Saaif Ahmed - Assignment #7

Sunday, November 3, 2019 4:57 PM

Problem 15.39

(q) Each pair from {Adam, Barb, Charlie, Doris} randomly decides whether or not to be friends

Six Relationships to consider: AB, AC, AD, BC, BD, CD

So $\Omega = \{AB, \neg AB, AC, \neg AC, AD, \neg AD, BC, \neg BC, BD, \neg BD, CD, \neg CD\}$

$\mathcal{E} = All\ possible\ combinations\ of\ the\ graphs$

Well this means that the friendship is either there or not there for all 6 relationships. This is a bijection between this scenario and a 6 bit binary string. So there are 2^6 possible graphs in this case.

$$P(\mathcal{E}) = \left\{\frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64}, \frac{1}{64} \dots\right\}$$

2^6 is 64 and each graph is equally likely to occur. So each has a $\frac{1}{64}$ chance of occuring. For clarity sake $|P(\mathcal{E})| = 64$.

Assignment #7

Sunday, November 3, 2019 5:40 PM

Problem 16.4

(a)

The chance to be placed into World 1 is 50%

Answer: $\frac{1}{2}$

(b)

Let A = "see a black raven"
Let B = "All ravens on the world are black"

$$P[B|A\,] = P[A\,|B]\ * \frac{P[B]}{P[A]}$$

$$P[B|A] = \frac{100}{10^6}\ * \frac{\frac{1}{2}}{\frac{1}{2}\left(\frac{100}{10^6} + \frac{1000}{10^6}\right)}$$

$$P[B|A] = \frac{1}{11}$$

Answer: $\frac{1}{11}$

Assignment #7

Sunday, November 3, 2019 5:47 PM

Problem 16.37

(a) 2 Heads

$\frac{5}{100}$ coins are 2 headed. Which means that they have a 100% chance of landing HH

$\frac{95}{100}$ are fair coins which means that the possible of 2 flip combinations are HH, HT, TH, TT.

$\Omega = \{HH, HH, HT, TH, TT\}$

$$P(\Omega) = \left\{\frac{5}{100}, \frac{95}{400}, \frac{95}{400}, \frac{95}{400}, \frac{95}{400}\right\}$$

So HH is $\frac{5}{100} + \frac{95}{100} = \frac{23}{80}$

Answer: $\frac{23}{80}$

(b) 2 Tails

See work above.

$TT = \frac{95}{400} = \frac{19}{80}$

Answer: $\frac{19}{80}$

(c) Matching tosses

See work above.

$TT\ or\ HH\ or\ HH = \frac{5}{100} + \frac{19}{80} + \frac{19}{80} = \frac{21}{40}$

Answer: $\frac{21}{40}$

Assignment #7

Sunday, November 3, 2019 6:04 PM

Problem 16.40

(a)

The 2 kid combinations are BB, BG, GB, GG
If we are guaranteed 1 child who Baniaz chose at random to tell us about is a girl then the total possible outcomes shrink to BG, GB, and GG. So $\frac{1}{3}$ possibility.

Answer: $\frac{1}{3}$

(b)

Let $A =$ Having the name Leilitoon

$$P[2\ girls\ \ |\ Leilitoon] = \frac{P[2\ G]}{P[Leilitoon]} * P[Leiliton\ |2\ Girls]$$

$$= \frac{1}{4}\left(\frac{1}{A}\right) * (1-(1-A)^2)$$

$$= \frac{-A^2+2A}{4A}$$

$$= \frac{-A+2}{4}$$

Let A approach 0

$$= \frac{1}{2}$$

Answer: $\frac{1}{2}$

(c)

Let $A =$ Having at least 1 girl born on Sunday

$$P[2\ Girls\ |\ A] = \frac{P[2\ G]}{P[A]} * P[\ A\ |2\ Girls]$$

$$= \frac{\frac{1}{4}}{\left(\frac{2}{7}+\left(1-\left(\frac{6}{7}\right)^2\right)\right)\left(\frac{1}{4}\right)} * \left(1-\left(\frac{6}{7}\right)^2\right)$$

$$= \frac{13}{27}$$

Answer: $\frac{13}{27}$

Assignment #7

Sunday, November 3, 2019 6:31 PM

Problem 17.9

(a)

Dependent. If you pick a white square (A) then the total number of squares available for choosing becomes 63 for B instead of 64 for A.

Answer: Dependent

(b)

Independent. If you choose an even row that does not alter the total number of even columns on the board so the events are not related

Answer: Independent

(c)

Independent. If you choose a white square, since there an equal number of white squares between odd and even columns, choosing a white square does not alter the choosing of an even column in any way.

Answer: Independent.

Assignment #7

Sunday, November 3, 2019 6:38 PM

Problem 17.28

Let us compute the probability that you will not roll some number more than once. Imagine that the numbers of dice rolls are placed into a correlating bucket. For the first bucket you have $\frac{100}{100}$ options for choosing which number goes into that bucket. For the second bucket, assuming that all buckets must be unique for this calculation, you have $\frac{99}{100}$ options for placing a number into that bucket. For bucket three there is $\frac{98}{100}$, and for four there is $\frac{97}{100}$ and five has $\frac{96}{100}$ options.

This can be organized into a tree diagram so to compute the probability that you will not roll some number more than once we multiply the edge probabilities.

$$\frac{99 * 98 * 97 * 96}{100^4} = \frac{90345024}{100000000}$$

Take the complement by 1 - that number:

$$1 - \frac{90345024}{100000000} = \frac{9654976}{100000000}$$

Answer: $\frac{9654976}{100000000}$