Math 206 - Test 2
March 19, 2014

Name key

Score _____

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

1. (3 points) The residents of Newtown all have fairly new cars. The table shown below gives the probabilities associated with certain ages of cars.

Age of car	Probability
0	0.12
1	0.17
2	0.41
3	0.13
4	0.07
5	0.03
6	0.07

What is the average age (i.e. expected age) of cars in Newtown?

$$E = 0(0.12) + 1(0.17) + 2(0.41) + 3(0.13)$$
$$+ 4(0.07) + 5(0.03) + 6(0.07)$$
$$= \boxed{2.23 \text{ years}}$$

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

IF THE ROLL IS EVEN, IT IS ONE OF $\{2,4,6\}$

THE PROB OF ROLLING 6 IS $\boxed{\frac{1}{3}}$

- OR -

A = EVENT OF ROLLING 6

B = EVENT OF ROLLING EVEN

$P(A \cap B) = \frac{1}{6}$

$P(B) = \frac{3}{6}$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{1/6}{3/6} = \boxed{\frac{1}{3}}$$

3. (6 points) In the following stem-and-leaf plot, 4 | 5 means 45.

3	1 4
4	1 2 5
5	0 0 2 6 7 8
6	3 8 8
7	0

(a) Compute the mean, median, and mode(s).

$\bar{X}$ = MEAN = $\boxed{52.\overline{3}}$ (CALCULATOR)

MEDIAN = $\boxed{52}$ (CALCULATOR)

MODES ARE $\boxed{50 \text{ \& } 68.}$

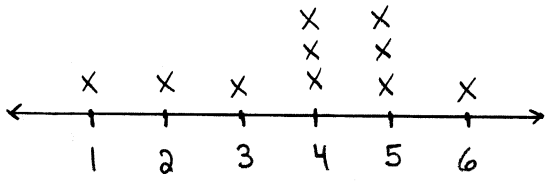
(b) Compute the range.

$70 - 31 = \boxed{39}$

(c) Find the standard deviation. (Use your calculator!)

$S = 11.76$ (CALCULATOR)

4. (2 points) Suppose you are given a weighted die for which it is a bit more likely to obtain a 4 or a 5 than each of the other numbers. Pretend you rolled the die 10 times. Construct a possible dot plot showing the outcomes.



5. (3 points) Some teens and adults were asked how much cash they were carrying. 15 teens were carrying a mean amount of \$9.75, and 25 adults were carrying a mean amount of \$28.15. What was the mean amount carried by all 40 people?

$$\text{MEAN} = \frac{15 \times 9.75 + 25 \times 28.15}{40} = \frac{850}{40} = 21.25$$

\$21.25

6. (4 points) For each of the following situations, tell which type of graph would best display the data. Choose from *dot plot*, *bar graph*, *line graph*, *scatterplot*, *pie chart*, or *stem-and-leaf plot*. You may get partial credit if you offer brief explanations.

   (a) A couple wants to sketch a graph showing how they budget their monthly earnings. They'd like to show how their money is divided among 7 different categories.

   PIE CHART

   (b) A teacher graded 25 tests, and they all had scores that were whole numbers between 17 and 55. She wants to display the entire set of scores.

   STEM-AND-LEAF PLOT

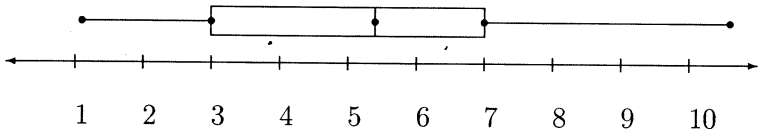
   (c) Among other things, Pike's dairy sells ice cream, milk, butter, and cheese. A manager would like to show a graph displaying sales of these products.

   BAR GRAPH

   (d) Oscar randomly selected 100 women. For each woman, he recorded her age and the number of minutes each day that she read. He formed ordered pairs and plotted the data.

