Score:

Name: Solution
Section (circle one): 1 2 3 4 5 6
Team (circle one): a b c d e f

SM316 – Quiz #02 (Section 2.6,3.1-3.3) – Due Tuesday

Take home quiz, open book, open notes. You may work with team members to solve problems, but you may not copy another's work. Calculators are allowed, but you must show all work for full credit.

1. The probability that the head of house is home when a telemarketing representative calls is 0.4. Given that the head of the house is home, the probability that goods are purchased is 0.3. Find the probability that the head of household is home and goods are purchased.

A: Head of House is Home

B: Item is Purchased

$P(A) = .4$
$P(B|A) = .3$
$\Rightarrow P(B|A) = \frac{P(A \cap B)}{P(A)}$

$\Rightarrow .3 = \frac{P(A \cap B)}{.4}$

$\Rightarrow \boxed{P(A \cap B) = .12}$

2. A coin is flipped until 3 heads in succession occur. List only those elements of the sample space that require 6 or less tosses. Is this a discrete sample space? Explain.

$S = \{ HHH, THHH, HTHHH, TTHHH, TTTHHH, HTTHHH, THTHHH, HHTHHH \ldots \}$

This is not a discrete sample space because there are an infinite # of possibilities.

OR

If you interpreted the experiment as having only a max of 6 tosses...

Discrete, (I'll take both answers)

3. Let W be a random variable giving the number of heads minus the number of tails in three coin tosses. List the elements of the sample space S for the three tosses and assign a value (heads-tails) to each element. What is probability distribution of the random variable W if the coin is biased so that heads occur twice is often as tails?

$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

$W = \{3, 1, 1, -1, 1, -1, -1, -3\}$

$P = \{\frac{8}{27}, \frac{4}{27}, \frac{4}{27}, \frac{2}{27}, \frac{4}{27}, \frac{2}{27}, \frac{2}{27}, \frac{1}{27}\}$

$\Rightarrow$ If heads is twice as likely as tails

$P(H) = \frac{2}{3}$ $P(T) = \frac{1}{3} \Rightarrow$

$P(3H) = \left(\frac{2}{3}\right)^3 = \frac{8}{27}$

$P(2H, 1T) = \left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right) = \frac{4}{27}$

$P(1H, 2T) = \left(\frac{2}{3}\right)\left(\frac{1}{3}\right)^2 = \frac{2}{27}$

$P(3T) = \frac{1}{27}$

$$F(\omega) = \begin{cases} 8/27 & \omega = 3 \\ 12/27 & \omega = 1 \\ 6/27 & \omega = -1 \\ 1/27 & \omega = -3 \end{cases}$$