, SINCE THE MEANS ARE SOMEWHAT CLOSE, A SIMPLE COMPARISON OF STD. DEV'S MAY BE OKAY.

7. (6 points) A National Center for Health Statistics study states that the mean height for adult men in the United States is 69.4 in, with a standard deviation of 3.1 in. The mean height for adult women is 63.8 in, with a standard deviation of 2.8 in. Who is relatively taller, a 73-in-tall man or a 68-in-tall woman? (Compute the corresponding z-scores.)

MAN:

$$Z = \frac{73 - 69.4}{3.1} \approx 1.16$$

WOMAN:

$$Z = \frac{68 - 63.8}{2.8} = 1.5$$

THE WOMAN IS RELATIVELY TALLER.

8. (4 points) Kevin's personal experience suggests that the odds in favor of the copy machine jamming are 1 to 7. What are the odds against a jam? What is the probability of a jam?

$$\frac{7}{1}$$

$$\frac{1}{8}$$

9. (2 points) The sample space for a probability experiment is $\{R, W, B, Y\}$. Must it be true that $P(\{Y\}) = 1/4$? Explain.

NO, THE ONLY THING THAT IS FOR SURE

IS THAT $P(\{R\}) + P(\{W\}) + P(\{B\})$

$+ P(\{Y\}) = 1$. THE OUTCOMES

ARE NOT NECESSARILY EQUALLY LIKELY.

10. (8 points) A jar contains 5 green marbles, 8 blue marbles, and 9 red marbles. A marble is selected at random.

(a) What is the sample space for this probability experiment?

$$\{G, B, R\}$$

(b) What is the probability of each outcome in your sample space?

$$P(\{G\}) = \frac{5}{22}, \quad P(\{B\}) = \frac{8}{22},$$

$$P(\{R\}) = \frac{9}{22}$$

(c) Are your probabilities in part (b) experimental, theoretical, or subjective?

THEORETICAL

(d) If A is the event of drawing a blue marble, then what is \bar{A} ? What is the probability of \bar{A} ?

$$\bar{A} = \{G, R\}$$

$$P(\bar{A}) = \frac{5}{22} + \frac{9}{22} = 1 - \frac{8}{22} = \boxed{\frac{14}{22}}$$

11. (2 points) When Sabrina asked to use the family car, her mother said, "No way! With all this snow and ice, there is a 95% chance you'll have an accident." What type of probability (theoretical, experimental, subjective, or geometric) did Sabrina's mother compute?

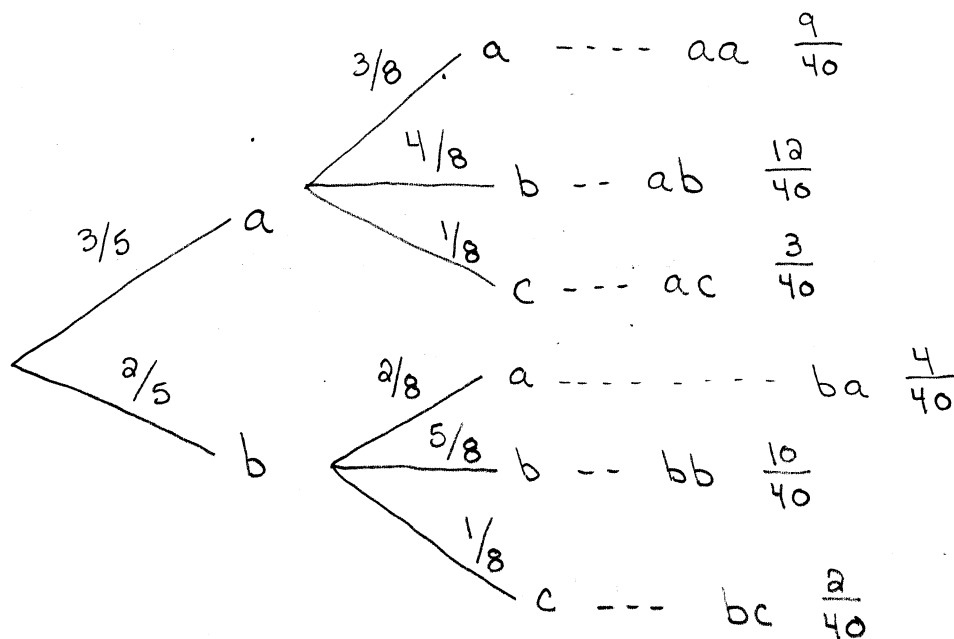
SUBJECTIVE

12. (10 points) A letter is selected at random from the first box and placed into the second box. Then a letter is selected at random from the second box.

a	a	a	b	b
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a	a	b	b	b	b	c
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- (a) Sketch the complete tree diagram for this experiment. Include the probabilities of each path.



- (b) What is the probability of selecting the letter b from the 2nd box?

