Problem Set 4

Mark Xavier (xaviem01)

April 9, 2019

1. Problem 1

   (a) This is the probability of choosing a coin in category 1 and getting heads plus choosing a coin in category 2 and getting heads plus choosing a coin in category 3 and getting heads, which translates to:

   $$P(F = H) = \left(\frac{1}{5} * 0.2\right) + \left(\frac{2}{5} * 0.3\right) + \left(\frac{2}{5} * 0.9\right) = 0.52$$

   (b) **come back**

   (c) **come back** Assuming C is the category and F represents the flip (Either H or T) then we are asked to find $P(C = 1|F = H), P(C = 2|F = H), P(C = 3|F = H)$. The overall formula for any category c is:

   $$P(C = c|F = H) = \frac{P(F = H|C = c) * P(C = c)}{P(F = H)}$$

   The denominator is calculated in (a), $P(C = c)$ is simply the number of coins in category c divided by 5, and $P(F = H|C = c)$ is given in the problem prompt, so we have:

   $P(C = 1|F = H) = \frac{\frac{1}{5} * 0.2}{0.52} = 0.077$
   $P(C = 2|F = H) = \frac{\frac{2}{5} * 0.3}{0.52} = 0.230$
   $P(C = 3|F = H) = \frac{\frac{2}{5} * 0.9}{0.52} = 0.692$

   (d) **come back**

   (e) The probability of getting heads is part (a) of this assignment, which is 0.52. This means it's a little over a 50/50 chance that you will get heads. If you bet heads, the expected payout is $E(X) = (0.52 * 10) + (0.48 * -10) = 0.4$. This means on average over a large number of plays, we expect a payout of \$0.40, so you should bet Heads and expect to win 40 cents over the long term.

   (f) **come back**