SECTION ONE: Multiple Choice (5 points for each answer: 50 points total)

1. On the planet Dangerboy, Captain Bananahands has stumbled across what appears to be a 3-sided coin. Let's call the sides *heads, tails,* and *feet.* Bananahands flips the coin 12 times and gets 6 feet. Assuming the coin is fair, what is the probability of this happening?

   A. .500 B. .111 C. .667 D. .392

2. In a magical, far-away land, I found a 5-sided die. On Earth, a 5-sided die is necessarily not fair. I decide to test this newly found die for fairness by rolling it 400 times and counting the number of ⚀'s. I counted 52.

   i) Assuming the die *is* fair, the number of ⚀'s rolled is _____, give or take _____, or so.

   A. 80; 8 B. 80; 16 C. 200; 8 D. 200; 16

   ii) Assuming the die *is* fair, the chance of rolling 52 or fewer ⚀'s is

   A) $\approx 0\%$ B) .03% C) .5% D) 99.997%

3. A strange lottery at Britneyland Casinos is played as follows. The numbers 2, 3, 5, 7, and 13 are placed in a hat. The chairman of the lottery then picks at random 120 times (with replacement) from the hat. There are two types of winning "hands":

   (A) The number 5 is picked more than 35 times;

   (B) The sum of the picks is less than 500.

   Here are the questions:

   i) The number of fives picked is _____, give or take _____, or so.

   A. 24;.037 B. 24;3.65 C. 24; 4.38 D. 24; 8.76

   ii) The sum of the picks is _____, give or take _____, or so.

   A. 720; 42.7 B. 600; 36.8 C. 720; 36.8 D. 600; 42.7

4. Someone rolls 100 four-sided dice. The sides are numbered 1 through 4 and are all equally likely to be rolled.

   i) The sum of the rolls should be _____, give or take _____, or so.

   A. 150; 11 B. 150; 52 C. 250; 11 D. 250; 52

   ii) What is the approximate chance that the sum of rolls is less than 300?

   A. 15% B. 75% C. 95% D. 99.9%

   iii) The number of threes rolled should be _____, give or take _____, or so.

   A. 15; 2 B. 15; 4 C. 25; 2 D. 25; 4

   iv) Estimate the chance that the number of threes rolled is between 15 and 20, exclusive.

   A. 1% B. 4% C. 9% D. 15%

SECTION TWO: Short Answer (5 points for each answer: 30 points total)

5. Regarding question #3 in the last section at Britneyland Casinos, which hand do you have a better chance of winning, (A) or (B)? Show all of your reasoning.

6. A box contains 5 letters: A, B, C, D, E from which you are to draw 900 times, with replacement and at random.

   a) Write an expression (I do not want a numerical answer) for the *exact* probability that you draw between 180 and 200 A's.

   b) Approximate this probability (I want a numerical answer) using the Central Limit Theorem.

7. TRUE or FALSE. For each question, circle true or false and give a reason to back up your answer. An answer alone is worth only 2 points if correct.

   i) You are more likely to get exactly 500 heads out of 1000 flips of a fair coin that you are to get 5 heads out of 10 flips with the same coin.

   TRUE FALSE (circle one) Reason:

   ii) The Central Limit Theorem applies only to 0-1 Boxes.

   TRUE FALSE (circle one) Reason:

   iii) If 2 events E and F are mutually exclusive, then $P(E \text{ or } F) = P(E) + P(F)$.

   TRUE FALSE (circle one) Reason:

SECTION THREE: Essay (20 points) Again, I will pick one of the unit readings at random (from units 4 and 5). This will be due at the beginning of the first class meeting following the test.

I will also give you the following on the test, as well as the Normal table.

SOME FORMULAS

$y - a_y = r\left(\frac{SD_y}{SD_x}\right)(x - a_x)$	$\sqrt{(\text{fraction of } 1'\text{s})(\text{fraction of } 0'\text{s})}$
$\sqrt{\frac{\text{sum of data}^2}{\#\text{ of data}} - (\text{avg})^2}$	$y - a_y = \left(\frac{SD_y}{SD_x}\right)(x - a_x)$
$\frac{X - a_x}{SD_x}$	$\binom{n}{k} p^k (1-p)^{n-k}$
(number of draws)(avg of box)	$(\sqrt{\text{number of draws}})(SD)$
$\frac{A - a_x a_y}{SD_x SD_y}$, where $A =$ Average of xy	$1 - P(\text{NOT } E)$
$P(E) + P(F) - P(E \text{ and } F)$	$P(E)P(F\|E)$