

Math 206 - Test 2

March 16, 2011

Name key

Score _____

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

1. (4 points) A bucket contains 1 quarter, 2 dimes, 3 nickels, and 4 pennies. A coin is selected at random.

- (a) What are the odds in favor of selecting a dime?

2 DIMES / 10 COINS

PROB OF DIME IS $\frac{2}{10} = \frac{1}{5}$

ODDS IN FAVOR = $\frac{1}{4}$

- (b) What is the expected value of the game?

$$E = 25\left(\frac{1}{10}\right) + 10\left(\frac{2}{10}\right) + 5\left(\frac{3}{10}\right) + 1\left(\frac{4}{10}\right) = \frac{64}{10}$$

= 6.4¢

- (c) If this game is to be fair, what should it cost to play? Explain.

A GAME IS FAIR IF THE COST TO PLAY IS
EQUAL TO THE EXPECTED VALUE.

THIS GAME SHOULD COST 6.4¢.

2. (2 points) Describe a situation in which the most appropriate way to display data would be a bar graph.

A BAR GRAPH WOULD BE APPROPRIATE TO
SHOW THE SIZES OF THE 5 BIGGEST
STATES.

3. Consider the following collection of test scores.

9, 72, 66, 83, 90, 78, 86, 85, 93, 78

(a) (3 points) Find the median, the quartiles (Q1 and Q3), and the interquartile range.

9, 66, 72, 78, 78, 83, 85, 86, 90, 93

$$\text{MEDIAN} = \frac{78+83}{2} = 80.5$$

$$Q_1 = 72$$

$$Q_3 = 86$$

$$\text{IQR} = 86 - 72 = 14$$

(b) (2 points) Compute the cutoff scores for outliers and identify all outliers.

$$1.5 \times \text{IQR} = 1.5 \times 14 = 21$$

ABOVE 107 OR BELOW 51
THE ONLY OUTLIER IS 9.

$$Q_3 + 21 = 107, \quad Q_1 - 21 = 51$$

(c) (2 points) On the attached graph paper, construct the box plot using asterisks to denote outliers.

SEE ATTACHED

(d) (1 point) Find the mode of the scores.

$$\text{MODE IS } 78$$

(e) (1 point) Find the mean of the scores.

SUM OF SCORES IS 740

$$\bar{x} = \frac{740}{10} = 74$$

(f) (1 point) Of the three measures of center computed above, which is least appropriate and why?

THE MEAN IS PROBABLY LEAST APPROPRIATE

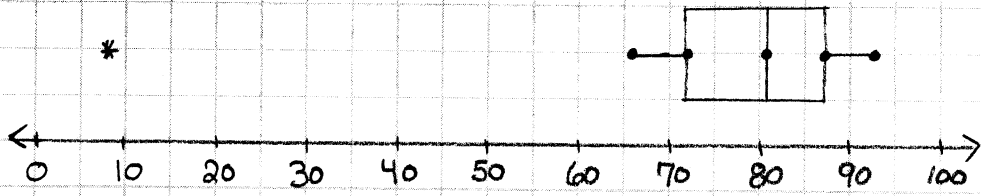
BECAUSE IT WAS PULLED DOWN BY THE 9.

ALSO, 74 DOES NOT SEEM REPRESENTATIVE OF THE "MIDDLE" OF THE SCORES.

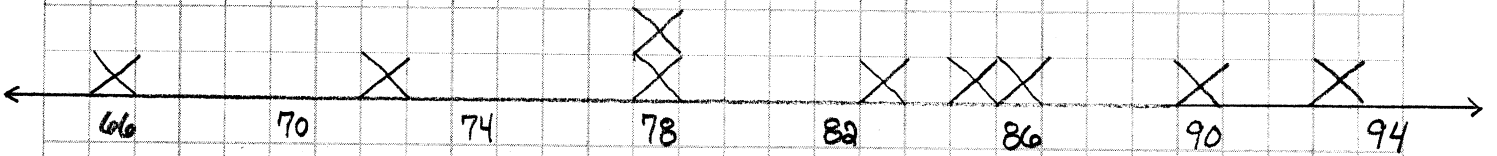
(g) (1 point) What is the range?

$$\text{RANGE} = 93 - 9 = 84.$$

Box plot for 3(a)



Line plot for 3(j)



- (h) (1 point) Continuing with the same data set, use your calculator to compute the standard deviation.

$$\sigma = 22.996$$

- (i) (1 point) Throw out the 9 and sketch the stem-and-leaf plot for the data.

6	6
7	2 8 8
8	3 5 6
9	0 3

- (j) (1 point) Throw out the 9 and sketch the line plot for the data. (Do this on the attached graph paper.)

SEE ATTACHED

- (k) (1 point) Explain why a line graph would not be appropriate to display the scores.

THE DATA SET CONSISTS OF SINGLE NUMBERS NOT ORDERED PAIRS. A LINE GRAPH IS APPROPRIATE FOR GRAPHING ORDERED PAIRS.

- (l) (1 point) Using the mean and standard deviation you computed above, compute the z-score corresponding to a score of 82.

$$z = \frac{82 - 74}{22.996} \approx 0.348$$

- (m) (2 points) Five new scores with a mean of 86.4 were added to the collection of test scores. What is the mean of the entire collection of scores?

$$\bar{X} = \frac{10(74) + 5(86.4)}{15} \approx 78.133$$

4. (3 points) The odds against the event A are 17 to 5. What are the odds in favor of A . What is the probability of A ?