   SCATTERPLOT

7. (5 points) The boxplot shown below describes a certain collection of data. Find approximate values for the median, first and third quartiles, and the interquartile range. Based on your approximations, what would be the cutoff values for outliers?



MEDIAN ≈ 5.3

$Q_1 \approx 3$

$Q_3 \approx 7$

$IQR \approx 7-3 = 4$

$Q_1 - 1.5 \times IQR$

$= 3 - 1.5(4) = -3$

$Q_3 + 1.5 \times IQR$

$= 7 + 1.5(4) = 13$

OUTLIERS WOULD BE DATA VALUES LESS THAN -3 OR GREATER THAN 13.

8. (4 points) A card is selected at random from a standard deck of playing cards. Let A be the event of drawing an even numbered card, and let B be the event of drawing a red ten. Compute $P(A|B)$ and $P(B|A)$.

$P(A|B)$ = PROB OF EVEN # CARD GIVEN IT'S A RED TEN = $\boxed{1}$ (TENS ARE EVEN!)

$P(B|A)$ = PROB OF RED TEN GIVEN IT'S EVEN

$= \boxed{\frac{2}{20}}$ ← # OF RED TENS ← # OF EVEN # CARDS

9. (3 points) Suppose you design the following fund-raising game: Roll a die. Win \$20 for rolling a 6 or win \$10 for rolling a 2. There are no other payouts.
If you wish to raise a dollar per play, on average, what should you charge to play the game?

$$E = 20\left(\tfrac{1}{6}\right) + 10\left(\tfrac{1}{6}\right) = \frac{30}{6} = 5$$

$5 + 1 = 6$

CHARGE \$6 PER PLAY.

10. (9 points) The data below show the numbers of medals won by different countries in the 2004 Summer Olympics.

LOWER HALF | UPPER HALF

12, 12, 15, 16, 17, 19, 19, 22, 23, 27, 30, 30, 32, 33, 37, 48, 49, 63, 92, 103

(a) Determine the three quartiles.

$Q_1 = \frac{17+19}{2} = \boxed{18}$

$Q_3 = \frac{37+48}{2} = \boxed{42.5}$

$\text{MED} = Q_2 = \frac{27+30}{2} = \boxed{28.5}$

(b) Determine the interquartile range.

$IQR = Q_3 - Q_1 = 42.5 - 18 = \boxed{24.5}$

(c) Determine the cut-off values for any outliers.

$1.5 \times IQR = 36.75$

$Q_1 - 36.75 = -18.75$

$Q_3 + 36.75 = 79.25$

OUTLIERS ARE DATA VALUES LESS THAN -18.75 OR GREATER THAN 79.25.

(d) Identify the outliers (if any).

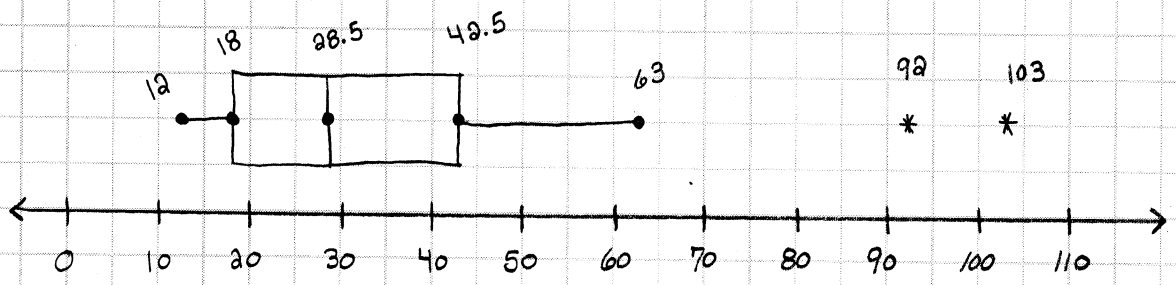
92 AND 103 ARE OUTLIERS

(e) On the attached graph paper, construct the boxplot (with outliers).

