Homework #2 - Solutions

1. Sincich 3.18: PIN pad shipments.

a. Define the following events:

B: {Bitel}
C: {Cybernet}
F: {Fujian Landi}
G: {Glint (Pava Rede)}
I: {Intelligent}
K: {Kwang Woo}
O: {Omvon}
PT: {Pax Tech}
PC: {Provenco Cadmus}
S: {SZZT Electronics}
T: {Toshiba TEC}
U: {Urmet}

The 12 sample points are: $B, C, F, G, I, K, O, PT, PC, S, T, U$

b. The probability of each sample point is not 1/12 because each of the manufacturers does not produce the same number of PIN pads. To compute the probability of each event, we first must sum the number of units shipped by all the manufacturers. The sum is 334,039.

$P(B) = 13,500/334,039 = .040$; $P(C) = 16,200/334,039 = .048$; $P(F) = 119,000/334,039 = .356$
$P(G) = 5,990/334,039 = .018$; $P(I) = 4,562/334,039 = .014$; $P(K) = 42,000/334,039 = .126$
$P(O) = 20,000/334,039 = .060$; $P(PT) = 10,072/334,039 = .030$; $P(PC) = 20,000/334,039 = .060$
$P(S) = 67,300/334,039 = .201$; $P(T) = 12,415/334,039 = .037$; $P(U) = 3,000/334,039 = .009$

c. $P(F \text{ or } S) = P(F) + P(S) = 0.356 + 0.201 = 0.557$

d. Define the event:
D: {PIN pad is defective}
$P(D) = 1000/334,039 = .003$

2. Sincich 3.36: Problems at major companies.

Define the following events:

A: {problems with absenteeism}

T: {problems with turnover}

From the problem, $P(A) = .55$, $P(T) = .41$, and $P(A \cap T) = .22$

$P(\text{problems with either absenteeism or turnover}) = P(A \cup T) = P(A) + P(T) - P(A \cap T)$
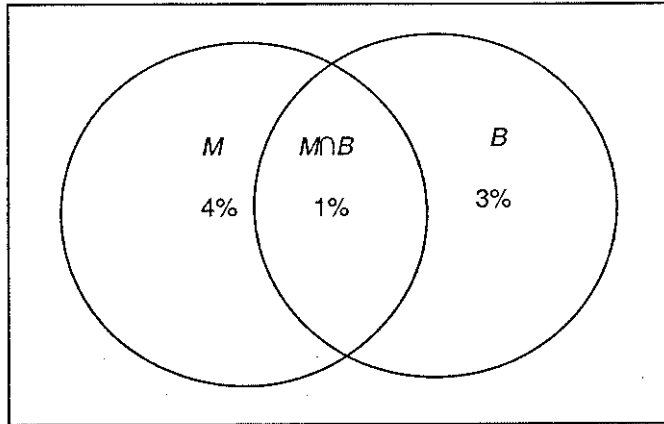$= .55 + .41 - .22 = .74$

3. Sincich 3.40: Social networking Web sites in the United Kingdom.

Define the following events:

M: {UK citizen visits MySpace}
B: {UK citizen visits Bebo}

a.   The Venn Diagram which illustrates the use of social networking sites in UK is:

b. $P(M \cup B) = P(M) + P(B) - P(M \cap B) = 0.04 + 0.03 - 0.01 = 0.06$

c. $P(M^C \cap B^C) = 1 - P(M \cup B) = 1 - 0.06 = 0.94$

4. Sincich 3.44: Guilt in decision making.

a.   Define the following events:

G: {Student is assigned to the guilty state}

C: {Student chooses the stated option}

Then $P(G) = 57/171 = .333$.

b. $P(C) = 60/171 = .351$

c. $P(G \cap C) = 45/171 = .263$

d. $P(G \cup C) = P(G) + P(C) - P(G \cap C) = .333 + .351 - .263 = .421$

5. **Five businesspeople meet at a convention. How many handshakes are exchanged if each shakes hands with all the others?**

$$\binom{5}{2} = \frac{5!}{3! \cdot 2!} = \frac{5 \cdot 4}{2} = 10$$

6. **How many handshakes are exchanged if fifty businesspeople meet at a convention and each shakes hands with all the others?**

$$\binom{50}{2} = \frac{50!}{48! \cdot 2!} = \frac{50 \cdot 49}{2} = 1225$$

7. **How many license plates are possible if the first three places are occupied by letters and the last three by numbers? The middle place can either be a letter or a number. Assume that every license plate has exactly seven characters, and that each character is either a letter (A–Z) or a number (0–9).**

$$26^3 \cdot 36 \cdot 10^3 = 632,736,000$$

8. **A basketball team has 5 players over six feet tall and 6 who are under six feet. How many ways can they have their picture taken if the 5 taller players stand in a row behind the 6 shorter players who are sitting on a row of chairs?**

$$5! \cdot 6! = 86,400$$

9. **Suppose that in the packaged-cereals industry, 29% of all vice presidents hold MBA degrees, 24% hold undergraduate business degrees, and 8% hold both. A vice president is to be selected at random.**

   (a) What is the probability that the vice president holds either an MBA or an undergraduate business degree (or both)?

$$P(A) = 0.29 + 0.24 – 0.08 = .45$$

   (b) What is the probability that the vice president holds neither degree?

$$P(B) = 1 – P(A) = .55$$

   (c) What is the probability that the vice president holds an MBA degree but not an undergraduate business degree?

$$P(C) = .29 - .08 = .21$$