Math 310 Spring 2009Test #1 Statistics & Probability ANSWERS Version B

SHOW WORK *as if making a solutions guide for students*. Use backs of paper for scratch.

Hope you Didn't forget *titles, labels, scales, & legends!*

#1-3 On 10 days, Feb 1– 10, Marty's kitten ate the following amounts (in grams).

31 31 28 15 23 18 22 35 37 51

(6) 1. Classify the data in an ordered stem-and-leaf diagram.

Amounts, in grams, eaten daily by Marty's Kitten on the first 10 days of February

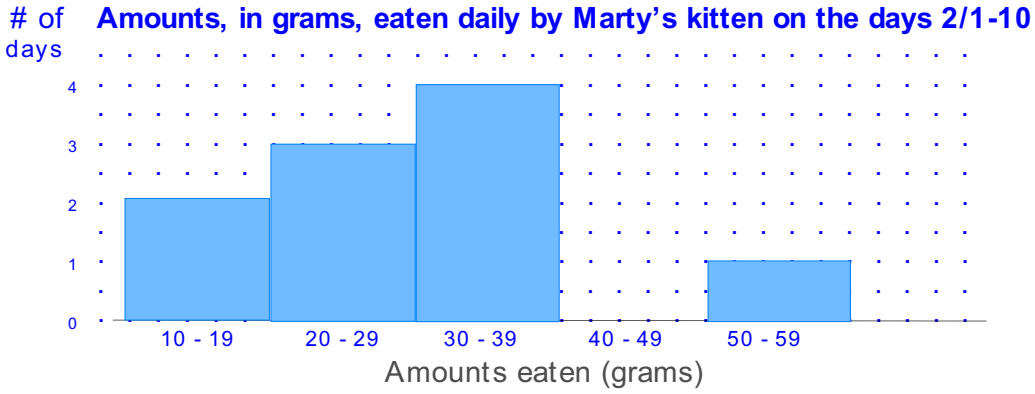
1	5 8
2	2 3 8
3	1 1 5 7
4	
5	1

Legend:

1 | 5 8

Shows the kitten ate 15g & 18g on two of the days

2. Draw a histogram using classes which correspond to those in problem (1).



(10) 3. For the data in problem 1, **find** the quartile marks, and present a **box and whiskers** plot.

Q_1 = 22

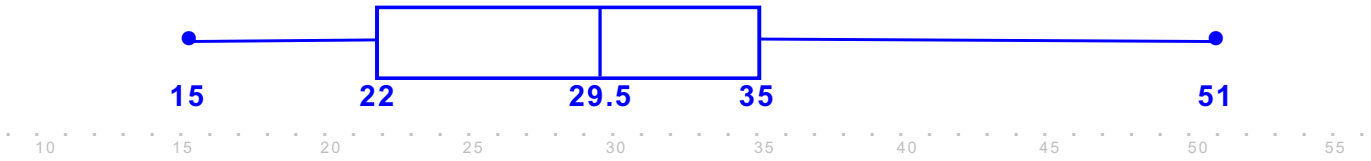
Q_2 = 29.5

Q_3 = 35

Ordered data: 15 18 22 23 28 31 31 35 37 51

Quartile marks divide the data into four equal parts (numbers of data)

Amounts, in grams, eaten daily by Marty's kitten on the days 2/1-2/10



(12) 4. Showing your work, for the six quiz scores in the frequency table at right:
a. calculate the **mean**. b. calculate the **standard deviation**.

Quiz score	Number of students
10	4
8	1
6	1

4a. Mean = $\frac{\Sigma(x)}{n}$

$= \frac{4\cdot 10 + 8 + 6}{6} = \frac{54}{6} = 9$

For this data, a mean lower than 6 or higher than 10 is clearly impossible!

4b. Variance = $\frac{\Sigma(x - \text{mean})^2}{n}$

$= \frac{4\cdot(10-9)^2 + (8-9)^2 + (6-9)^2}{6} = \frac{4\cdot 1 + 1 + 9}{6} = \frac{14}{6}$

Std Dev = $\sqrt{2.333\ldots}$

(9) 5. Construct a pie chart illustrating the allocation of expenditures according to the Budget of the LAC Unified School District, for school year 2007-8 which is summarized below.

