Chapter : 13 PROBABILITY प्रायिकता

MCQ

1 An event in the probability that will never be happened is called as.

एक घटना जो कभी नहीं होगी उसे क्या कहा जाता हैं ?

a) Unsure event अनिश्चित घटना
b) Sure event निश्चित घटना
c) Possible event सम्भव घटना
d) Impossible event असम्भव घटना

2. What will be the probability of getting odd numbers if a dice is thrown ?

एक पासे को फेंकने पर विषम संख्या आने की प्रायिकता क्या होगी ?

a) $\frac{1}{2}$
b) 2
c) $\frac{1}{3}$
d) $\frac{5}{2}$

3. What will be the probability of losing a game if the winning probability is 0.3 ?

यदि एक खेल के जीतने की प्रायिकता 0.3 है तो इसे हारने की प्रायिकता क्या हागी ?

a) 0.5
b) 0.6
c) 0.7
d) 0.8

4. A card is drawn from a pack of 52 cards.What is the probability of getting a king of a black suit ?

52 ताश के पत्तो की एक गड्डी से एक काला राजा मिलने की प्रायिकता क्या है?

a) $\frac{1}{52}$
b) $\frac{1}{26}$
c) $\frac{3}{26}$
d) $\frac{7}{52}$

5. A card is drawn from a pack of 52 cards.What is the probability of getting a queen card ?

52 ताश के एक गड्डी से एक पत्ता निकाला गया। उसके रानी होने की प्रायिकता क्या है?

a) $\frac{1}{26}$
b) $\frac{1}{52}$
c) $\frac{3}{13}$
d) $\frac{1}{13}$

6. Which of the following can be the probability of an event ?

निम्न में से कौन सी संख्या किसी घटना की प्रायिकता हो सकती हैं।

a) -1.3
b) 04
c) $\frac{3}{8}$
d) $\frac{10}{7}$

7. If P(A)= $\frac{1}{2}$, P(B)=0 then P $\left(\frac{A}{B}\right)$ is

यदि P(A)= $\frac{1}{2}$, P(B)=0 **तब** P $\left(\frac{A}{B}\right)$ **है।**

a) 0
b) $\frac{1}{2}$,
c) Undefined **परिभाषित नहीं**
d) 1

8. If A and B be two events such that $P\left(\frac{A}{B}\right)=P\left(\frac{B}{A}\right)\neq 0$, then

यदि A और B दो घटनाएँ इस प्रकार है कि $P\left(\frac{A}{B}\right)=P\left(\frac{B}{A}\right)\neq 0$, **तब**

a) $A\subset B$
b) A=B
c) $A\cap B\neq\phi$
d) P(A)=P(B)

9. If E and F are events such that P(E)=0.6, P(F)=0.3 and $P(E\cap F)=0.2$. Find $P\left(\frac{E}{F}\right)$

यदि E और F इस प्रकार की घटनाएँ है कि P(E)=0.6, P(F)=0.3 **और** $P(E\cap F)=0.2$. **हैं तो** $P\left(\frac{E}{F}\right)$. **होगा।**

a) $\frac{2}{3}$
b) $\frac{3}{2}$
c) $\frac{1}{6}$
d) $\frac{1}{2}$

10. $P(A\cap B)$ is equal to.

$P(A\cap B)$ **के बराबर होगा।**

a) $P(A).P\left(\frac{B}{A}\right)$
b) $P(B).P\left(\frac{A}{B}\right)$

c) Both (a) and (b)
(a) और (b) दोनों

d) None of these
इनमें से कोई नहीं

11. If E and F are independent events , then
यदि E और F स्वतंत्र घटना हो, तो

a) $P(E \cap F)=\frac{P(E)}{P(F)}$

b) $P(E \cap F)=P(E)+P(F))$

c) $P(E \cap F)=P(E).P(F)$

d) None of these
इनमें से कोई नहीं

12. The probability of obtaining an even prime number on each die when a pair of dice rolled.
दो पासे के एक बार फेकने पर प्रत्येक में सम अभाज्य संख्या आने की प्रायिकता क्या होगी?