ODDS AGAINST ARE $\frac{17}{5}$

\Rightarrow

ODDS IN FAVOR ARE $\frac{5}{17}$

& PROBABILITY IS $\frac{5}{22}$.

5. (5 points) Design a simulation that could be used to estimate the solution of the following problem.

A person is selected at random and asked his/her birth month. On average how many people must be selected until you have encountered two people with the same birth month?

Perform several trials of your simulation and use your data to estimate the solution.

Roll a 12-sided die to simulate asking for a

BIRTH MONTH: 1 = JAN, 2 = FEB, ..., 12 = DEC.

Roll the die until a number is repeated.

When a number is repeated, one trial is complete.

Count how many rolls were needed. Repeat many

times and take the average of your counts per

trial.

TRIAL #1

6
2
12
10
7
2

6

TRIAL #2

10
10

2

TRIAL #3

11
9
11

3

4

TRIAL #4

6
2
6

3

TRIAL #5

8
5
4
5

4

ON AVERAGE, $\frac{6+2+3+3+4}{5} = 3.6$

6. (3 points) When playing the Badgers, the Wombats always win. The following table shows the number of points that the Wombats may win by and their associated probabilities. How many points should the Wombats expect to win by?

Points	Probability
1	43%
2	16%
3	9%
4	23%
5	4%
6	5%

$$1(0.43) + 2(0.16) + 3(0.09) + 4(0.23) + 5(0.04) + 6(0.05) = 2.44$$

They should expect to win by
2.44 points

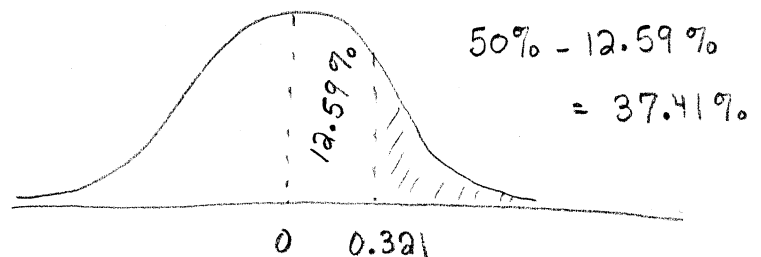
7. (3 points) Speaking of wombats, adult male wombats in Narawntapu National Park have a mean weight of 35.6 kg with a standard deviation of 2.8 kg. If the park is home to 254 adult male wombats, about how many weigh more than 36.5 kg?

$$Z = \frac{36.5 - 35.6}{2.8} = 0.321$$

Look up 0.321

To get

12.59%



37.41% of 254

≈ 95

About 95 weigh more than 36.5 kg

8. (6 points) Two fair six-sided dice are rolled.

(a) Using ordered pairs for the outcomes, list all possible outcomes. (There are 36 possibilities).

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

(b) What is the probability of rolling a two on at least one die?

$$P(T) = \frac{11}{36}$$

← Row 2 AND Column 2
HAVE 11 ELEMENTS

(c) What is the probability of rolling an even sum?

$$P(E) = \frac{18}{36}$$

← HALF ARE EVEN SUMS
HALF ARE ODD SUMS

(d) What is the probability of rolling a two on at least one die given that you roll an even sum?

$$P(T|E) = \frac{\# \text{ OF EVEN SUMS WITH A 2}}{\# \text{ OF EVEN SUMS}} = \frac{5}{18}$$

(e) Are the events of rolling a two and rolling an even sum independent?

No, THEY ARE NOT INDEPENDENT.

$$P(T) \neq P(T|E)$$

$$\frac{11}{36} \neq \frac{5}{18}$$

9. (3 points) Stanley Smythe claims that his 40 ft by 60 ft house is often bombarded by falling meteors. (His neighbors and his insurance agent think he's crazy.)

(a) What is the probability that a 6 ft by 6 ft sun window will be broken by a meteor destined to hit his roof?

$$\text{AREA OF WINDOW} = 6 \times 6 = 36 \text{ FT}^2$$

$$\text{AREA OF ROOF} = 40 \times 60 = 2400 \text{ FT}^2$$

$$\text{PROB IS } \frac{36}{2400} = 1.5\%$$

(b) Stanley thinks he'll be safer if he installs four separate 3 ft by 3 ft sun windows. What do you think?

No, 4 windows measuring 9 FT² EACH

STILL MAKES FOR 36 FT² OF WINDOW.

$$\text{PROB IS STILL } \frac{36}{2400} = 1.5\%$$

10. (3 points) Jason takes home \$4000 per month. His earnings are budgeted as follows: \$1000 mortgage, \$200 insurance, \$600 food, \$200 auto gas & maintenance, \$600 utilities, \$300 loan payment, \$450 savings, and the rest is reserved for miscellaneous expenses.

(a) Explain why a circle graph is particularly appropriate for displaying this data.

CIRCLE GRAPH ARE BEST SUITED TO

ILLUSTRATE PORTIONS OF A WHOLE. IN THIS

CASE, THE AMOUNTS ARE PORTIONS OF HIS TOTAL PAY.

(b) Recall that there are 360 degrees in a circle. Suppose you constructed the circle graph corresponding to the data above. What should be the degree measure of the angle in the portion associated with insurance?

$$\frac{200}{4000} = \frac{x}{360} \Rightarrow \boxed{x = 18^\circ}$$