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Section: 10

Course : STA201

Assignment: 4

Ans to the Q. N. 1

A dice has 6 digits. They are: 1, 2, 3, 4, 5, 6.

For a pair of dice,

	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

(a)

For sum of 8,

the events are = $\{(2,6), (3,5), (4,4), (5,3), (6,2)\}$

$\therefore$ Probablity of getting 8 as a sum = $\frac{5}{36}$

(Ans)

(b)

for a doublet,

Events are = $\{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$

$\therefore$ Probablity of a doublet = $\frac{6}{36} = \frac{1}{6}$

(c)

Events for sum greater than 5 are $= \{(1,5),$
$(1,6), (2,4), (2,5), (2,6), (3,3), (3,4), (3,5), (3,6),$
$(4,2), (4,3), (4,4), (4,5), (4,6), (5,1), (5,2), (5,3),$
$(5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4),$
$(6,5), (6,6)\}$

$\therefore$ Probablity of sum greater than $5 = \frac{26}{36} = \frac{13}{18}$

(Ans)

(d)

Events for sum less than $4 = \{(1,1), (1,2),$
$(2,1)\}$

Events for sum greater than $8 = \cancel{\{(6,3)}\ \{(3,6),$
$(4,5), (4,6), (5,4), (5,5), (5,6), (6,3), (6,4),$
$(6,5), (6,6)\}$

$\therefore$ Probablity of getting a sum less than 4 or greater than 8 $= \frac{3+10}{36}$

$= \frac{13}{36}$

(Ans)

(e)

Events where even numbers are on the first dice are = {(2,1), (2,2), (2,3), (2,4) (2,5), (2,6), (4,1), (4,2), (4,3), (4,4), (4,5) (4,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)}

$\therefore$ Probablity of getting an even number on the first dice is $= \frac{18}{36} = \frac{1}{2}$

(Ans)

(f)

Events where one dice is odd and another is even are $= \{(1,2), (1,4), (1,6), (2,1), (2,3), (2,5), (3,2), (3,4), (3,6), (4,1), (4,3), (4,5), (5,2), (5,4), (5,6), (6,1), (6,3), (6,5)\}$

$\therefore$ Probablity of getting one even and another odd is $= \frac{18}{36} = \frac{1}{2}$

(Ans)

(g)

Events where there are atleast one 6 are $= \{(1,6), (2,6), (3,6), (4,6), (5,6), (6,6), (6,1), (6,2), (6,3), (6,4), (6,5)\}$

$\therefore$ Probablity of getting atleas one 6 is $= \frac{11}{36}$

(h)

Events where there are at least one 6, if the two faces are different are = {(1, 6), (2, 6), (3, 6), (4, 6), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5)}

∴ Probablity of getting at least one 6, if ~~b~~ the two faces are different $= \frac{10}{36}$

$= \frac{5}{18}$

Ans to the Q: N: 2

(a)

(i)

From 1 to 30, there are 15 even numbers.

As two balls are drawn from the bag with replacement, for each draw, the probablity of success is $= \frac{15}{30} = \frac{1}{2}$

$\therefore$ for two successes the probablity is $= \frac{1}{2} \times \frac{1}{2}$

$= \frac{1}{4}$

(Ans)

(ii)

For exactly one success, there can be two events. Either the first ball is success or the second ball is success.

Probality of not getting a success in each draw $= \frac{15}{30} = \frac{1}{2}$

$\therefore$ Probability of getting exactly one success $= \left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right)$

$= \frac{1}{4} + \frac{1}{4}$

$= \frac{1}{2}$

(~~e~~) (iii)

For atleast one success, there can be 3 different events. Success in the first draw on the second draw on both draw.

$\therefore$ probablity of at least one success $= \left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right) + \left(\frac{1}{2} \times \frac{1}{2}\right)$

$= \frac{3}{4}$ (Ans)

(iv)

Probablity of getting no success $= \left(\frac{1}{2} \times \frac{1}{2}\right)$

$= \frac{1}{4}$

(Ans)

(b)
(i)

Here, two balls are drawn without replacement.

Probability of success or fail in the first draw $= \frac{15}{30} = \frac{1}{2}$

$\therefore$ Probablity of two success $= \frac{1}{2} \times \frac{14}{29}$

$= \frac{7}{29}$

(Ans)

(ii)

Probablity of exactly one success

$= \left(\frac{1}{2} \times \frac{15}{29}\right) + \left(\frac{1}{2} \times \frac{15}{29}\right)$

$= \frac{15}{29}$ (Ans)

(iii)

Probablity of atleast one success $= \left(\frac{1}{2} \times \frac{15}{29}\right) + \left(\frac{1}{2} \times \frac{15}{29}\right) + \left(\frac{1}{2} \times \frac{14}{29}\right)$

$= \frac{22}{29}$

(Ans)

(iv)

Probablity of no success $= \left(\frac{1}{2} \times \frac{14}{29}\right)$

$= \frac{7}{29}$

(Ans)

Ans to the Q: N: 3

A = sum of six sided dices

B = sum of four sided dices

Sample space for four sided dice and six sided dices ~~a it~~ is given below.

	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

Now, $12 = 1 \times 12$

$= 2 \times 6$

$= 3 \times 4$

A or B ~~an~~ cannot be 1 or 12.

