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• Pg:- 51

Q1) 2.23

Ans) By Rolling a die can land in $n_1 = 6$

A Letter can be selected in $n_2 = 26$

The Rule of multiplication gives $= n_1 n_2$

$\Rightarrow 6 \times 26$

$\Rightarrow 156$

S in points $= 156$

Q2) 2.25

Ans) A certain brand of shoes comes in $n_1 = 5$

Each style Available in $n_2 = 4$

The Rule of multiplication gives $\Rightarrow n_1 \times n_2$

$\Rightarrow 4 \times 5$

$\Rightarrow 20$

The store have on display is:- 20

Q3) 2.47

Ans) No of candidate to select = 3

equally qualified recent graduate = 8

Lets Consider $n = 8$; $r = 3$

$$\boxed{{}^{n}C_{r} = \frac{n!}{r!(n-r)!}}$$

$${}^{8}C_{3} = \frac{8!}{3!(8-3)!}$$

$$= \frac{8!}{3!(5)!}$$

$$= \frac{8 \times 7 \times 6 \times \cancel{5!}}{3!\ \cancel{5!}} = \frac{8 \times 7 \times 6}{3!} = \frac{8 \times 7 \times 6}{3 \times 2 \times 1} = \frac{336}{6} = 56$$

There are 56 times to select the candidates.

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Q4) 2.49

a) Ans) Let us consider some following events

Let 'x' Automobile Salesperson will sell 0 cars on any given day

Let 'y' Automobile salesperson will sell 1 cars on any given day

Let 'z' Automobile sales person will sell 2 cars on any given day

Let 'o' Automobile sales person will sell 3 cars on any given day

They Provided the information

$P(x) = 0.19 \quad P(y) = 0.38 \quad P(z) = 0.29 \quad P(0) = 0.15$

The sum of probability must be in between 0 ~~and~~ to 1

$\Rightarrow P(x) + P(y) + P(z) + P(0)$

$\Rightarrow 0.19 + 0.38 + 0.29 + 0.15$

$\Rightarrow 1.01 \Rightarrow 1.01$ which is greater than 1

b) Ans) Lets Consider the events

The probability that it will Rain tomorrow Consider 'x' event

The Probability that it will not Rain tomorrow Consider 'y' events

Given $P(x) = 0.40$

$P(y) = 0.52$

The Sum of Probability should be in between 0 to 1

$\Rightarrow P(x) + P(y)$

$\Rightarrow 0.40 + 0.52$

$\Rightarrow 0.92$ which is less than 1

Sum of probability is less than 1, So given statement is true.

c) Ans) Lets Consider ~~the~~ probabilities

$P(0), P(1), P(2), P(3), P(4)$

$P(0) = 0.19$, $P(1) = 0.34$, $P(2) = -0.25$, $P(3) = 0.43$, $P(4) = 0.29$

Now if you see the $P(2) = -0.25$ the probability can't be the negative.

Rule $0 \leq P(x) \leq 1$

$P(2) = -0.25$ (A negative probability)

d) Ans) Lets consider "x" for single drawn deck of cards selecting a heart is $1/4$ $P(A) = 1/4$

Lets consider "y" for single drawn deck of cards selecting a black card is $1/2$ $P(B) = 1/2$

The combination of both heart & black cards is $P(A \cap B) = \frac{1}{8}$

$\Rightarrow$ The given two events are disjoint, is 1 is black card other is hearts

$P(A \cap B) = 0 \neq \frac{1}{8}$

$\Rightarrow$ probability of both a heart and black card is zero

2 53) Q5)

Ans) Consider events

The probability that an American industry will locate in Shanghai, china $\Rightarrow P(S) = 0.7$

The probability that an American industry will locate in Beijing, china $\Rightarrow P(B) = 0.4$

The probability that it will locate in either shanghai or Beijing $P(S \cup B) = 0.8$

a) in Both cities?

$P(S \cap B) = P(S) + P(B) - P(S \cup B)$

$= 0.7 + 0.4 - 0.8$

$\boxed{P(S \cap B) = 0.3}$

b) in neither city?

