DPP

DAILY PRACTICE PROBLEMS

CLASS : XIth
DATE :

Solutions

SUBJECT : MATHS
DPP NO. :5

Topic :-PROBABILITY

1 **(c)**

Let $P(R) = 10\% = \frac{1}{10}$

$P(F) = 5\% = \frac{1}{20}$

$P(R \cap F) = 3\% = \frac{3}{100}$

Probability of getting either rich or famous but not both

$= P(R \cap F') + P(R' \cap F)$

$= P(R) - P(R \cap F) + P(F) - P(R \cap F)$

$= P(R) + P(F) - 2P(R \cap F)$

$= \frac{1}{10} + \frac{1}{20} - \frac{6}{100} = \frac{10+5-6}{100} = 0.09$

2 **(c)**

Let A and B are the Ist and IInd aeroplane hit the target respectively and their corresponding probabilities are

$P(A) = 0.3$ and $P(B) = 0.2$

$\Rightarrow P(\overline{A}) = 0.7$ and $P(\overline{B}) = 0.8$

$\therefore$ Required probability

$= P(\overline{A})P(B) + P(\overline{A})P(\overline{B})P(\overline{A})P(B) + \dots$

$= (0.7)(0.2) + (0.7)(0.8)(0.7)(0.2) +$
$(0.7)(0.8)(0.7)(0.8)(0.7)(0.2) + \dots$

$= 0.14[1 + (0.56) + (0.56)^2 + \dots]$

$= 0.14\left(\frac{1}{1-0.56}\right) = 0.32$

3 **(b)**

Let probability of box B, $P(B) = P$

According to given condition

$P(A) = 2P(B) = 2P$

Now, $P\left(\frac{R}{A}\right) = \frac{{}^3C_1}{{}^5C_1} = \frac{3}{5}$

and $P\left(\frac{R}{B}\right) = \frac{{}^4C_1}{{}^7C_1} = \frac{4}{7}$

$$\therefore\ P\left(\frac{B}{R}\right) = \frac{P(B).P\left(\frac{R}{B}\right)}{P(A).P\left(\frac{R}{A}\right) + P(B).P\left(\frac{R}{B}\right)}$$

$$= \frac{p.\frac{4}{7}}{2p.\frac{3}{5} + p.\frac{4}{7}} = \frac{10}{31}$$

4 **(c)**

Clearly,

$P[A \cap (B \cup C)] = P[(A \cap B) \cup (A \cap C)]$

$= P(A \cap B) + P(A \cap C) - P[(A \cap B) \cap (A \cap C)]$

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

5 **(a)**

We have,

$$\sum_{k=0}^{4} P(X = k) = 1$$

$$\Rightarrow \sum_{k=0}^{4} C\,k^2 = 1 \Rightarrow C(1^2 + 2^2 + 3^2 + 4^2) = 1 \Rightarrow C = \frac{1}{30}$$

6 **(a)**

Let $'H'$denote the head and any of them come is $'A'$.Suppose the sequence of m consecutive heads start with first throw, then

$P[(HH \ldots.m \text{ times})(AA \ldots n \text{ times})]$

$$= \left(\frac{1}{2}.\frac{1}{2} \ldots.m \text{ times}\right)(1..1\ldots..n \text{ times})$$

$$= \left(\frac{1}{2}\right)^m$$

Now, suppose the sequence of m consecutive heads start with second throw, the first must be a tail,

$\therefore P[T(H.H \ldots m \text{ times})(A.A \ldots n - 1 \text{ times})]$

$$= \frac{1}{2}.\frac{1}{2^m} \times (1)^{n-1} = \frac{1}{2^{m+1}}$$

Similarly, as above

$\therefore$ Required probability

$$= \frac{1}{2^m} + \left(\frac{1}{2^{m+1}} + \frac{1}{2^{m+1}} + \ldots n \text{ times}\right)$$

$$= \frac{1}{2^m} + \frac{n}{2^{m+1}} = \frac{n+2}{2^{m+1}}$$

7 **(b)**

Given that, $x = 33^n$

Where, n is a positive integral value.

Here, only four digits may be at the unit place *ie*, 1, 3, 7, 9.

$\therefore n(S) = 4$

Let E be the event of getting 3 at its units place.

$n(E) = 1$

$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1}{4}$

8 **(d)**

Here, two numbers are selected from $\{1,2,3,4,5,6,\}$

$\Rightarrow n(S) = 6 \times 5$ {as one by one without replacement}

Favourable cases,

First number	Possible value for second number
1	2, 3, 4, 5, 6
2	3, 4, 5, 6
3	4, 5, 6

There are 12 ways but the numbers may be interchanged

$\therefore\ n(E) = 2 \times 12 = 24$

$\therefore$ Required probability $= \frac{n(E)}{n(S)} = \frac{24}{30} = \frac{4}{5}$

9 **(a)**

We have, $P(A) = \frac{1}{5}$ and $P(A \cup B) = \frac{7}{10}$

Now,

$P(A \cup B) = \frac{7}{10}$

$\Rightarrow 1 - P(\overline{A})P(\overline{B}) = \frac{7}{10}$ [$\because A$ and B are independent events]

$\Rightarrow 1 - \frac{4}{5}P(\overline{B}) = \frac{7}{10} \Rightarrow \frac{4}{5}P(\overline{B}) = \frac{3}{10} \Rightarrow P(\overline{B}) = \frac{3}{8}$

10 **(c)**

Since A is a finite set, therefore every injective map from A to itself is bijective also

