Announcements

- HW2 Due Tonight 11:59PM on Icon.
- HW1 Missed Problems Due Tonight 11:59 PM By email / Icon
- Exam 1 Wed Feb 11th 6:30-8:30PM Location TBD
  1 Crib Sheet Allowed
- Quiz 2 Today Last 20 minutes
  Show Work on quizzes

Prob 1)

Sally Sells Seashells and Lemonade. The probability a tourist buys a seashell is 40%, the probability they buy lemonade is 20%, and prob they buy either is 50%

(a) What % of customers buy both Seashells & Lemonade?

(ans) $P(S) = 0.4$, $P(L) = 0.2$

$P(S \cup L) = 0.5$

$P(S \cap L) = ?$

Using formula

$$P(\bar{S} \cap L) = P(S) + P(L) - P(S \cup L)$$

$$= 0.4 + 0.2 - 0.5$$

$$= 0.1$$

(b) What percent buy only a seashell?

(ans)

$$P(S \cap L^c) = P(S) - P(S \cap L)$$

$$= 0.5 - 0.1$$

$$= 0.4$$

2)

Steve flips a water bottle 8 times independently. The probability of a successful flip is 70%.

What is probability at least one water bottle flip lands successfully?

(ans) 1

$P(f) = 0.7$,

$P(f^c) = 1 - P(f) = 1 - 0.7 = 0.3$

$P(\text{At least one}) = 1 - P(\text{none})$

$= 1 - [P(f^c)]^8$

$= 1 - (0.3)^8$

3) A dog daycare center has 70% Golden Retrievers and 30% Labradors. 80% of Golden Retrievers like walks while only 50% of Labradors like walks. If a random dog is selected that likes walks, what is the probability that its a Golden Retriever?

(ans)

$P(GR) = 0.7$, $P(GR') = 0.3$

$P(W|GR) = 0.8$, $P(W|GR') = 0.5$

$P(GR|W) = ?$

Bayes Theorem:

$$P(GR|W) = \frac{P(W|GR)\,P(GR)}{P(W|GR)P(GR) + P(W|GR^c)P(GR^c)}$$

$$= \frac{(0.8)(0.7)}{(0.8)(0.7) + (0.5)(0.3)}$$

$$= \frac{0.56}{(0.56) + 0.15}$$

$$= \frac{0.56}{0.71}$$

Alternatively

$(GR|W)^2 \rightarrow GR \rightarrow W|GR$

$\rightarrow GR^c \rightarrow W|GR^c$

$$= \frac{(0.7)(0.8)}{(0.3)(0.5)+(0.7)(0.8)}$$

4) 30% people hate coffee. 70% like it. 85% of coffee haters like apples while 60% coffee drinkers like apples. Given someone likes apples what is probability they hate coffee?

(ans)

$P(H) = 0.3$

$P(H^c) = 0.7$

$P(a|H) = 0.85$

$P(a|H^c) = 0.6$

$P(H|a) = ?$

$$P(H|a) = \frac{P(a|H)P(H)}{P(a|H)P(H) + P(a|H^c)P(H^c)}$$

$H \rightarrow a|H$

$H^c \rightarrow a|H^c$

$$= \frac{(0.3)(0.85)}{(0.7)(0.6)}$$

$$= \frac{(0.255)}{0.42}$$

$$\approx 0.607$$