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ASSIGNMENT 9 — Probability

1 Probably Pizza

let T: event where person order tomato sauce.
let p: event where person order pesto sauce.
let G: even where person orders green peppers.

$P(T) = 0.8$
$P(p) = 0.2$
$P(G|T) = 0.6$
$P(G|p) = 0.7$
$P(G|T) = \dfrac{P(G \cap T)}{P(T)}$
$P(G|p) = \dfrac{P(p \cap T)}{P(T)}$
$\implies P(G \cap T) = 0.48$
$\implies P(G \cap p) = 0.14$
$P(G) = P(G \cap T) + P(G \cap p)$
$= 0.62$

Therefore, it is 62% likely that the person gets green peppers.

2 Holiday Happenstance

3 Robot Redux

let S: all ways to pick 10 bolts, twice and independantly.
let E: event where each robot picks 10 bolts that the other did not.

$||S|| = \binom{20}{10}^2$
$||E|| = \binom{20}{10} \cdot \binom{10}{10}$
$\implies P(E) = \dfrac{1}{\binom{20}{10}}$
$= \dfrac{1}{184756}$

4 Sea Kayaking

let R: event where it is raining in Salt Spring Island
let C: even where Environment Canada predicts that it would rain.

$P(R) = 0.2$
$P(R \cap C) = 0.15$
$P(C|\neg R) = 0.1$
$P(C|R) = 0.75$
Since, $P(C|\neg R) = \dfrac{P(C \cap \neg R)}{P(\neg R)} \implies P(C \cap \neg R) = P(C|\neg R) \cdot P(\neg R)$
Similarly, $P(C|R) = \dfrac{P(C \cap R)}{P(R)} \implies P(C \cap R) = P(C|R) \cdot P(R)$
$P(C) = P(C \cap R) + P(C \cap \neg R)$
$= P(C|\neg R) \cdot P(\neg R) + P(C|R) \cdot P(R)$
$= 0.08 + 0.15$
$P(C) = 0.23$

$P(R|C) = 0.65$

Submitted by Yashashwin Karthikeyan, Roozbeh Ali on April 5, 2024.