BRAC UNIVERSITY

STA201

Elements of Statistics and Probability

Assignment 4

Student Information:
Name: Md. Danial Islam ID: 20101534
Section: 01

Date: 10 December 2021

ID: 20101534

Date: ...../...../.....

STA 201 Assignment 4

[1] sample spaces, $S = \{$

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

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

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

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

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

$(6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$

(a) $E = \{(2,6), (3,5), (4,4), (5,3), (6,2)\}$

So, $P(\text{A sum of } 8) = P(E) = \frac{n(E)}{n(S)} = \frac{5}{36}$

(b) $E = \{(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)\}$

So, $P(\text{A doublet}) = P(E) = \frac{n(E)}{n(S)} = \frac{6}{36} = \frac{1}{6}$

Protivas

Date :...../...../.....

(c) $E = \{(1,5),(1,6),(2,4),(2,5),(2,6),(3,3),(3,4),$
$(3,5),(3,6),(4,2),(4,3),(4,4),(4,5),$
$(4,6),(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),$
$(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

$\therefore P(\text{a sum greater than } 5) = P(E) = \frac{n(E)}{n(S)}$

$= \frac{26}{36} = \frac{13}{18}$

(d) $E = \{(1,1),(1,2),(2,1),(3,6),(4,5),(4,6),(5,4),$
$(5,5),(5,6),(6,3),(6,4),(6,5),(6,6)\}$

$P(\text{A sum less than 4 or greater than 8})$

$\Rightarrow P(E) = \frac{n(E)}{n(S)} = \frac{13}{36}$

(e) $E = \{(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(4,1),(4,2),$
$(4,3),(4,4),(4,5),(4,6),(6,1),(6,2),(6,3),$
$(6,4),(6,5),(6,6)\}$

$P(\text{An even number on the 1st die}) = P(E) = \frac{n(E)}{n(S)}$

$= \frac{18}{36} = \frac{1}{2}$

Date :...../...../.....

(f) $E = \{(1,2),(1,4),(1,6),(2,1),(2,3),(2,5),(3,2),(3,4),(3,6),(4,1),(4,3),(4,5),(5,2),(5,4),(5,6),(6,1),(6,3),(6,5)\}$

P(An odd number on one and an even number on the other) $= P(E) = \frac{n(E)}{n(S)} = \frac{18}{36} = \frac{1}{2}$

(g) $E = \{(1,6),(2,6),(3,6),(4,6),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

P(At least one 6) $= P(E) = \frac{n(E)}{n(S)} = \frac{11}{36}$

(h) $E = \{(1,6),(2,6),(3,6),(4,6),(5,6),(6,1),(6,2),(6,3),(6,4),(6,5)\}$

P(At least one 6, if the two faces are different)

$\Rightarrow P(E) = \frac{n(E)}{n(S)} = \frac{10}{36} = \frac{5}{18}$

— o —

Date :...../...../.....

2 (a) As two balls are drawn with replacement then total number of even balls and total numbers of ball will not be changed.

(i) From 1 to 30 there are 15 even number.

$$P(\text{Two success}) = \frac{15}{30} \times \frac{15}{30} = \frac{1}{4} = 0.25$$

(ii) Case 1: 1st one is success and second one is failure.

$$\Rightarrow \frac{15}{30} \times \frac{15}{30}$$

Case 2: 1st one is failure and second one is success.

$$\Rightarrow \frac{15}{30} \times \frac{15}{30}$$

$$P(\text{exactly one success}) = \frac{15}{30} \times \frac{15}{30} + \frac{15}{30} \times \frac{15}{30}$$

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

$$\Rightarrow \frac{2}{4} = 0.5$$

Protivas

Date :...../...../.....

(iii) Case 1: 1st success and 2nd failure

Case 2: 1st failure and 2nd success

Case 3: 1st Success and 2nd success

$$P(\text{at least one success}) = \frac{15}{30} \times \frac{15}{30} + \frac{15}{30} \times \frac{15}{30} + \frac{15}{30} \times \frac{15}{30}$$

$$= \frac{3}{4} = 0.75$$

(iv) If no success then both will be failure,

$$P(\text{No success}) = \frac{15}{30} \times \frac{15}{30}$$

$$= \frac{1}{4} = 0.25$$

(b) if without replacement the total ball will be decrease by one after each ball is drawn.

(i) $P(\text{two success}) = \frac{15}{30} \times \frac{14}{29} = \frac{7}{29}$

(ii) $P(\text{Exactly one success}) = \frac{15}{30} \times \frac{15}{29} + \frac{15}{30} \times \frac{15}{29}$

$$= \frac{15}{29}$$

Date :...../...../.....

