PROBABILITY

1. An integer is chosen at random between 1 to 100. find the probability that it is
i) divisible by 8. ii) divisible by 6 or 8

2. A box contained card numbered 1 to 30. A card is drawn from the box at random. propability of getting a number on card is prime number?

3. Two fair dice are Thrown independently. For events A, B, C and D

A - Even face with first die
B - Even " " second die
C - sum of both dice is odd.
D - Product of the points on both the dice exceeds 20.

4. In a college, 60% of students in hostel and 40% are day scholar. Previous year report that 30% of all students in hostel scored A grade and 20% of day scholars scored A grade. At end of the year, one student is chosen at random and found that he/she has an A grade. probability that he is a hosteller?

5. Three person A, B and C apply for job of Manager in a pvt company. Chance of selection (A:B:C) is in ratio 1:2:4. The probability that A, B, C can introduce chance in improve profit of the company are 0.8, 0.5 and 0.3. If changes does not take place find the probability that it is due to the appointment of C.

6. The chances of X, Y, Z becoming manager are 4:2:3. The probability that bonus scheme will be introduced in the company if X, Y, Z become managers is 0.3, 0.7 and 0.8 respectively. If the Bonus scheme has introduced, what is the probability that the X has been appointed as Manager?

PROBABILITY

WORK SHEET

1) Total no. of integers = $N = 100$

i) Divisible by 8

$n(A)$ = Number of values divisible by 8

$n(A) = \{8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96\}$

$n(A) = 12$

$$P(A) = \frac{n(A)}{N} = \frac{12^{3}}{100_{25}} = \frac{3}{25}$$

$$\boxed{P(A) = 3/25}$$

∴ The probability of Numbers divisible by 8 is $\frac{3}{25}$.

ii) NOT divisible by 8

$n(B)$ = Number of value not divisible by 8

$n(B)$ = Total no. of integers - no. of values divisible by 8.

$= 100 - 12 \Rightarrow 88$

$$P(B) = \frac{n(B)}{N} = \frac{88}{100} \Rightarrow \boxed{\frac{22}{25}}$$

∴ The probability of Numbers not divisible by 8 is $\frac{22}{25}$

iii) Divisible by 6 or 8

$n(L)$ = Number of values divisible by 6 or 8.

$n(L) = \{6, 12, 24, 30, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96, 8, 16, 32, 40, 64, 80, 88, 56, 18\}$

$n(L) = 24$

$p(L) = \frac{24}{100} \Rightarrow \boxed{\frac{6}{25}}$

∴ The probability of Numbers divisible by 6 or 8 is $\frac{6}{25}$

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2)

N = Total number of cards a box contains = 30

$N = 30$.

$n(A)$ = Number of cards getting a prime number

$= \{2, 3, 5, 7, 11, 13, 17, 19, 23, 29\}$

$n(A) = 10$

$p(A) = \frac{n(A)}{N} \Rightarrow \frac{10}{30} = \boxed{\frac{1}{3}}$

∴ The probability of getting a prime numbers is $\frac{1}{3}$.

3) N = Two fair dice are thrown independently $\Rightarrow 36$

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

$\boxed{N = 36}$

i) Even face with first dice

$n(A) = 18 \Rightarrow \{(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),$
$(4,1),(4,2),(4,3),(4,5),(4,5),(4,6),$
$(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$

$p(A) = \frac{18}{36} = \boxed{\frac{1}{2}}$

$\therefore$ probability of getting even face with first dice is $\frac{1}{2}$

ii) Even face with second dice

$n(B) = \{(1,2),(2,2),(3,2),(4,2),(5,2),(6,2),$
$(1,4),(2,4),(3,4),(4,4),(5,4),(6,4),$
$(1,6),(2,6),(3,6),(4,6),(5,6),(6,6)\}$

$n(B) = 18$

$p(B) = \frac{n(B)}{N} = \frac{18}{36} = \boxed{\frac{1}{2}}$

$\therefore$ probability of getting even with second dice is $\frac{1}{2}$

iii) Sum of the points on both the side dice is odd.

$n(L) = \{(1,2), (1,4), (1,6), (2,1), (2,3), (2,5)$
$(3,2), (3,4), (3,6), (4,1), (4,3),$
$(4,5), (5,2), (5,4), (5,6), (6,1), (6,3)$
$(6,5)\}$.

$n(L) = 18$

$P(L) = \frac{n(L)}{N} = \frac{18}{36} = \boxed{\frac{1}{2}}$

∴ Probability of getting sum of the points on both the side dice odd is $\frac{1}{2}$.

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iv) Product of the points on both the dice exceeds 20.

