You MUST use good notation and show appropriate work.

Math 102 Name Key (Chapter 13 Further Interest) Do # 1, 4, 5, 6 a & e

13 FI Binomial Experiments Binomial Prob. Formula on p. 775

- 1. Determine the probability of getting exactly 5 heads when you flip a coin 8 times.
- $B(8,5; 1) = B(-5)(1-1)^{5}(1-1)^{5-5}$ $= 56(0.5)^{5}(0.5)^{3} = 2.$ 2. Determine the probability of getting a six exactly four times when you roll a die twelve times. Round your answer to five decimal places.

$$B(12; 4, \xi) = C_4(\xi)^{4}(1-\xi)$$

= 495(7.2×10⁻⁴)(0,23257) = 0.09883

3. Determine the probability of getting a six at least once when you roll a die twelve times. Round your answer to five decimal places.

$$-B(12,0,t) = 1 - (0.1121b) = 0.8874$$

4. Determine the probability of getting a six no more than three times when you roll a die twelve times. Round your answer to five decimal places.

$$B(12,3;t) = 220(t)(1-t)^{12-2} = 0.19740$$

$$B(12,2;t) = 66(t)(1-t)^{12-2} = 0.29609$$

$$B(12,2;t) = 12(t)(1-t)^{12-1} = 0.26918$$

$$B(12,1;t) = 12(t)(1-t)^{12} = 0.11216$$

$$B(12,0;t) = 1(t)(1-t)^{12} = 0.11216$$

$$Total 0.87483 \text{ or } 87.4832$$

5. A basketball player has a free throw average of 78%. Assuming that the probability of making a free throw does not change during the course of a game, find the probability that the player makes at least six of the eight free throws attempted during the game. Round your answer to three decimal places.

$$B(8,6,0.78) + B(8,7;0.78) + B(8,8;0.78)$$

 $B(6(0.78)^{6(1-.78)^{8-6}} + 0.309 + 0.137 = 0.751$
 $O.305 + 0.309 + 0.137 = 0.751$

- 6. A goalkeeper for a soccer team has a probability of stopping a penalty kick with a probability of 0.1. Assume that a game has gone to penalty kicks (which happens if the game requires a winner and is still tied after two overtime periods). Five penalty kicks are taken.
 - (a) Find the probability that the goalkeeper saves none of the penalty kicks. Give the exact answer.

$$B(5,0;0.1) = {}_{5}C_{0}(6.1)^{\circ}(1-0.1)^{\circ} = 0.59049$$

or 59.0492

b) Find the probability that the goalkeeper saves one of the penalty kicks. Give the exact answer.

$$B(5,1;0.1) = C_{5}(0.1)(1-0.1)^{2}$$
$$= 5(0.1)(0.9)^{4} = 0.32805$$

- c) Find the probability that the goalkeeper saves two of the penalty kicks. Give the exact answer. $B(5,2;0.1) = -5C_2(0.1)^2(1-0.1)^{5-2}$
- d) Find the probability that the goalkeeper saves three of the penalty kicks. Give the exact answer.

$$\mathcal{B}(5,3;0!) = 5C_3(0!)^3(1-0!)^{5-3}$$

$$10(0.00!)(0.9)^2 = 0.008!$$

 $10(0.01)(0.9)^3 = 0.0729$

e) Find the probability that the goalkeeper saves four of the penalty kicks. Give the exact answer.

- $B(5,4;0.1) = 5C_4(.1)^4(1-0.1)^{5-4} = 0.00045$
- f) Find the probability that the goalkeeper saves all five of the penalty kicks. Give the exact answer.

 $B(5,5;0.1) = 5C_5(.1)^5(1-0.1)^{5-5} = 0.00001$

g) Find the expected number of penalty kicks that the goalkeeper will save. Give the exact answer.