a) 0 b) $\frac{1}{3}$

c) $\frac{1}{12}$ d) $\frac{1}{36}$

13. A die is thrown once , then the probability of getting a number greater than 3 is
एक पासे को एक बार फेंकने पर 3 से बड़ी संख्या आने की प्रायिकता होगी।

a) $\frac{1}{2}$ b) $\frac{2}{3}$

c) 3 d) 0

14. An urn countaining 6 balls of which two are red and four are black .Two balls are drawn at random, probability that they are of the different colour is?
एक थैले में 6 गेंदे है जिसमें 2 गेंदे लाल और 4 गेंदे काली है तो दो गेंदे निकालने पर दोनों भिन्न रंग के होने की प्रायिकता क्या होगी ?

a) $\frac{2}{5}$ b) $\frac{1}{15}$

c) $\frac{8}{15}$ d) $\frac{4}{15}$

2 MARKS QUESTION

1. Find $P\left(\frac{A}{B}\right)$. If P(B)=0.5 and $P(A \cap B)=0.32$
$P\left(\frac{A}{B}\right)$ ज्ञात कीजिए, यदि P(B)=0.5 और $P(A \cap B)=0.32$

2. If P(A)= $\frac{6}{11}$, P(B)= $\frac{5}{11}$ and $P(A \cup B)=\frac{7}{11}$, then find $P(A \cap B)$.
यदि P(A)= $\frac{6}{11}$,P(B)= $\frac{5}{11}$ और $P(A \cup B)=\frac{7}{11}$ हो तो $P(A \cap B)$. का मान ज्ञात करे ।

3. Given two independent events A and B Such that P(A)=0.3 P(B)=0.6 .Find P(A and B).
A और B स्वतंत्र घटनाएँ दी गई है जहाँ P(A)=0.3, P(B)=0.6 तो P(A और B) का मान ज्ञात करे ।

4. If P(A)=0.8 , P(B)=0.5 and $P\left(\frac{B}{A}\right)=0.4$, find the following :-
यदि P(A)=0.8 , P(B)=0.5 और $P\left(\frac{B}{A}\right)=0.4$, तो निम्नलिखित ज्ञात करें :–
(i) $P(A \cap B)$ (ii) P(A/B)
(iii) $P(A \cup B)$

5. Two cards are drawn at random and without replacement from a pack of 52 playing card . Find the probability that both the cards are black.
52 पत्तो की एक गड्डी में से यादृच्छया बिना प्रतिस्थापित किए दो पत्ते निकाले गए । दोनो पत्तों के काले रंग का होने की प्रायिकता ज्ञात कीजिए।

6. A die marked 1,2,3 in red and 4,5,6 in green is tossed . Let A be the event 'the number is even' and B be the event 'the number is red' ,Are A and B independent ?
एक पासे पर 1, 2,3 लाल रंग से और 4, 5, 6 हरे रंग से लिखे गए है। इस पासे को उछाला गया । मान ले A घटना ''संख्या सम'' है और B घटना ''संख्या लाल रंग से लिखी गई है'' को निरूपित करते हैं। क्या A और B स्वतंत्र है?

7. If E_1 and E_2 are two independent events such that $P(E_1)=0.35$ and $P(E_1 \cup E_2)=0.60$ find $P(E_2)$.
यदि E_1 और E_2 दो स्वतंत्र घटना इस प्रकार है कि $P(E_1)=0.35$ और $P(E_1 \cup E_2)=0.60$ तो $P(E_2)$ का मान ज्ञात करें।

3 MARKS QUESTION

1. Evaluate $P(A \cup B)$, if $2P(A) = P(B) = \frac{5}{13}$ and $P\left(\frac{A}{B}\right) = \frac{2}{5}$

$P(A \cup B)$ ज्ञात कीजिए, यदि

$2P(A) = P(B) = \frac{5}{13}$ और $P\left(\frac{A}{B}\right) = \frac{2}{5}$.

2. Detrmine $P\left(\frac{E}{F}\right)$ if a coin is tossed three times

Where E: head on third toss & F : head on first two tosses.

$P\left(\frac{E}{F}\right)$ ज्ञात कीजिए । यदि एक सिक्के को तीन बार उछाला गया है, जहाँ E= तीसरी उछाल पर चित F=पहली दोनो उछालो पर चित।

3. A family has two children .What is the probability that both the childrens are boys given that at least one of them is a boy?