$n(D) = \{(4,6), (5,5), (5,6), (6,4), (6,5), (6,6)\}$

$n(D) = 6$

$P(D) = \frac{n(D)}{N} = \frac{6}{36} = \boxed{\frac{1}{6}}$

∴ The probability of getting product of the points on both the dice exceeds 20 is $\frac{1}{6}$.

4) Let E_1, E_2 and A be the events

$E_1 \rightarrow$ Students Reside in the hostel.

$E_2 \rightarrow$ Students Reside in the day Scholar

$A \rightarrow$ Students who Scored in A grade.

So,

$P(E_1) = 0.6$ $\quad P(A/E_1) = 0.3$

$P(E_2) = 0.4$ $\quad P(A/E_2) = 0.2$

$$P(E_1/A) = \frac{P(E_1)\ P(A/E_1)}{P(E_1)\ P(A/E_1) + P(E_2)\ P(A/E_2)}$$

$$= \frac{(0.6)\ (0.3)}{(0.6)\ (0.3) + (0.4)\ (0.2)}$$

$$= \frac{0.18}{0.18 + 0.08} \Rightarrow \frac{0.18}{0.26}$$

$$= \frac{18}{26} \Rightarrow \frac{9}{13}$$

$$\boxed{P(E_1/A) = \frac{9}{13}}$$

∴ The probability that the student is a hosteller has a A grade is $\frac{9}{13}$.

5) Let E_1, E_2, E_3 and A be the events.

$E_1 \rightarrow A$ apply for manager role

$E_2 \rightarrow B$ apply for manager role

$E_3 \rightarrow C$ apply for manager role.

$A \rightarrow$ change does not take place.

$P(E_1) = \frac{1}{7}$ $\quad P(A|E_1) = 1 - 0.8 = 0.2 \Rightarrow \frac{2}{10}$

$P(E_2) = \frac{2}{7}$ $\quad P(A|E_2) = 1 - 0.5 = 0.5 \Rightarrow \frac{5}{10}$

$P(E_3) = \frac{4}{7}$ $\quad P(A|E_3) = 1 - 0.3 = 0.7 \Rightarrow \frac{7}{10}$

$$P(E_3|A) = \frac{P(E_3)\,P(A|E_3)}{P(E_1)\,P(A|E_1) + P(E_2)\,P(A|E_2) + P(E_3)\,P(A|E_3)}$$

$$= \frac{\frac{4}{7} \times \frac{7}{10}}{\frac{1}{7} \times \frac{2}{10} + \frac{2}{7} \times \frac{5}{10} + \frac{4}{7} \times \frac{7}{10}}$$

$$= \frac{\frac{28}{70}}{\frac{2}{70} + \frac{10}{70} + \frac{28}{70}} \Rightarrow \frac{\frac{28}{70}}{\frac{40}{70}}$$

$$= \frac{28}{70} \times \frac{70}{40} \Rightarrow \boxed{\frac{7}{10}}$$

∴ The probability that it is due to appointment of C is $\frac{7}{10}$.

6) Let E_1, E_2, E_3 and A be the events

$E_1 \rightarrow$ X is a manager

$E_2 \rightarrow$ Y is a manager

$E_3 \rightarrow$ Z is a manager

$A \rightarrow$ Bonus Scheme introduced. ~~that X has~~

$P(E_1) = \frac{4}{9}$ $\quad P(A/E_1) = 0.3 \Rightarrow 3/10$

$P(E_2) = \frac{2}{9}$ $\quad P(A/E_2) = 0.7 \Rightarrow 7/10$

$P(E_3) = \frac{3}{9}$ $\quad P(A/E_3) = 0.8 \Rightarrow 8/10$

$$P(E_1/A) = \frac{P(E_1)\,P(A/E_1)}{P(E_1)\,P(A/E_1) + P(E_2)\,P(A/E_2) + P(E_3)\,P(A/E_3)}$$

$$= \frac{\frac{4}{9} \times \frac{3}{10}}{\frac{4}{9} \times \frac{3}{10} + \frac{2}{9} \times \frac{7}{10} + \frac{3}{9} \times \frac{8}{10}}$$

$$= \frac{\frac{12}{10}}{\frac{12}{90} + \frac{14}{90} + \frac{24}{90}} \Rightarrow \frac{\frac{12}{90}}{50/90} \Rightarrow \frac{\cancel{12}^{6}}{\cancel{90}} \times \frac{90}{\cancel{50}_{25}}$$

$$\boxed{P(E_1/A) = \frac{6}{25}}$$

∴ The probability that the X has been appointed as manager is $\frac{6}{25}$.