$\therefore$ Required probability $= \frac{n\,!}{n^n} = \frac{(n-1)\,!}{n^{n-1}}$

11 **(a)**

We are getting a odd number of points, if it will comes (two heads, one tail and three tails)

$\because\ P(H) = P(T) = \dfrac{1}{2}$

$\therefore$ Required probability=Probability of getting two heads and one tail + Probability of all three tails

$= {}^3C_2\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^1 + \left(\frac{1}{2}\right)^3$

$= 3\left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^3$

$= \dfrac{3}{8} + \dfrac{1}{8} = \dfrac{1}{2}$

12 **(a)**

We have,

$p =$ Probability that the bomb strikes the target $= 1/2$

Let n be the number of bombs which should be dropped to ensure 99% chance or better of completely destroying the target. Then, the probability that out of n bombs, at least two strike the target, is greater than 0.99

Let X denote the number of bombs striking the target. Then,

$P(X = r) = {}^nC_r\left(\frac{1}{2}\right)^r\left(\frac{1}{2}\right)^{n-r} = {}^nC_r\left(\frac{1}{2}\right)^n, r = 0, 1, 2, \ldots, n$

Now,

$P(X \geq 2) \geq 0.99$

$\Rightarrow \{1 - P(X < 2)\} \geq 0.99$

$\Rightarrow 1 - \{P(X = 0) + P(X = 1)\} \geq 0.99$

$\Rightarrow 1 - \left\{(1 + n)\dfrac{1}{2^n}\right\} \geq 0.99$

$\Rightarrow 0.01 \geq \dfrac{1 + n}{2^n}$

$\Rightarrow 2^n > 100 + 100\, n \Rightarrow n \geq 11$

Thus, the minimum number of bombs is 11

13 **(b)**

The probability of getting head at least once in n times

$= 1 - P$(None of the trial getting head)

$= 1 - \left(\frac{1}{2}\right)^n$

Given $1 - \left(\frac{1}{2}\right)^n > 0.8 \Rightarrow \left(\frac{1}{2}\right)^n < 0.2$

$\Rightarrow 2^n > \dfrac{1}{0.2} \Rightarrow 2^n > 5$

Hence, least value of n is 3

14 **(b)**

Required probability $= P(\bar{A}_1 \cap \bar{A}_2 \cap \ldots \cap \bar{A}_n)$

$= P(\bar{A}_1)P(\bar{A}_2)\ldots P(\bar{A}_n) = \dfrac{1}{2}\cdot\dfrac{2}{3}\cdot\dfrac{3}{4}\cdot\ldots\cdot\dfrac{n}{n+1} = \dfrac{1}{n+1}$

15 **(d)**

Given, mean $= \Sigma X_k P(X = k) = 1.3$

$\Rightarrow X_0 P(X=0)+X_1(X=1)+X_2 P(X=2)$

$+X_3 P(X=3)=1.3$

$\Rightarrow 0.P(X=0)+1.P(X=1)+2.P(X=2)$

$+3.P(X=3)=1.3$

$\Rightarrow P(X=1)+2(0.3)+3.2P(X=1)=1.3$

$\Rightarrow 7P(X=1)=0.7$

$\Rightarrow P(X=1)=0.1$

Since, $P(X=3)=2P(X=1)=2(0.1)=0.2$

Also, $P(X=0)+P(X=1)+P(X=2)+P(X=3)=1$

$\Rightarrow P(X=0)+0.1+0.3+0.2=1$

$\Rightarrow P(X=0)=1-0.6=0.4$

16 **(b)**

P(getting a sum greater than 4)

$=1-P$(getting a sum less than 5) ...(i)

For sum 3, Number of cases=1

For sum 4, Number of cases=3

$\therefore$ Total number of cases=4

From Eq.(i),

$P=1-\frac{4}{216}=1-\frac{1}{54}=\frac{53}{54}$

17 **(d)**

The required probability $=\frac{{}^6C_2+{}^4C_2}{{}^{10}C_2}=\frac{7}{15}$

18 **(b)**

There are two cases arise.

Case I If Ist ball is white, then

$P=\frac{{}^3C_1}{{}^5C_1}\times\frac{{}^2C_1}{{}^4C_1}=\frac{6}{20}=\frac{3}{10}$

Case II If Ist ball is red, then

$P=\frac{{}^2C_1}{{}^5C_1}\times\frac{{}^1C_1}{{}^4C_1}=\frac{2}{20}=\frac{1}{10}$

$\therefore$ Required probability $=\frac{3}{10}+\frac{1}{10}=\frac{2}{5}$

19 **(a)**

Let the coin be tossed n times and let X denote the number of heads obtained. Then,

$$P(X=r) = {}^{n}C_{r}\left(\frac{1}{2}\right)^{n}$$

We have,

$$P(X=4) = P(X=7) \Rightarrow {}^{n}C_{4} = {}^{n}C_{7} \Rightarrow n = 11$$

$$\therefore P(X=2) = {}^{11}C_{2}\left(\frac{1}{2}\right)^{11} = \frac{55}{2048}$$

20 **(b)**

We have,

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

$$\Rightarrow P(\overline{A \cup B}) = \frac{1}{3} \Rightarrow 1 - P(A \cup B) = \frac{1}{3} \Rightarrow P(A \cup B) = \frac{2}{3}$$

$$\Rightarrow P(A) + P(B) - P(A \cap B) = \frac{2}{3} \Rightarrow p + 2\,p - \frac{1}{2} = \frac{2}{3} \Rightarrow p = \frac{7}{18}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	C	B	C	A	A	B	D	A	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	B	B	D	B	D	B	A	B