Tutorial 2(Solution)
Statistics 2510

1. The route used by a certain motorist in commuting to work contains two intersections with traffic lights. The probability that he must stop at the first light is 0.35, the probability of stopping at the second light is 0.65, and the probability that he must stop at least one of the two lights is 0.70. What is the probability that he must stop

a. At both lights.
b. At the first light but not at the second light.
c. At exactly one light.

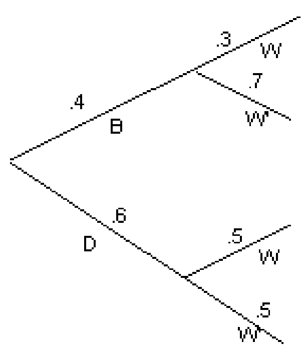
a. $P(A_1 \cap A_2) = P(A_1) + P(A_2) - P(A_1 \cup A_2) = 0.35 + 0.65 - 0.70 = 0.30$

b. $P(A_1 \cap A_2') = P(A_1) - P(A_1 \cap A_2) = 0.35 - 0.30 = 0.05$

c. $P(\text{exactly one}) = P(A_1 \cup A_2) - P(A_1 \cap A_2) = 0.70 - 0.30 = 0.40$

2. A company that manufactures video cameras produces a basic model and a deluxe model. Over the past year, 40% of the cameras sold have been of the basic model. Of those buying the basic model, 30% purchase an extended warranty, whereas 50% of all deluxe purchasers do so. If you learn that a randomly selected purchaser has an extended warranty, how likely is it that he or she has a basic model?

Using a tree diagram, B = basic, D = deluxe, W = warranty purchase, W' = no warranty



$.4 \times .3 = .12 = P(B \cap W)$

$.4 \times .7 = .28 = P(B \cap W')$

$.6 \times .5 = .30 = P(D \cap W)$

$.6 \times .5 = .30 = P(D \cap W')$

We want P(B|W) = $\frac{P(B \cap W)}{P(W)} = \frac{.12}{.30 + .12} = \frac{.12}{.42} = .2857$

3. A friend who works downtown owns two cars, one small and one large. Three quarters of the time he drives the small car to work, and one-quarter of the time he takes the large car. If he takes the small car, he usually has little trouble parking, and so he is at work on time with probability of 0.80. If he takes the large car, he is on time to work with probability 0.50. Given that he was on time on a particular morning, what is the probability that he drove the small car?

S → small car
L →large car
W → at work

$P(S \cap W) + P(L \cap W) = 0.675 + 0.15 = 0.825 = P(W)$

$$P(S|W) = \frac{P(S \cap W)}{P(W)} = \frac{0.675}{0.825} = 0.8181$$

4. An individual who has automobile insurance from a certain company is randomly selected. Let Y be the number of moving violations for which the individual was cited during the last 3 years. The pmf of Y is

y	**0**	**1**	**2**	**3**
p(y)	**0.60**	**0.25**	**0.10**	**0.05**

a. Compute *E(Y).*
b. Suppose an individual with Y violations incur a surcharge of $\$100Y^2$. Calculate the expected amount of the surcharge.

a. $E(Y) = \sum_{x=0}^{4} y \cdot p(y) = (0)(.60) + (1)(.25) + (2)(.10) + (3)(.05) = .60$

b. $E(100Y^2) = \sum_{x=0}^{4} 100y^2 \cdot p(y) = (0)(.60) + (100)(.25)$

$+ (400)(.10) + (900)(.05) = 110$

5. A certain type of refrigerator comes in three sizes, each of which is available with or without an icemaker. The table below gives the probabilities for a randomly selected purchaser:

		Size		
		$17\ ft^3$	$21\ ft^3$	$24\ ft^3$
Icemaker	Yes	0.12	0.17	0.24
	No	0.18	0.13	0.16

a. What is the probability that the purchaser selects a $21\ ft^3$ refrigerator? A refrigerator with an icemaker?

b. Given that the purchaser selected a model with at least $20\ ft^3$ of space, what is the probability that the selected refrigerator did not have an icemaker?

a. $P(21\ ft^3) = 0.17 + 0.13 = 0.30$

$P(\text{icemaker}) = 0.12 + 0.17 + 0.24 = 0.53$

c. $P(\text{at least } 20\ ft^3) = 0.17 + 0.13 + 0.24 + 0.16 = 0.70$

$P(\text{ No ice} \cap \text{at least } 20\ ft^3) = 0.13 + 0.16 = 0.29$

$$P(\text{No ice} \mid \text{at least } 20\ ft^3) = \frac{P(\text{ No ice} \cap \text{at least } 20\ ft^3)}{P(\text{at least } 20\ ft^3)} = \frac{0.29}{0.70} = 0.4143$$