$P(S' \cap B') = 1 - P(S \cup B)$

$= 1 - 0.8$

$\boxed{P(S' \cap B') = 0.2}$

Q6) 2.63

Ans) Lets Consider Events

Probability of Adult bedrooms $= P(X) = 0.03$

Probability of Child bedrooms $: P(Y) = 0.15$

probability of other bedrooms $= P(Z) = 0.14$

Probability of office or den $= P(D) = 0.40$

Probability of other Rooms $= P(R) = 0.28$

a) probability that pc's in bed Rooms $\Rightarrow P(X) + P(Y) + P(Z)$

$\Rightarrow 0.03 + 0.15 + 0.14$

$\boxed{\Rightarrow 0.32}$

probability thats pc's in bed Rooms 0.32

b) probability thats pc's not in a bed Room

probability that pc's not in a bed Room = 1 - probability that pc's in bed Room

$= 1 - 0.32$

$= 0.68$

c) we got probability that pc's in bed Rooms $= 0.32$

we got probability that pc's not in bed Rooms $= 0.68$

$\therefore$ The probability Room would I expect to find a pc is

$\boxed{\text{office or den}}$ the even $\boxed{P(D)}$

Pg 69 :-

2.73 Q.)

Ans) Given events

The event that a Convict Committed armed Robbery => $p(R)$

The event that a Convict pushed dope => $p(D)$

a) $p(R/D)$

∴ The probability that a convict who pushed dope, also Committed armed robbery.

b) $p(D'/R)$

∴ The probability that a Convict who Committed armed robbery, did not push dope.

c) $p(R'/D')$

∴ The probability that a convict who did not push dope also did not Commit armed robbery.

Q8) 2.83

Ans) Consider the events

The vehicle is a camper probability is $P(A)$

The probability that the vehicle has Canadian license plate is $P(B)$

The probability ~~entering~~ the Luray Caverns

a) Given to find camper entering the Luray Caverns has Canadian license plate,

$$\boxed{P(B|A) = \frac{P(A \cap B)}{P(A)}}$$

Given $P(A) = 0.\cancel{1}28$ $P(B) = \frac{0.12}{\cancel{0.28}}$, $P(A \cap B) = 0.09$

$$P(B/A) = \frac{P(A \cap B)}{P(A)} = \frac{0.09}{0.\cancel{1}28} = \frac{9}{28}$$

$$\boxed{a)\ P(B/A) = \frac{9}{28}}$$

b) A vehicle with Canadian license plates entering the Luray Caverns is a camper

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{(0.09)}{(0.12)} = \frac{3}{4}$$

$$\boxed{P(A/B) = 3/4}$$

c) A vehicle entering the Luray Can very does not have Canadian plates or is not a Campy.

$P(B' \cup A') = 1 - P(A \cap B)$

$= 1 - 0.09$

$\boxed{P(B' \cup A') = 0.91}$

Q9) 2.89

Ans) Given that two five engines operating independently.

The probability of 1st specific engine Available is $P(A) = 0.96$

$P(A') = 1 - 0.96$

$\boxed{P(A') = 0.04}$

The probability of 2nd specifice engine Available is $P(B) = 0.96$

$P(B') = 1 - 0.96$

$= 0.04$

a) That neither is Available when needed $= P(A' \cap B') = P(A') \times P(B')$

$= 0.04 \times 0.04$

$\boxed{P(A' \cap B') = 0.016}$

(b) The probability that a fire engine is Available when needed is $p(C) = 1 - P(A' \cap B')$

$= 1 - 0.016$

$\boxed{P(C) = 0.9984}$

Pg :- 76

Q.) 2.95

Ans) Given that An Adult over 40 years of age with cancer $p(c) = 0.05$

$p(c')$ => does not have the Cancer

$p(c') = 1 - p(c)$

$= 1 - 0.05$

$\boxed{P(c') = 0.95}$

The Probability of a doctor Correctly diagnosing a cancer person having a disease is 0.78

=> $p(D|c) = 0.78$

The probability of incorrectly diagosing a person without Cancer as having disease = 0.06

$$P(D/c') = 0.06$$

To find probability of adult over 40 years age is diagnosed as having cancer => $P(D) = ?$

$$P(C/D) = \frac{P(D/C)\,P(C)}{P(D/C)\,P(C) + P(D/C')\,P(C')}$$

$$= \frac{(0.78)(0.05)}{(0.78)(0.05) + (0.06)(0.95)}$$

$$= \frac{0.039}{0.096}$$

$$\boxed{P(C/D) = 0.40625}$$

$$P(D) = P(C \cap D) + P(C' \cap D)$$

$$= (0.05)(0.78) + (0.95)(0.06)$$

$$\boxed{P(D) = 0.096}$$

Q.) 2.97)