(These figures have been rounded):

Salaries (Cert & Classified):	$ 4 billion
Employee Benefits:	$ 1 billion
Instructional Supplies:	$ 0.3 billion
Miscellaneous Expenses:	$ 0.7 billion
Total	6.0 billion

In the space below, show in detail how you find the portion to allocate for Employee Benefits.

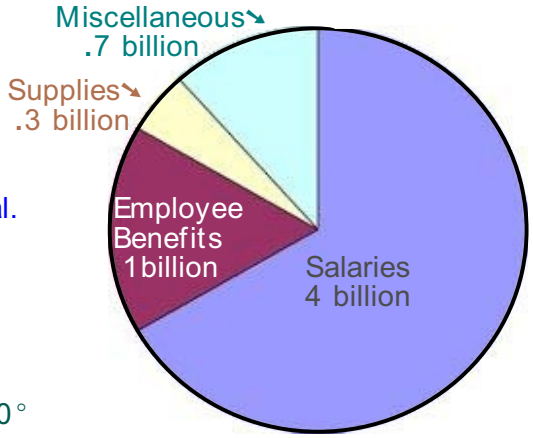
Employee Benefits have 1billion of the 6 billion total.

Since E.B. accounts for 1/6 of the total,
E.B. should appear as 1/6 of the pie chart.
Therefore the sector for E.B. should have
a central angle measuring (1/6) of 360° = 60°.

& Salaries should have central angle $4 \cdot 60° = 240°$
& Supplies has central angle $0.3 \cdot 60° = 18°$
& Miscellaneous has $0.7 \cdot 60° = 42°$

(Quick little check: $60° + 240° + 18° + 42° = 360°$)

Budget of $6 Billion in Expenditures by LAC USD for academic year 2007-2008



You can see the real details at page 54 of:
http://notebook.lausd.net/pls/ptl/docs/PAGE/CA_LAUSD/LAUSDNET/OFFICES/CFO_HOME/BSFPD_HOME/SUPERINTENDENT'S%2007-08%20ADOPTED%20FINAL%20BUDGET.PDF

(5) 6. On the first science test, the mean score of the 30 students in Archer's class was 70; the mean score of the 20 students in Jacob's class was 75. What is the mean for both science classes combined?

To compute the mean, put all the points back into the pot, and redistribute!
Archer's class will contribute $30 \cdot 70 = 2100$ points.
Jacob's class will contribute $20 \cdot 75 = 1500$ points.
Thus 3600 points will be distributed among 50 students.

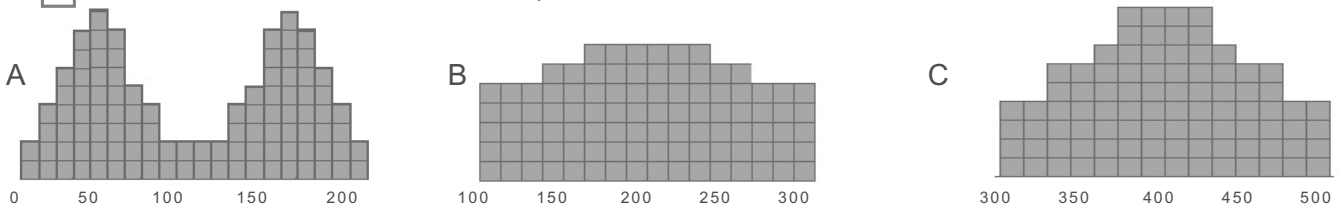
$$\text{Combined mean} = \frac{30 \cdot 70 + 20 \cdot 75}{50} = \frac{2100 + 1500}{50} = \frac{3600}{50} = 72$$

Note we could get the same result by saying 3/5 of the group averaged 70, 2/5 averaged 75,

So the combined mean is $70 \cdot (3/5) + 75 \cdot (2/5) = 72$

(4) 7a. Three Ballroom Dance Classes are offered at the Rec Center: Class A is for Advanced students only, Class B is for Beginners only, and Class C is open to anyone. If the Ballroom Dance ability of students in all three classes were scored from 1 to 5, which class would have the greatest standard deviation?
[C] ←Write in the box A or B or C. C, the class with the broadest range of ability.

