CS 513 : KDDM HOMEWORK 1

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1) Jerry & Susan have a joint bank account.
Jerry goes to the bank 20% of the days.
Susan goes there 30% of the days.
Together they are at the bank 8% of the days.

a) Susan was at the bank last monday. What's the probability that Jerry was there too?

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

$$= \frac{8}{30}$$

$$= 0.266$$

$$= \boxed{26.66\%}$$

b) Last friday, Susan wasn't at the bank. What is the probability that Jerry was there?

$$\Rightarrow P(\text{Jerry} \mid \text{Susan}') = \frac{P(\text{Jerry} \cap \text{Susan}')}{P(\text{Susan}')}$$

$$= \frac{12}{70}$$

$$= \boxed{17.14\%}$$

c) Last Wednesday atleast one of them was at the bank. What is the probability that both of them were there?

$$\Rightarrow P(\text{Jerry} \mid \text{Susan}) = \frac{P(\text{Jerry} \cap \text{Susan})}{P(\text{Jerry} \cup \text{Susan})}$$

$$= \frac{8}{42}$$

$$= \boxed{19.04\%}$$

1.2] Harold & Sharon are studying for a test. Harold's chances of getting a 'B' are 80%. Sharon's chances of getting a 'B' are 90%. The probability of atleast one of them getting a 'B' is 91%.

a) What is the probability of that only Harold gets 'B'?

$\Rightarrow P(\text{only Harold}) = P(\text{Harold}) - P(\text{Harold} \cap \text{Sharon})$

$= 80 - 79$

$= \boxed{1\%}$

b) What is the probability that only Sharon gets 'B'?

$\Rightarrow P(\text{only Sharon}) = P(\text{Sharon}) - P(\text{Harold} \cap \text{Sharon})$

$= 90 - 79$

$= \boxed{11\%}$

c) What is the probability that both won't get a 'B'?

$\Rightarrow P(\text{Harold} \cap \text{Sharon})' = 100 - P(\text{Harold} \cap \text{Sharon})$

$= 1 - 0.91$

$= 0.09$

$= \boxed{9\%}$

1.3] Jenny & Susan have a joint bank account.
Jenny goes to the 20% of the days.
Susan goes there 30% of the days.
Together they are at the bank 8% of the days.
Are the events 'Jenny is at the bank' and 'Susan is at the bank' independent?

⇒ Both Jenny & Susan go to the bank 8% of days.
If the events were independent the individual parameters of going together if calculated product would be similar. But,

$$20 \times 30$$

∴ The events are not independent.

1.4] You roll 2 dice

a) Are the events 'the sum is 6' and 'the second die shows 5' independent?

⇒ If those events are independent -

P(second dice = 5 & sum = 6) =
P(sum = 6) * P(second dice = 5)

$\frac{5}{36} * \frac{6}{36} = \frac{1}{36}$ which is not equal

Thus, both events are not independent.

b) Are the events 'the sum is 7' and 'the first die shows 5' independent?

⇒ If these events are independent.

P(first dice = 5 & sum = 7) =
P(sum = 7) * P(first dice = 5)

1/36 *= 6/36 * 6/36

As both events are equal, events are independent.

1.5] An oil company is considering drilling in either TX, AK & NJ. The company may operate in only one state. There is 60% chance the company will choose TX & 10% chance - NJ There is 30% chance of finding oil in TX, 20% - in AK & 10% in NJ.

a) What the probability of finding oil?

⇒ For TX, $P(\text{Oil} \mid \text{Tx}) * P(\text{Tx}) = 30\% * 60\% = 18\%$

For AK, $P(\text{Oil} \mid \text{AK}) * P(\text{AK}) = 20\% * 30\% = 6\%$

For NJ, $P(\text{Oil} \mid \text{NJ}) * P(\text{NJ}) = 10\% * 10\% = 1\%$.

∴ probability of finding oil

$= 18\% + 6\% + 1\%$

$= \boxed{25\%}$.

b) The company decided to drill and found oil what is the probability that they drilled in TX?

$$P(\text{Tx} \mid \text{oil}) = \frac{P(\text{Tx} \cap \text{Oil})}{P(\text{Oil})} = \frac{18}{}$$

$$= \boxed{72\%}.$$

1.6

a) What is the probability that a passenger did not survive?

$\Rightarrow P(\text{not survived}) = \frac{1490}{2201} = \boxed{67.69\%}$

b) What is the probability that a passenger was staying in the first class?

$\Rightarrow P(\text{First class}) = \frac{325}{2201} = \boxed{14.76\%}$

c) $P(\text{Survived} \cap \text{First class}) = \frac{203}{711}$

$= \boxed{28.5\%}$

d) Are survival & staying in first class independent?

$\Rightarrow P(\text{survived}) = \frac{711}{2201} = 32.30\%$.

$P(\text{First class}) = 14.76$

$P(\text{Survived} \cap \text{First class}) = \frac{203}{711} = 28.55\%$

As $28.55\% \neq 14.76\%$.

Hence, surviving & staying in first class are not independent.

e) Given that a passenger survived, what is the probability that the passenger was staying in the first class & the passenger was a child?

$\Rightarrow P(\text{survived} \cap \text{first class} \cap \text{child})$

$= \frac{6}{711}$

$= \boxed{0.84\%}$

f) Given that a passenger survived, what is the probability that the passenger was an adult?

$\Rightarrow P(\text{survived} \cap \text{Adult}) = \frac{654}{711}$

$= \boxed{91.98\%}$

g) Given that a passenger survived, are age & staying in the first class independent?

$\Rightarrow P(\text{survived} \cap \text{Adult}) = 91.98\%$

$P(\text{survived} \cap \text{first class}) = 28.55\%$

$P(\text{survived} \cap \text{Adult} \cap \text{first class}) = \frac{197}{711} = 27.70\%$

$27.70 \neq P(\text{Survived} \cap \text{Adult}) \times P(\text{survived} \cap \text{First Class})$

$27.70 \neq 26.26\%$

∴ They are not independent.