एक परिवार में दो बच्चे हैं। यदि यह ज्ञात हो कि बच्चों में से कम से कम एक बच्चा लड़का है तो दोनो बच्चों के लड़का होने की क्या प्रायिकता है ?

4. A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once ?

एक पासे को दो बार उछाला गया और प्रकट हुई संख्याओ का योग 6 पाया गया। संख्या 4 के न्यूनतम एक बार प्रकट होने की सप्रतिबंध प्रायिकता ज्ञात कीजिए।

5. A fair coin and an unbiased die are tossed .Let A be the event 'head appears on the coin' and B be the event '3 on the die'.Check whether A and B are independent event or not?

एक न्याय्य सिक्का और एक अभिनत पासे को उछाला गया। मान ले A घटना 'सिक्के पर चित प्रकट होता है' और B घटना पासे पर संख्या '3 प्रकट होती है' को निरूपित करते है। निरीक्षण कीजिए कि घटनाएँ A और B स्वतंत्र हैं या नहीं?

6. Let A and B be independent events with

P (A) = 0.3 and P (B) = 0.4 then find

(i) $P(A \cap B)$

(ii) $P(A \cup B)$

(iii) $P\left(\frac{B}{A}\right)$

मान ले A और B स्वतंत्र घटनाएँ है तथा P(A)=0.3 और P(B)=0.4 तब

(i) $P(A \cap B)$

(ii) $P(A \cup B)$

(iii) $P\left(\frac{B}{A}\right)$

ज्ञात कीजिए।

7. Two balls are drawn at random with replacement from a box containing 10 black and 8 red balls .Find the probability that both balls are red.

दो गेंद एक बॉक्स से बिना प्रतिस्थापित किए निकाली जाती है। बॉक्स में 10 काली और 8 लाल गेंदे है तो दोनो गेंदे लाल हाने की प्रायिकता ज्ञात कीजिए।

5 MARKS QUESTION

1. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bag is selected at random and a ball is drawn from the bag which is found to be red. Find the probability that the ball is drawn from the first bag.

एक थैले में 4 लाल और 4 काली गेंदे है और एक अन्य थैले में 2 लाल और 6 काली गेंदें है। दोनों थैलों में से एक को यादृच्छया चुना जाता है और उसमें एक गेंद निकाली जाती है जो लाल है। इस बात की क्या प्रायिकता है कि गेंद पहले थैले से निकाली गई है ?

2. An insurance company insured 2000 scooter driver, 4000 car drivers and 6000 truck drivers. The probability of accident are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident .What is the probability that he is a scooter driver.

एक बीमा कंपनी 2000 स्कूटर चालकों, 4000 कार चालकों और 6000 ट्रक चालकों का बीमा करती है। दुर्घटनाओं की प्रायिकताएँ क्रमशः 0.01,0.03 और 0.15 है। बीमाकृत व्यक्तियों में से एक दुर्घटनाग्रस्त हो जाता है। उस व्यक्ति के स्कूटर चालक होने की प्रायिकता क्या है?

3. From a lot of 30 bulbs which include 6 defectives . A sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

30 बल्बो के एक ढेर में से 6 बल्ब खराब है, 4 बल्बों का एक नमूना (प्रतिदर्श) यादृच्छया बिना प्रतिस्थापना के निकाला जाता है। खराब बल्बों की संख्या का प्रायिकता बंटन ज्ञात कीजिए ।

4. Find the probability distribution of the number of successesive two tosses of a die, where a success is defined as

(i) Number greater than 4

(ii) Six appears on at least one die

एक पासे दो बार उछालने पर सफलता की संख्या का प्रायिकता बंटन ज्ञात कीजिए जहाँ–

(i) '4 से बडी संख्या' को एक सफलता माना गया है।

(ii) 'पासे पर संख्या 6 प्रकट होना' को एक सफलता माना गया है।

5. Find the mean number of heads in three tosses of a fair coin.

एक न्याय्य सिक्के की तीन उछालों पर प्राप्त चितों संख्या का माध्य ज्ञात कीजिए।

6. A bag consists of 10 balls each marked with one of the digits 0 to 9 . If four balls are drawn successive with replacement from the bag, what is the probability that none is marked with the digit 0 ?