7b. Of the three distributions shown below, which one (A or B or C) has the smallest standarddeviation?
[C] ←Write in the box A or B or C. C, the one which is MOST clustered near the mean.

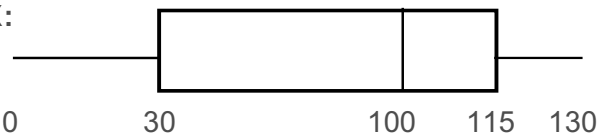


(3) 8. Data X has the box plot shown at right.

The range of X is 130 .

The interquartile range for X is 85 .

The middle fifty-percent of data lies between 30 and 115 .



MATH 310 Test #1: Probability SHOW appropriate work! ANSWERS

(6) 9. Blocks spelling the word "DUDE" (D & U & D & E) are placed in a bag. One block is selected at random from the bag.

a. List a Sample Space (SS) for this experiment.
{ D, U, E } and $\{D_1, D_2, U, E\}$ are both acceptable answers.

b. List the event that the block is a "D".
{D} and $\{D_1, D_2\}$ (Must be consistent with SS given in part a.)

c. What is the probability of the event in part b?
½

(5) 10. A fair die is rolled. What is the probability that:

a. the number that turns up is EVEN? $P(\{2,4,6\}) = {}^3/_6 = {}^3/_6$

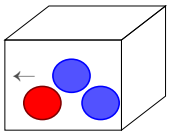
b. the number that turns up is a MULTIPLE OF 3? $P(\{3,6\}) = {}^2/_6$

c. the number that turns up is EVEN or a MULTIPLE OF 3? $P(E \text{ OR } M) = P(E) + P(M) - P(EM)$
$= {}^3/_6 + {}^2/_6 - {}^1/_6 = {}^4/_6 = {}^2/_3$

(17) 11. A box contains four marbles: two RED, two BLUE. Two marbles are randomly taken from the jar; the first is held in the right hand, the second in the left.

a. Draw a **complete** tree diagram for this experiment.

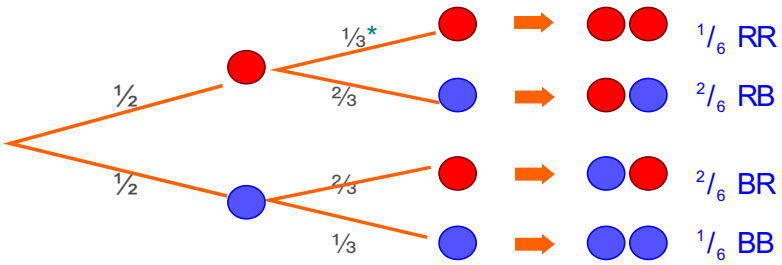
b. What is the probability the second marble is RED, given the first marble is RED* ? ${}^1/_3$



c. What is the probability the marbles drawn are both RED? $P(RR) = {}^1/_6$

d. What is the probability the first marble is RED and the second one is BLUE? $P(RB) = {}^1/_3$

e. What is the probability that two DIFFERENT-COLOR marbles are obtained? $P(RB \text{ or } BR) = 2 \cdot {}^1/_3 = {}^2/_3$



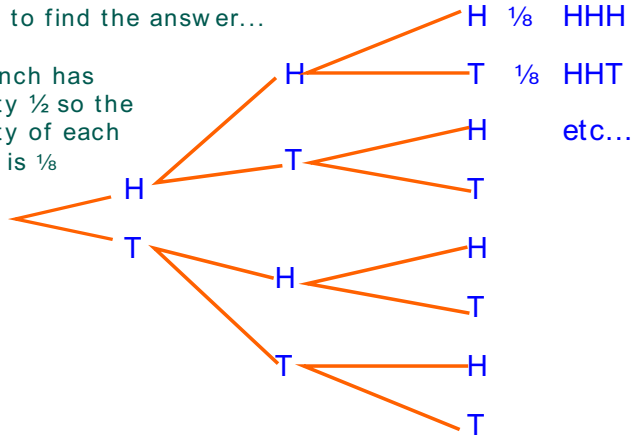
b. * P (2nd Red | 1st Red) = ⅓ because the condition (1st Red) says the box looks like above right

(5) 12a. (2) A fair coin has been tossed and has turned up heads.
What is the probability that the next toss will be tails? ½ It's still a fair coin!

