Extra Conditional Probability Problems

1) In statistics class 55% of the class passed <u>both</u> the first and the second test and 68% of the class passed the first test. What percent of those who passed the first test also passed the second test?

i.e., P(pass1 and pass2) = 55%

P(pass1) = 68%

$$P(pass2|pass1) = \frac{55\%}{68\%} = \mathbf{81\%}$$

2) A container contains red and white candy. Two candies are chosen without replacement. The probability of selecting a red candy and a white candy is 0.40, and the probability of selecting a red candy on the first draw is 0.55. What is the probability of selecting a white candy on the second draw, given that the first candy drawn was red?

P(Red and White) = 40%

P(Red) = 55%

$$P(White|red) = \frac{40\%}{55\%} = \mathbf{73\%}$$

3) The probability that it is Monday and that a worker is late for work is 0.03. Since there are 5 work days in a week, the probability that it is Monday is 0.2. What is the probability that a worker is late given that today is Monday?

P(M and Late) = 3%

P(M) = 1/5 = 20%

$$P(late|Monday) = \frac{3\%}{20\%} = \mathbf{15\%}$$

4) Suppose a vote poll is taken with the results shown for 3 cities below. Assume that the entire electorate comes from these 3 cities.

City	Vote	Proportion of Pop
A	44%	38%
B	62%	23%
C	52%	39%

P(V|A) = 44% P(A) = 38%
P(V|B) = 62% P(B) = 23%
P(V|C) = 52% P(C) = 39%

a) Find probable vote for candidate:

P(V) = P(V and A) + P(V and B) + P(V and C)
= P(A)*P(V|A) + P(B)*P(V|B) + P(C)*P(V|C)
= 16.72% + 14.26%
+ 20.28%
= **51%**

b) Given that a voter supports the candidate, what is the probability that she lives in state B?

Since: P(V and B) = P(V) x P(B|V) = P(B) x P(V|B)

then: $P(B|V) = \frac{P(V|B) \times P(B)}{P(V)}$

Which Is Bayes Formula with $P(V) = \sum P(V|City) \times P(City)$

$$P(B|V) = \frac{P(V|B) \times P(B)}{\sum P(V|City) \times P(City)}$$

$$= \frac{62\% \ 23\%}{51\%}$$

= **27.8%**

5) If people with two cars have a 40% chance of owning a truck, what is the chance that someone with a truck also has two cars given that:

P(Truck) = 25%
P(two cars) = 35%

P(Truck|Cars) = 40%

$$P(Cars|Truck) = \frac{P(Truck|Cars) \times P(Cars)}{P(Truck)}$$

p

$$= \frac{40\% \quad 35\%}{25\%}$$

= **56%**

6) Consider the following facts about the employees of a company:

fraction of employees who are college graduates	20%
fraction of college graduates who are supervisors	75%
fraction of those who did not go to college who are supervisors	20%

What is the probability that a randomly selected supervisor is a college graduate?

P(C) = 20% P(C') = 80%
P(S|C) = 75%
P(S|C') = 20%

P(S) = P(S and C) + P(S and C')
P(S) = P(C) * P(S|C) + P(C') * P(S|C')
= 15% + 16%
= 31%

$$P(C|S) = \frac{P(S|C) \times P(C)}{P(S)}$$

$$= \frac{75\% \quad 20\%}{31\%}$$

= **48.4%**