एक थैले में 10 गेंदे है जिनमें से प्रत्येक पर 0 से 9 तक के अंको में से एक अंक लिखा है। यदि थैले में 4 गेंद उत्तरोत्तर पुनः वापस रखते हुए निकाली जाती तो इसकी क्या प्रायिकता है कि उनमें से किसी भी गेंद पर अंक 0 न लिखा हो?

7. A card from a pack of 52 cards is lost .From the remaining cards of the pack , two cards are drawn and are found to be both diamonds .Find the probability of the lost card being a diamond

52 ताशों की गड्डी से एक पत्ता खो जाता है। शेष पत्तो से दो पत्ते निकाले जाते है जो ईंट के पत्ते है। खो गए पत्ते की ईंट होने की प्रायिकता क्या है ?

8. Find the probability of throwing atmost 2 sixes in 6 throws of a single dice.

एक पासे को छः बार उछालने पर अधिकतम 2 बार छः आने की प्रायिकता ज्ञात कीजिए ।

(MCQ ANSWER)

Ans- 1)-d ,2)-a , 3)-c, 4)-b, 5)-d, 6)-c 7)-c, 8)-d, 9)-a, 10)-c, 11)-c, 12)-d, 13)-a, 14)-c

(2 MARKS) SOLUTION

1. Sol - Given $P(B) = 0.5$

$and\ P(A \cap B) = 0.32$

$$\therefore P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{0.32}{0.5} = \frac{32}{50} = \frac{16}{25} \text{ Ans}$$

2 Sol - Given that

$$P(A) = \frac{6}{11}, P(B) = \frac{5}{11}$$

$$and\ P(A \cup B) = \frac{7}{11}$$

$$\therefore P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\Rightarrow P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

$$= \frac{6}{11} + \frac{5}{11} - \frac{7}{11} = \frac{4}{11} \text{ Ans}$$

3 Sol - Given that

$P(A) = 0.3$

, $P(B) = 0.6$

$\because$ A and B are independent events then,

$$P(A \text{ and } B) \text{ or } P(A \cap B) = P(A).P(B)$$

$$= (0.3).(0.6)$$

$$= 0.18 \text{ Ans}$$

4. Given that $P(A) = 0.8$, $P(B) = 0.5$, $P\left(\frac{B}{A}\right) = 0.4$

(i) $P\left(\frac{B}{A}\right) = 0.4$

$$\Rightarrow \frac{P(A \cap B)}{P(A)} = 0.4$$

$$\Rightarrow \frac{P(A \cap B)}{0.8} = 0.4$$

$$\therefore P(A \cap B) = 0.4 \times 0.8$$

$$= 0.32$$

(ii) $$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{0.32}{0.5} = 0.64$$

(iii) $$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$= 0.8 + 0.5 - 0.32$$

$$= 1.3 - 0.32 = 0.98$$

5. Sol - There are 26 black cards in a pack of 52 cards .

let $P(A)$ be the probability of getting a black cards in first draw

$$\therefore P(A) = \frac{26}{52} = \frac{1}{2}$$

Let $P(B)$ be the probability of getting a black card in the second draw

(the card is not replaced)

$$\therefore P(B) = \frac{25}{51}$$

Thus, the probability of getting both the cards black $= \frac{1}{2} \times \frac{25}{51} = \frac{25}{102}$

6. Sol - When a die is thrown, the sample space is

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

let A: the number is even $=\{2,4,6\}$, $n(A)=3$

$\Rightarrow P(A)=\frac{3}{6}=\frac{1}{2}$

B: the number is red $=\{1,2,3\}$, $n(B)=3$

$\Rightarrow P(B)=\frac{3}{6}=\frac{1}{2}$

$A\cap B=\{2\}$

$\Rightarrow P(A\cap B)=\frac{1}{6}$

now, $P(A\cap B)=\frac{1}{6}$

$\Rightarrow P(A).P(B)=\frac{1}{6}$

$\Rightarrow \frac{1}{2}\cdot\frac{1}{2}=\frac{1}{6}$

$\Rightarrow \frac{1}{4}\neq\frac{1}{6}$

$P(A).P(B)\neq P(A\cap B)$

therefore A and B are not independent event.

