BINOMIAL RANDOM VARIABLE   TEXT:

LAST NAME	FIRST NAME	DATE

1 (6 points). Research indicates that in 2008 more than 97% of email messages were spam, and that 6.4% of all that spam email came from Russia. Consider a random sample of 1000 spam emails.

(a) Describe the distribution of the variable X which counts the number of emails in the sample which originated from Russia.

(b) Find the probability that exactly 60 emails in the sample originated from Russia.

(c) Find the probability that 80 or more emails in the sample originated from Russia.

(d) Find the expected value for the number of Russian spam emails in the sample.

(e) Find the standard deviation for the number of Russian spam emails in the sample.

(f) Find the z-score for a sample with $x = 80$ Russian spam emails.

2 (5 points). A grand jury has to have between 16 and 23 members, and it is selected randomly out of a population where 61% identify as Hispanic.

    (a) If you take a random jury of size $n = 19$, how many people in the jury would you expect to identify as Hispanic?

    (b) In a random jury of size $n = 16$, what is the probability that exactly 8 individuals identify as Hispanic?

    (c) In a random jury of size $n = 23$, what is the probability that fewer than 4 individuals identify as Hispanic? What would you think about an actual jury with these statistics?

    (d) In a random jury of size $n = 20$, what is the probability that more than 16 individuals identify as Hispanic?

    (e) In a random jury of size $n = 20$, what is the probability that 8, 9, 10, 11, 12, or 13 individuals identify as Hispanic?

3 (4 points). A random experiment for this activity consists in tossing a fair twelve-sided die 5 times, then counting the number of times the die showed a number 10, 11, or 12 (success) as opposed to 1 through 9 (failure).

(a) Describe the theoretical distribution of the random variable X, which counts successes among the 5 trials in this experiment.
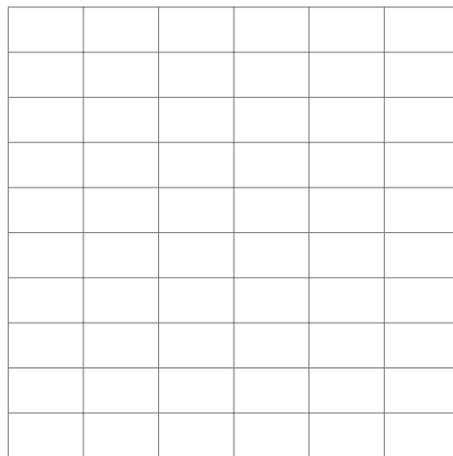
(b) Fill out the pmf table for X, and construct a corresponding frequency histogram:

x	$P(X = x)$
0	
1	
2	
3	
4	
5	
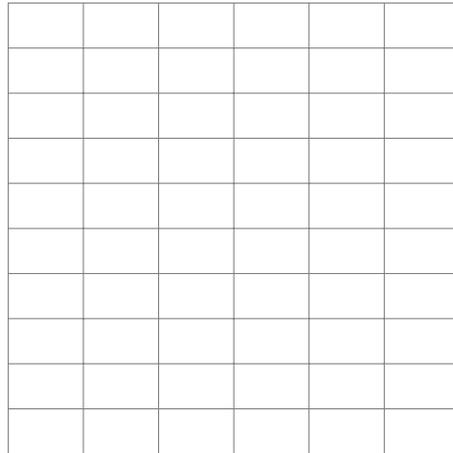
(c) Conduct the experiment 10 (or more) times. You will have to toss one die 50 times, or 5 dice 10 times. Fill out the following table with your empirical pmf values, and use the grid below to construct a frequency histogram for your empirical distribution.

y	tally	$P(Y = y)$
0		
1		
2		
3		
4		
5		

4. Typical MLB pitchers throw 62% strikes, so 62 strikes for 100 throws on average. Consider a random sample of 1800 throws and let X be the number of strikes in the sample.

(a) State the distribution for the number of strikes in the sample.

(b) What is the expected number of strikes in the sample?

(c) Find the standard deviation for the number of strikes in the sample.

(d) Find x_1, the number of strikes in the sample which approximately corresponds to the z-score of -1.

(e) Find x_2, the number of strikes in the sample which approximately corresponds to the z-score of 1.

(f) Find the probability that the number of strikes in the sample is between x_1 and x_2, specifically, $P(x_1 \leq X \leq x_2)$.