MATH 103 - Test #2 - 3/22/02

Points in [brackets] total 105. ***Show <u>all work</u> for full credit. Short answer questions should be answered in <u>full sentences</u>*** **The following formulas may be used as needed.**

$$P_{n,r} = \frac{n!}{(n-r)!} \qquad C_{n,r} = \frac{n!}{r!(n-r)!} \qquad E.V. = \Sigma\, p_i x_i$$

1. [15] Answer the following assuming you have a *fair* six-sided die.

a. What is the probability of rolling a 4 on one roll of the die?

b. You plan to roll the die 300 times. What is the *expected* number of 4's you will obtain?

c. Suppose you roll a <u>pair</u> of fair dice. What is the probability that the *sum* of the two dice is 4? **Justify your answer!**

2. [15] Suppose the *odds* for your winning a game are 2:5.

a. Are you more likely to win or lose? **Explain!**

b. What is the *probability* you will win?

c. What are the odds *against* your winning?

3. A young child is shown a stack of five blocks, each of a different color. The blocks are knocked down and the child is asked to re-stack them in the same order. If the child is just randomly guessing, what is the probability that she stacks them back up in the correct order?

[15]

4. Seven-digit telephone numbers in the United States are constructed with the restriction that the first digit cannot be a 0 or a 1.

   a. How many possible seven-digit phones are there within each area code?

[10]

   b. In the old days (up until about 10 years ago) there was an <u>additional</u> restriction that the second digit could not be a 0 or 1. Due to the growth of cell phones, fax machines and computers more phone numbers were needed, so this restriction was removed. How many additional phone numbers did this change create within each area code.

[5]

5. You are hosting a dinner for your local service club and plan to have a drawing for door prizes. There are 30 people in attendance and you are going to draw three names.

a. Suppose each person receives the same prize (a $10 gift certificate to the Pasta Shack). How many possible ways are there for three people to be selected to receive the certificates?

[10]

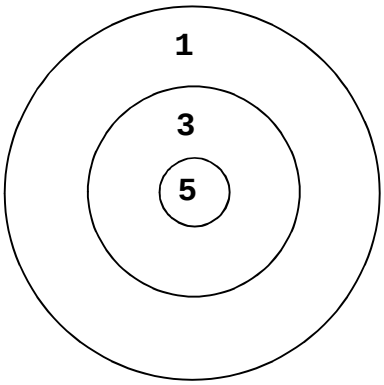
b. Suppose each person receives a *different* door prize (the first winner receives a certificate to the Pasta Shack, the second to the Sub Basement, and the third to the Green Tiger). Now, how many different ways are there for three people to be chosen and given the gift certificates?

[10]

c. Suppose that in part (a), the club's president, vice-president and secretary were declared the winners. Would this give someone attending the dinner reason to be suspicious about how the drawing was conducted? **Explain your answer in detail!**

[5]

6. You are responsible for designing a game for your school's spring carnival. In your game, players throw a dart at a dartboard. If the player hits the board they win a stuffed animal that costs the school either 1, 3 or 5 dollars, depending on where the dart lands (see below). If they miss the board they receive no prize.



You estimate the following probabilities for where a dart lands on the board.

Miss Board	One Dollar	Three Dollars	Five Dollars
.40	.30	.20	.10

a. Calculate the *expected value* of the prize won by players of this game.

[15]

b. The carnival director requires that all tickets must cost $1. (Thus, players must pay $1 for each dart thrown.) Will this game create a profit for the carnival? **Explain why or why not.** If not, explain what could be done so that the game would make a profit. **Be specific!**

[5]