(iii) P(at least one success)

$$\Rightarrow \left(\frac{15}{30} \times \frac{15}{29}\right) + \left(\frac{15}{30} \times \frac{15}{29}\right) + \left(\frac{15}{30} \times \frac{14}{29}\right)$$

$$\Rightarrow \frac{22}{29}$$

(iv) P(No success)

$$\Rightarrow \frac{15}{30} \times \frac{14}{30} = \frac{7}{29}$$

—o—

[3] Sample space is in the question no 1.

for rolling two regular six-sided dice

Sample space for rolling two 4 sided dice

(1,1), (1,2), (1,3), (1,4)
(2,1), (2,2), (2,3), (2,4)
(3,1), (3,2), (3,3), (3,4)
(4,1), (4,2), (4,3), (4,4)

Date : ...../...../.....

A = sum of two regular sided dice

B = sum of two 4 sided dice

we have to get $A \times B = 12$

Case 1 : $A = 2, B = 6$

Case 2 : $A = 3, B = 4$

Case 3 : $A = 4, B = 3$

Case 4 : $A = 6, B = 2$

Case 1 :

$$P(A=2) = \frac{1}{36} \qquad P(B=6) = \frac{3}{16}$$

as $E = \{1, 1\}$

as, $E = \{(2,4), (3,3), (4,2)\}$

Case 2 :

$$P(A=3) = \frac{2}{36} = \frac{1}{18} \qquad P(B=4) = \frac{3}{16}$$

as $E = \{(1,2), (2,1)\}$

as $E = \{(1,3), (2,2), (3,1)\}$

Case 3 :

$$P(A=4) = \frac{3}{36} = \frac{1}{12} \qquad P(B=3) = \frac{2}{16}$$

as $E = \{(1,3), (2,2), (3,1)\}$

as $E = \{(1,2), (2,1)\}$

Protivas

Date : ____/____/____

Case 4:

$P(A = 6) = \frac{5}{36}$ $\quad P(B = 2) = \frac{1}{16}$

$\therefore E = \{(1,5),(3,4),(3,3),(4,2),(5,1)\}$ or $E = \{(1,1)\}$

$$P = \frac{1}{36} \times \frac{3}{16} + \frac{2}{36} \times \frac{3}{16} + \frac{3}{36} \times \frac{2}{16} + \frac{5}{36} \times \frac{1}{16}$$

$$= \frac{5}{144} \text{ (Ans)}$$

4.

P(enrolled in photography) $= \frac{48}{250} = P(P)$

P(enrolled in swimming) $= \frac{34}{250} = P(S)$

P(both photography and swimming) $= \frac{12}{250} = P(P \cap S)$

enrolled in any classes $= 48 + 34 - 12$

$= 70$

$\therefore P(P \cup S) = \frac{70}{250}$

$\therefore$ Not enrolled in any $\therefore P(P \cup S)' = 1 - \frac{70}{250} = \frac{18}{25}$ (Ans)

Date :...../...../.....

5

Let, A = treated with meditation

B = treated with drugs

C = has high blood pressure.

given that,

$P(A) = P(B) = 0.5$ and $P(C) = 60\% = 0.6$

$P(C|A) = 0.6 \times 0.55$

$= 0.33$

also,

$P(C|B) = 0.6 \times .45$

$= 0.27$

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

$= (.33 \times .5) + (.27 \times .5) = 0.3$

$P(A|C') =$ given meditation and doesn't suffer from high blood pressure

$= \frac{P(C'|A) \times P(A)}{P(C')} = \frac{(1 - (P(C|A) \times P(A))}{1 - P(C)} = \frac{(1 - 0.33) .5}{1 - 0.3}$

$= \frac{67}{140} = 0.4786$ (Ans)

6 Bag A,

Red → 6

Black → 7

Bag B,

Red → 9

Black → 6

~~P(Black drawn) = $\frac{7}{13}$~~

P(Black transferred from A to B) = $\frac{7}{13}$

P(Red " " A to B) = $\frac{6}{13}$

Date :...../...../.....

P(Drawing black ball from Bag B when transferred ball is Red)

$$\Rightarrow \frac{6}{16}$$

P(Drawing black ball from Bag B when transferred ball is Black)

$$\Rightarrow \frac{7}{16}$$

P(transferred ball was Red)

$$\Rightarrow \frac{\frac{6}{16} \times \frac{6}{13}}{\frac{6}{16} \times \frac{6}{13} + \frac{7}{16} \times \frac{7}{13}}$$

$$\Rightarrow \frac{36}{85}$$

$$\Rightarrow 0.4235 \quad \text{(Ans)}$$

Date :...../...../.....

☒ Let,

A = two headed coin chosen

B = fair coin in chosen

C = biased coin in chosen

D = Head in shower.

Given that

$P(A) = P(B) = P(C) = \frac{1}{3} = 0.33$

P(getting head from the two headed coin)

$\Rightarrow P(D|A) = 1$

P(getting head from the fair coin)

$\Rightarrow P(D|B) = \frac{1}{2}$

P(getting Head from the baised coin)

$\Rightarrow P(D|C) = \frac{3}{4}$

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

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

Date : ...../...../.....

P(Head is chosen and two headed coin)

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

$$= \frac{1 \times \frac{1}{3}}{\frac{3}{4}} = \frac{4}{9} \text{ (Ans)}$$