Quiz 5 (March 8, 2017) NAME: SOLUTIONS

Statistics for Social Science (201-401-DW)
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[QUESTION 1] (4 MARKS)
In a certain group of people, the probability that someone has a sibling is 0.75. Seven people are selected randomly from the group.

(a) What is the probability that exactly two people picked have a sibling?

$$P(2) = \binom{7}{2}(0.75)^2(0.25)^5 = 0.0115$$

(b) What is the probability that all of them have a sibling?

$$P(7) = \binom{7}{7}(0.75)^7(0.25)^0 = 0.133$$

(c) What is the probability that none of them have siblings?

$$P(0) = \binom{7}{0}(0.75)^0(0.25)^7 = 0.000061$$

(d) What is the probability that at least one of them has a sibling

$$1 - P(0) = 1 - 0.000061 = 0.999$$

[QUESTION 2] (6 MARKS)
A coin is flipped 3 times. Let X denote the number of heads observed.

(a) What is the set of possible values of the variable X?

$$X = 0, 1, 2, 3$$

(b) Suppose the coin is biased so that the probability of flipping heads is actually 0.6. What is the probability of observing heads at least twice?

$$P(2) + P(3) = \binom{3}{2}(0.6)^2(0.4)^1 + \binom{3}{3}(0.6)^3(0.4)^0$$
$$= 0.432 + 0.216 = 0.648$$

(c) What are the mean and the standard deviation of X?

$$\mu = np = 3(0.6) = 1.8$$

$$\sigma = \sqrt{npq} = \sqrt{3(0.6)(0.4)} = 0.8485$$