A and B can be 2, 3, 4 or 6.

When $A = 2$, events are $\{(1,1)\}$

$A = 3$, " " $\{(1,2), (2,1)\}$

$A = 4$, " " $\{(1,3), (2,2), (3,1)\}$

$A = 6$, " " $\{(1,5), (2,4), (3,3), (4,2), (5,1)\}$

When $B = 2$, events are $\{(1,1)\}$

$B = 3$, " " $\{(1,2), (2,1)\}$

$B = 4$, " " $\{(1,3), (2,2), (3,1)\}$

$B = 6$, " " $\{(2,4), (3,3), (4,2)\}$

A	B	Probablity
2	6	$\frac{1}{36} \times \frac{3}{16} = \frac{1}{192}$
3	4	$\frac{2}{36} \times \frac{3}{16} = \frac{1}{96}$
4	3	$\frac{3}{36} \times \frac{2}{16} = \frac{1}{96}$
6	2	$\frac{5}{36} \times \frac{1}{16} = \frac{5}{576}$
		Sum $= \frac{5}{144}$

$\therefore$ Probablity that the product of A and B is 12 will be $\frac{5}{144}$ (Ans)

Ans to the Q: N: 4

Probablity of photography = $\frac{48}{250}$

Probablity of swimming = $\frac{34}{250}$

Probablity of both = $\frac{12}{250}$

∴ Probablity of enrolling in atleast one class = $\frac{48}{250} + \frac{34}{250} - \frac{12}{250}$

∴ Probablity of not enrolled in any class = $1 - \left(\frac{48}{250} + \frac{34}{250} - \frac{12}{250}\right)$

$= \frac{18}{25}$ (Ans)

Ans to the Q: N: 5

Let, problity of high blood pressure = P(BH)

Probablity of choosing meditation = P(M)

Probablity of choosing drugs = P(D)

Given,

$P(BH) = 0.6$

$P(M) = 0.5$

$P(D) = 0.5$

Meditation reduces risk by 45%. So, the risk is 55% if one choose meditation.

$\therefore P(B|M) = 0.6 \times 0.55$

$= 0.33$

Drug reduces risk by 55%. So, the risk is 45%.

$\therefore P(B|D) = (0.6 \times 0.45)$

$= 0.27$

$\therefore$ Probablity of high blood pressure after choosing any of the method,

$P(B) = P(B|M) \times P(M) + P(B|D) \times P(D)$

$= (0.33 \times 0.5) + (0.27 \times 0.5)$

$= 0.3.$

∴ Probablity of choosing medication when patient does not have high blood pressure,

$$\therefore P(M \mid B') = \frac{P(B' \mid M) \times P(M)}{P(B')}$$

$$= \frac{(1-0.33) \times 0.5}{1-0.3}$$

$$= \cancel{0.489}$$

$$= 0.4786$$

(Ans)

Ans to the Q: N: 6

Probablity of Red ball from Bag A,

$P(R_A) = \frac{6}{13}$

Probablity of Black ball from Bag B,

$P(R'_A) = \frac{7}{13}$

Let, Probablity of black ball from Bag B = $P(B_B)$

∴ Probablity of a black ball from Bag B after a red ball is trarfenned,

$$P(B_B \mid R_A) = \frac{6}{15+1} = \frac{\cancel{6}\,6}{16}$$

$\therefore$ Probablity of black ball from bag B, when the trarfenned ball is Black,

$$P(B_B \mid R_A') = \frac{7}{16}$$

$\therefore$ Probablity of black ball from Bag B,

$$P(B_B) = P(B_B \mid R_A) \times P(R_A) + P(B_B \mid R_A') \times P(R_A')$$

$$= \left(\frac{6}{16} \times \frac{6}{13}\right) + \left(\frac{7}{16} \times \frac{7}{13}\right)$$

$$= \frac{85}{208}$$

$\therefore$ Probablity of black ~~ball~~ ball from Bag B when transferred,

$$P(R_A | B_B) = \frac{P(B_B | R_A) \times P(R_A)}{P(B_B)}$$

$$= \frac{\frac{6}{16} \times \frac{6}{13}}{\frac{85}{208}}$$

$$= \frac{36}{85}$$

(Ans)

Ans to the Q: N: 7

Let,

Probablity of two headed coin = P(A)

Probablity of fair coin = P(B)

Probablity of biased coin = P(C)

Probablity of getting head = P(H)

$P(A) = P(B) = P(C) = \frac{1}{3}$

$\therefore P(H \mid A) = \frac{2}{2} = 1$

$\therefore P(H \mid B) = \frac{1}{2}$

$\therefore P(H \mid C) = \frac{3}{4}$

$\therefore P(H) = P(H|A) \times P(A) + P(H|B) \times P(B)$
$+ P(H|C) \times P(C)$

$= 1 \times \frac{1}{3} + \frac{1}{2} \times \frac{1}{3} + \frac{3}{4} \times \frac{1}{3}$

$= \frac{3}{4}$.

$\therefore$ Probablity of a head when it is a two heades ~~cor~~ coin,

$$P(A|H) = \frac{P(H|A) \times P(A)}{P(H)}$$

$$= \frac{\frac{1}{3} \times 1}{\frac{3}{4}}$$

$$= \frac{4}{9}$$

(Ans)