12b. Find the probability of obtaining EXACTLY ONE head in three tosses of a fair coin, *showing how* you got your answer.

One way to find the answer...

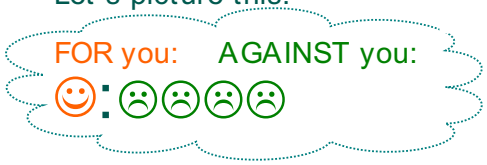
Each branch has probability ½ so the probability of each outcome is ⅛



P(exactly one head)
= P(HTT or THT or TTH)
= P(HTT) + P(THT) + P(TTH)
= ${}^1/_8$ + ${}^1/_8$ + ${}^1/_8$
= ${}^3/_8$

(8) 13a. In a game in which your odds are **1:4**, what is the probability of winning?

Let's picture this:



Your chance of winning is ONE out of FIVE.

P(win) = $^1/_5$

13b. If the probability of rain tomorrow is 20%, what are the odds against rain tomorrow?

20% = $^1/_5$ Gee, it must be the reverse of above!!!

If the PROBABILITY of rain is one in five, then the ODDS are against rain, four to one.

The odds are against rain 4 to 1.

(3) 14. A pair of fair dice is tossed. What is the probability that the sum of dice is more than 2?

Just look at the sample space for tossing a pair of fair dice (shown on PN-3).

There we see the sum of the dice can be 2 only if the dice turn up ⚀ ⚀

The rest of the 36 outcomes give sums higher than 2.

P(sum > 2) = $^{35}/_{36}$

(3) 15. A probability experiment has four possible outcomes: e_1, e_2, e_3, e_4.
The outcome e_1 is twice as likely as each of the remaining outcomes.
Find the probability of e_4.

This is the Sample Space: e_1, e_2, e_3, e_4

But these outcomes are not equally likely; e_1 has twice the chance of being the outcome...

So we can picture the experiment like this:

Five marbles in a jar, and two are labelled e_1, and the other three are labelled e_2, e_3, e_4. Pick one.

The probability of each "marble" is $^1/_5$, so P(e_4) = $^1/_5$

(Check– put probabilities on each; see that all the conditions stated are met by this model.)

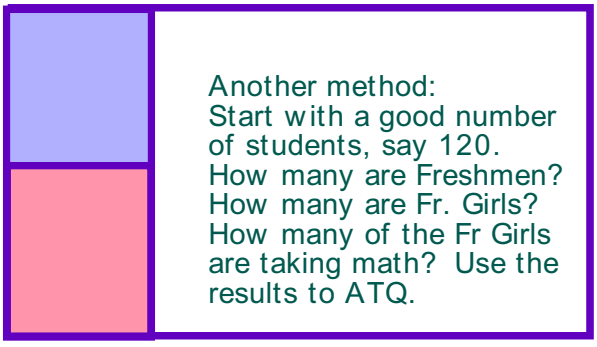
(3) 16. Given:
1/4 of the school are Freshmen; 1/2 of the Freshmen are girls; 2/3 of Freshmen girls take math.
What part of the school are Freshmen girls taking math?

Two-thirds of one-half of one-fourth,

which is $\frac{2}{3} \cdot \frac{1}{2} \cdot \frac{1}{4} = \frac{2 \cdot 1 \cdot 1}{3 \cdot 2 \cdot 4} = \frac{1}{12}$

The result at left can be illustrated with a tree diagram.

In the illustration at right, the large rectangle represents the whole school. The leftmost quarter of that rectangle has been shaded, representing the Freshmen. Half of the Freshmen are shaded rose, representing the Freshmen GIRLS.
Shade ⅔ of the rose area;
then *subdivide the entire rectangle into like parts.*
You should be able to see that you have shaded 2 twenty-fourths of the whole.



Another method:
Start with a good number of students, say 120.
How many are Freshmen?
How many are Fr. Girls?
How many of the Fr Girls are taking math? Use the results to ATQ.