SEE ATTACHED SHEET.

11. (2 points) Describe a situation in which it would be best to display data in a line graph.

LINE GRAPHS ARE BEST FOR SHOWING TRENDS IN TIME. FOR EXAMPLE, A LINE GRAPH WOULD BE GREAT TO SHOW GAS PRICES VS. TIME.



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12. (5 points) Design a simulation that could be used to estimate the solution of the following problem.

> The probability of encountering a Brown Barbaloot on a walk through Sherwood forest is 0.42. On average how many Brown Barbaloots will you see on 5 walks?

Perform ten trials of your simulation. Then use your data to estimate the solution.

USE A RANDOM DIGIT TABLE AND SELECT A TWO-DIGIT BLOCK TO REPRESENT A WALK THROUGH THE FOREST. IF you SELECT 00-41 (PROB 0.42), you HAVE SEEN A BARBALOOT. IF you SELECT 42-99 (PROB 0.58), you DID NOT SEE A BARBALOOT. ONE TRIAL IS 5 WALKS, i.e. 5 TWO-DIGIT BLOCKS. DO TEN TRIALS INSTEAD OF A RANDOM DIGIT TABLE, I USED THE RESEARCH RANDOMIZER. RESULTS ARE ATTACHED.

TRIAL 1 - 3 BARBALOOTS
TRIAL 2 - 0 BARBALOOTS
TRIAL 3 - 4 BARBALOOTS
TRIAL 4 - 3 BARBALOOTS
TRIAL 5 - 2 BARBALOOTS
TRIAL 6 - 0 BARBALOOTS
TRIAL 7 - 2 BARBALOOTS
TRIAL 8 - 4 BARBALOOTS
TRIAL 9 - 4 BARBALOOTS
TRIAL 10 - 2 BARBALOOTS

$\frac{24 \text{ BARBS}}{10 \text{ TRIALS}} = 2.4 \text{ BARBS PER 5 WALKS}$

13. (2 points) Joe wanted to simulate rolling a die by flipping a coin. What advice would you have for Joe?

IT'S PROBABLY NOT A GOOD IDEA TO SIMULATE ROLLING A DIE BY FLIPPING A COIN. EACH OUTCOME ON A DIE HAS PROBABILITY $\frac{1}{6}$ WHEREAS EACH OUTCOME ON A COIN HAS PROBABILITY $\frac{1}{2}$. IT WOULD BE DIFFICULT (IMPOSSIBLE) TO DESIGN A COIN FLIPPING SIMULATION WITH PROBABILITIES EQUAL TO THOSE OF DIE ROLLING. OF COURSE, WHEN ROLLING A DIE, CERTAIN EVENTS HAVE PROB $\frac{1}{2}$ (e.g. $\{2,4,6\}$, $\{1,2,3\}$, etc.). THESE WOULD BE EASY TO SIMULATE.

RESEARCH RANDOMIZER

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Research Randomizer Results

10 Sets of 10 Non-unique Numbers Per Set
Range: From 0 to 9 -- Unsorted

Job Status: **Finished**

Set #1:

1, 2, 1, 3, 5, 4, 9, 0, 0, 2

Set #2:

6, 5, 7, 5, 7, 5, 9, 0, 6, 2

Set #3:

2, 6, 1, 9, 7, 0, 0, 8, 4, 1

Set #4:

4, 1, 2, 1, 8, 5, 9, 9, 1, 8

Set #5:

6, 0, 2, 3, 8, 8, 6, 5, 2, 0

Set #6:

4, 3, 6, 0, 7, 3, 4, 6, 7, 1

Set #7:

5, 7, 1, 6, 5, 4, 7, 5, 0, 2

Set #8:

4, 6, 1, 5, 0, 3, 3, 8, 0, 9

Set #9:

4, 9, 0, 5, 1, 8, 1, 8, 2, 5

Set #10:

1, 0, 7, 1, 9, 7, 3, 4, 6, 1
