Probability Assignment

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Homework 1.1

a] Probability that Jerry was at the bank the same time as Susan

$$P(\text{Jerry}/\text{Susan}) = \frac{P(\text{Jerry} \cap \text{Susan})}{P(\text{Susan})}$$

$$= \frac{8\%}{30\%} \Rightarrow \frac{0.08}{0.3} \Rightarrow 0.2667$$

$$\Rightarrow \underline{26.67\%}$$

b] Probability that Jerry was at the bank, and Susan wasn't

$$P(J/\bar{S}) = \frac{P(J \cap S')}{P(S')} = \frac{P(J) - P(J \cap S)}{P(S')}$$

$$= \frac{0.2 - 0.08}{1 - 0.3}$$

$$= 12/70$$

$$\Rightarrow 0.171 \Rightarrow \underline{17.1\%}$$

c] $\frac{P(J \cap S)}{J \cup S} = \frac{P((J \cap S) \cap (J \cup S))}{P(J \cup S)}$

$= \frac{P(J \cap S)}{P(J) + P(S) - P(J \cap S)}$

$\Rightarrow \frac{0.08}{0.2 + 0.3 - 0.08} \Rightarrow \frac{0.08}{0.42}$

$\Rightarrow 0.19 \Rightarrow \underline{19\%}$

Homework 1.2

a] $P(\text{Harold}) - P(\text{Harold} \cap \text{Sharon})$

$P(H) = 80\%$

$P(S) = 90\%$

$P(H \cup S) = 91\%$

$P(H \cap S) = 0.8 + 0.9 - 0.91 = 0.79$

$\therefore 0.8 - 0.79 \Rightarrow \underline{0.01}$

$\Rightarrow \underline{1\%}$

b] $P(S) - P(H \cap S)$

$= 0.9 - 0.79$

$= 0.11 \Rightarrow$ 11%

c] $P(\overline{H \cup S})$

$\therefore 1 - 0.91 \Rightarrow 0.09 \Rightarrow$ 9%

Homework 1.3

for the event to be independent, the intersection should be equal to the Product of the Individual Probability ie Sino Jeery goes to the bank 20% and Sesan goes to the bank 30%, $20 \times 30 = 60\%$ which is not equal to 8% $\therefore$ they are not Independent

Homework 1.4

a]

$P(\text{Sum is 6 and Second die is 5}) = P(\text{Sum is 6}) \times P(\text{Second die is 5})$

$\therefore P(\text{Sum is 6}) = \frac{5}{36}$ $P(\text{Second die is 5}) = \frac{6}{36}$

$P(\text{sum is 6 and Second die is 5}) = \frac{1}{36}$

$\therefore \frac{5}{36} \times \frac{6}{36} = \frac{5}{216} \therefore \neq \frac{1}{36} \therefore$ Not Independent

b] $P(\text{Sum is } 7) = \frac{6}{36}$ $\quad P(\text{first die is } 5) = \frac{6}{36}$

$P(\text{Sum is 7 and first die is 5}) = \frac{1}{36}$

$\therefore \frac{6}{36} \times \frac{6}{36} = \frac{1}{36}$

$\therefore$ they are Independent

Homework 1.5

Choice $\quad 100 - 60 - 10 = 30$

$P(TX) = 60\%$ $\quad P(NJ) = 10\%$ $\quad P(AK) = 30\%$

Oil

$P(TX) = 30\%$ $\quad P(NJ) = 10\%$ $\quad P(AK) = 20\%$

1] $P(oil) = P(oil/Tx) \times P(Tx) + P(oil/NJ) \times P(NJ) + P(oil/AK) \times P(AK)$

$= 0.30 \times 0.60 + 0.10 \times 0.10 + 0.20 \times 0.30$

$= 0.25$

$\therefore$ 25%

2] Found oil in TX

$= \frac{P(\text{Choice TX} \times \text{Oil TX})}{P(\text{found oil})}$

$= \frac{0.30 \times 0.60}{0.25} \Rightarrow \frac{0.18}{0.25} \Rightarrow 0.72 = 72\%$

Homework 1.6

1] P (did Not Survive) = $\frac{1490}{2201}$ = 0.677 ⇒ 67.7%

2] P(Staying in First Class) = $\frac{325}{2201}$ = 0.148 ⇒ 14.8%

3] P(First Class / Survived) = $\frac{P(\text{First Class} \cap \text{Survive})}{P(\text{Survive})}$

= $\frac{203}{711}$ ⇒ 0.285

⇒ 28.5%

4] P (survived) = 1 − 0.677 ⇒ 0.323 ⇒ 32.3%

P (First Class) = 14.8%

∴ ~~0.323 × 14.8 =~~

0.32 × 0.14 = 4.78%

P (First Class ∩ Survive) = $\frac{203}{2201}$ = 9.22%

∴ they are not independent.

5] P(Child in first Class / Survived)

$$\frac{P(\text{First Class} \cap \text{Child} \cap \text{Survived})}{P(\text{Survived})}$$

$$\Rightarrow \frac{6}{711} = 0.0084$$

$$\Rightarrow 0.84\ \%$$

6] $P(\text{adult} / \text{Survived}) = \frac{P(\text{Adult} \cap \text{Survived})}{P(\text{Survived})}$

$$\Rightarrow \frac{654}{711}$$

$$\Rightarrow 0.919 \Rightarrow 91.9\ \%$$

7] $P(\text{adult} \cap \text{First}) = \frac{197}{2201} = 0.089$

$P(\text{child} \cap \text{first}) = \frac{6}{2201} = 0.0027$

$P(\text{first class}) = 203/2201 = 0.092$

$P(\text{adult}) = 654/2201 = 0.297$

$P(\text{Child}) = 57/2201 = 0.025$

$P(\text{child}) \times P(\text{First}) = \frac{57}{2201} \times \frac{203}{2201} = 0.0023$

$P(\text{adult}) \times P(\text{first}) = \frac{197}{2201} \times \frac{203}{2201} = 0.008$

$P(\text{adult} \cap \text{first})$ is not equal to $P(\text{adult}) \times P(\text{first})$
and $P(\text{child} \cap \text{first})$ is not equal to $P(\text{child}) \times P(\text{first})$

age and staying in the first class Not Independent