Ans Refer Values and events are Refer from 2.95

$P(c) = 0.05$

$P(c') = 1 - 0.05$

$\boxed{P(c') = 0.95}$

We Known that $P(D|c) = 0.78$

We Known that $P(D|c') = 0.06$

$$P(c|D) = \frac{P(c \cap D)}{P(D)}$$

$$= \frac{0.039}{0.096}$$

$$\boxed{P(c|D) = 0.040625}$$

The probability of person diagnosed as having cancer Actually has the disease is 0.040625

Q_{12}) 2.99

Ans) Consider events

Let John is be $= B_1$

Let Tom is be $= B_2$

Let Jeff is be $= B_3$

Let Pat is be $= B_4$

events $\bar{x}$ is does not expiry date

$p(B_1) = 0.2$

$p(B_2) = 0.6$

$p(B_3) = 0.15$

$p(B_4) = 0.05$

(i) $p(\cancel{A}X/B_1) = \frac{1}{100}$; stamps 20% of packages fail to stamp an expiration date in 200 packay

(ii) Jeff, stampts 15% of packags fails to stamp expiration date in 200 packags $\Rightarrow$ $p(x/B_2) = 1/200$

(iii) ~~pat who sta~~ $p(x/B_3) = 1/90$

(iv) $p(X/B_4) = 1/200$

$\therefore$ probability is at the package that does not show expiration date which was done by "John".

$$P(B_1/x) = \frac{P(x/B_1)\,P(B_1)}{\Sigma_i\, P(x/B)\,P(B)}$$

$$= \frac{(1/200)\,(0.2)}{(1/200)\,(0.2) + (1/100)\,(0.6) + (1/90)(\cancel{0.45}) + \frac{1}{200}\,(0.09)}$$

$$\boxed{P(B_1/x) = 0.1124}$$

$\therefore$ probability that was inspected by John is $\boxed{0.1124}$

Chapter:- 2 Formulae Sheet

→ Bayes's Rule Allow us to find the Conditional Probability that (B_1 or B_2 or B_3) given that A has occurs

$$P(B_1/A) = \frac{P(B_1 \cap A)}{P(A)} = \frac{P(A/B_1)\,P(B_1)}{P(A/B_1)\,P(B_1) + P(A/B_2)\,P(B_2) + P(A/B_3)\,P(B_3)}$$

$$= \frac{P(A/B_1)\,P(B_1)}{\sum_{i=1}^{3} P(A/B_i)\,P(B_i)}$$

→ $A \cap B = B \cap A$

→ $A \cap A = A$

→ $A \cap S = A$

→ $A \cap \phi = \phi$

→ $A \cap A' = \phi$

→ $A \cap (B \cap C) = (A \cap B) \cap C$

→ $(A \cap B)' = A' \cup B'$

→ $A \cup B = B$

→ $A \cup A = A$

→ $A \cup \phi = A$

→ $A \cup A' = S$

→ $A \cup (B \cup C) = (A \cup B) \cup C$

→ $(A \cup B') = A' \cap B'$

Law of Probability

$$P(A) = P(A \cap B_1) + P(A \cap B_2) + P(A \cap B_3)$$

$$= P(A/B_1)\,P(B_1) + P(A/B_2)\,P(B_2) + P(A/B_3)\,P(B_3)$$

$$P(A) = \sum_{j=1}^{k} P(A/B_j)\,P(B_j)$$

$$P(B_r/A) = \frac{P(A/B_r)\,P(B_r)}{\sum_{i=1}^{k} P(A/B_i)\,P(B_i)}$$

$\rightarrow$ $${}^{n}P_{r} = \frac{n!}{(n-r)!}$$

$\rightarrow$ $${}^{n}C_{r} = \frac{n!}{r!\,(n-r)!}$$

$\rightarrow$ $$P(C/A \cap B) = \frac{P(A \cap B \cap C)}{P(A \cap B)}$$

$\rightarrow$ $$P(A \cup B/C) = P(A/C) + P(B/C) - P(A \cap B/C)$$

$\rightarrow$ $$P(A/F) = \frac{P(A \cap F)}{P(F)}$$

$\rightarrow$ $$P(A/F) = \frac{P(F/A)\,P(A)}{P(F)}$$