

**MATH 103 - Test #3 - 11/14/01**

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**Show all work for maximum credit. You may use the following formulas as needed. Points in [brackets] total 105.**

$$E.V. = \sum p_i x_i$$

$$z = \frac{X - \mu}{s}$$

$$m = \frac{z}{2\sigma}$$

1. You are given the opportunity to play the following game using a *four-sided* die. Painted on each face of the die is the amount you win if that side is rolled. The faces are painted: \$100, \$1000, \$10,000 and ! \$1000. (A negative amount means you lose!) Suppose the die is weighted so that half the time you win \$100, and the three other outcomes are equally likely.

a. Complete the following table for the probability of winning each of the four amounts given above. (Double check that your probabilities sum up to the correct number!)

[5]

<u>X</u>	<u>P(X)</u>
100	1/2
1000	
10,000	
! 1000	

b. Suppose you are allowed to play this game many times. Determine the average amount you would expect to win, in the long run. (I.e., find the *expected value* of this game.)

[10]

c. If you were allowed to play many times (say, 1000 times) would you want to play? Why or why not?

[3]

d. If you could just play just one time, would you want to play? Why or why not?

[3]

e. Explain how the “Law of Large Numbers” relates to your answers in parts (c) and (d).

[3]

2. Suppose that birth weights of full-term babies in the U.S. are normally distributed with a mean of 7 pounds and standard deviation of .4 pounds.

[21]

a. What percentage of babies weigh *between* 6.5 and 7 pounds?

b. What percentage weigh *below* 6.5 pounds?

c. What percentage weigh *between* 6.5 and 8 pounds?

d. Construct separate intervals that contain the following percentages of babies' birth weights.

[6]

68%

95%

“Almost 100%”

3. You ask 15 students to record how many hours they watch TV in a given month. The following values are reported:

30 45 46 47 48 49 50 52 53 54 55 58 60 63 69

- a. Construct a frequency table by grouping the data into eight groups, each including a range of five values. The table below gives the first grouping. **Define the remaining groups in an appropriate way and fill in the frequency for each class.**

[5]

<u>Class</u>	<u>Frequency</u>
30–34	

- b. Use your frequency table to make a histogram (bar chart) of the data you collected.

[8]

- c. Describe the *main features* and *pattern* of your histogram and any *exceptions* to the overall pattern.

[5]

- d. Based on your answer to (c), which do you expect to be greater, the mean or the median? **Explain your answer in detail.**

[3]

- e. Compute the mean and median for this data. **Show your work!**

[8]

Mean:  $\mu =$

Median:  $M =$

4. You are interested in determining the percentage of people in your hometown who support the current military action in Afghanistan. Over Thanksgiving break you choose a random sample of 150 people from your town and 120 of them say “yes,” they support the action.

a. *Compute the sample result* — that is, the percentage of people in your survey who answered “yes.”  
[5]

b. Using a 99% confidence level, *compute the margin of error* for the percentage computed in (a).  
[5]

c. *Construct a confidence interval* for the true percentage of people in your town who support the military action.  
[5]

d. Interpret the meaning of your confidence interval, in the context of your study, *using a complete sentence*.  
[5]

e. Suppose you wish to provide a more accurate estimate than you obtained in (c). What are two things you could do to reduce the margin of error?  
[5]