$\{ab, bb\}$

$$\frac{12}{40} + \frac{10}{40} = \boxed{\frac{22}{40}}$$

- (c) What is the probability of selecting two different letters?

$\{ab, ac, ba, bc\}$

$$\frac{12}{40} + \frac{3}{40} + \frac{4}{40} + \frac{2}{40} = \boxed{\frac{21}{40}}$$

13. (8 points) Suppose A and B are events such that $P(A) = 0.52$, $P(\bar{B}) = 0.36$, and $P(A \cup B) = 0.68$.

(a) Compute $P(B)$.

$$1 - 0.36 = \boxed{0.64}$$

(b) Compute $P(A \cap B)$.

$$\begin{aligned} P(A \cap B) &= P(A) + P(B) - P(A \cup B) \\ &= 0.52 + 0.64 - 0.68 = \boxed{0.48} \end{aligned}$$

(c) Compute $P(\bar{A})$.

$$1 - 0.52 = \boxed{0.48}$$

(d) What are the odds in favor of A ?

$$\frac{0.52}{0.48} = \frac{52}{48} = \boxed{\frac{13}{12}}$$

14. (5 points) Four letters are selected at random **without replacement** from the word *MELLIFLUOUS*. What is the probability of spelling *LIFE* (in order)?

$$\frac{3}{11} \text{ L } \frac{1}{10} \text{ I } \frac{1}{9} \text{ F } \frac{1}{8} \text{ E}$$

$$\text{Prob is } \boxed{\frac{3}{7920}}$$

Math 153 - Test 2b

March 17, 2016

Name key

Score _____

Show all work. Supply explanations where necessary.

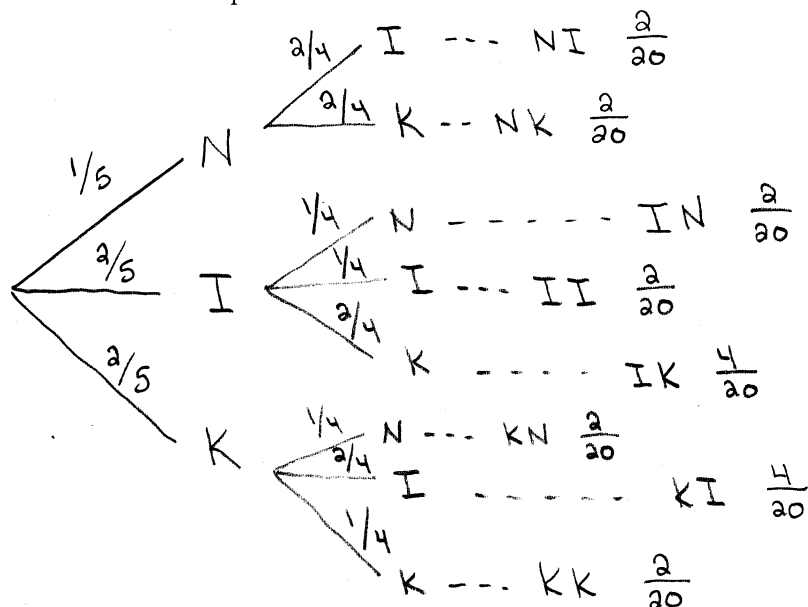
1. (2 points) A single six-sided die is rolled. What is the probability of rolling a 6 given that the roll is an even number?

$$\text{RESTRICTED SAMPLE SPACE} = \{2, 4, 6\}$$

$$\text{Prob of } 6 = \boxed{\frac{1}{3}}$$

2. (7 points) Two letters are selected at random (without replacement) from the word *NIKKI*.

- (a) Sketch the complete tree diagram for this experiment. Include the probabilities of each path.



- (b) What is the probability that the 1st letter is *N* given that the 2nd letter is *K*?

$$\text{Prob}(\text{1st letter } N \mid \text{2nd letter } K)$$

$$= \frac{\text{Prob}(\text{1st letter } N \text{ -AND- 2nd letter } K)}{\text{Prob}(\text{2nd letter } K)}$$

1

$$= \frac{2/20}{2/20 + 4/20 + 2/20} = \boxed{\frac{2}{8}}$$

3. (6 points) Some adults are selected at random and asked whether they are right or left handed. The results are shown below.

	Female	Male
Right handed	44	43
Left handed	4	9

$$44 + 43 + 4 + 9 = 100$$

A person from the sample is selected at random.

- (a) What is the probability that the person is a female?

$$\frac{44 + 4}{100} = \frac{48}{100} = \boxed{48\%}$$

- (b) What is the probability that the person is a left-handed female?

$$\frac{4}{100} = \boxed{4\%}$$

- (c) What is the probability that the person is a female given that the person is left handed?

$$\frac{4}{4 + 9} = \frac{4}{13} \approx \boxed{30.77\%}$$

- (d) Are the events of selecting a female and selecting a left-handed person independent. Use some of your results from above to support your answer.

No, BECAUSE $(c) \neq (a)$