7. Sol - Let $P(E_2)=x$; E_1 and E_2 being independent event

$\therefore P(E_1\cap E_2)=P(E_1).P(E_2)=0.35x$

$\Rightarrow P(E_1)+P(E_2)-P(E_1\cup E_2)=0.35x$

$\Rightarrow \quad 0.35+x-0.60=0.35x$

$\Rightarrow \quad 0.65x=0.25$

$\Rightarrow \quad x=\frac{25}{65}=\frac{5}{13}$ Ans

3 MARKS SOLUTION

1. Sol - Given $2P(A)=P(B)=\frac{5}{13}$

so, $P(A)=\frac{5}{26}$

& $P(B)=\frac{5}{13}$

Also, $P(A/B)=\frac{2}{5}$

We know $P\left(\frac{A}{B}\right)=\frac{P(A\cap B)}{P(B)}$

$\therefore \quad P(A\cap B)=P\left(\frac{A}{B}\right).P(B)$

$=\frac{2}{5}\cdot\frac{5}{13}$

$=\frac{2}{13}$

Also, $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

$=\frac{5}{26}+\frac{5}{13}-\frac{3}{13}$

$=\frac{5+10-4}{26}=\frac{11}{26}$ Ans

2. The sample space of the given experiment will be

$S=\{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$

$E=\{HHH, HTH, THH, TTH\}$

$F=\{HHH, HHT\}$

$\therefore E\cap F=\{HHH\}$

so that, $n(S)=8$, $n(E)=4$,

$n(F)=2$, $n(E\cap F)=1$

$P(E)=\frac{4}{8}=\frac{1}{2}$

$P(F)=\frac{2}{8}=\frac{1}{4}$

and $P(E\cap F)=\frac{1}{8}$

$\therefore P(E/F)=\frac{P(E\cap F)}{P(F)}=\frac{\frac{1}{8}}{\frac{1}{4}}=\frac{1}{8}\times\frac{4}{1}=\frac{1}{2}$

3. Sol - Let b stands for boy and g stands for girl.

The sample space of the experiment is

$S=\{(b,b),(g,b),(b,g),(g,g)\}$, $n(S)=4$

Let E be the event that both children are boys & F is the event that atleast one of the child is a boy,

Then, $E=\{(b,b)\}\Rightarrow n(E)=1$

& $F=\{(b,b),(g,b),(b,g)\}\Rightarrow n(F)=3$

$(E\cap F)=\{(b,b)\}\Rightarrow n(E\cap F)=1$

$\therefore P(E)=\frac{1}{4}$, $P(F)=\frac{3}{4}$, $P(E\cap F)=\frac{1}{4}$

$\therefore P\left(\frac{E}{F}\right)=\frac{P(E\cap F)}{P(F)}=\frac{\frac{1}{4}}{\frac{3}{4}}=\frac{1}{3}$

4.

Sol -

The sample space of the given experiment is

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

$\therefore n(S) = 36$

Let E be the event that 'number 4 appears at least once 'and F be the event that' the sum of the numbers appearing is 6'.

Then ,

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

$\therefore n(E) = 11$

$\& \; F = \{(1,5),(2,4),(3,3),(4,2),(5,1)\}$

$\therefore n(F) = 5$

$\because (E \cap F) = \{(2,4),(4,2)\} \Rightarrow n(E \cap F) = 2$

Therefore $P(E) = \frac{11}{36}, P(F) = \frac{5}{36},$

$P(E \cap F) = \frac{2}{36}$

$\therefore$ Hence , the required probability

$$P\left(\frac{E}{F}\right) = \frac{P(E \cap F)}{P(F)} = \frac{\frac{2}{36}}{\frac{5}{36}} = \frac{2}{5}$$

5.

Sol - If a fair coin and an unbiased die are tossed,

then $S = \begin{Bmatrix}(H.1),(H.2),(H.3),(H.4),(H.5),(H.6)\\(T,1),(T,2),(T,3),(T,4),(T,5),(T,6)\end{Bmatrix}$

A = Head appear on the coin

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

$\therefore \quad P(A) = \frac{6}{12} = \frac{1}{2}$

B = 3 on the die

$= \{(H,3),(T,3)\}$

$\therefore P(B) = \frac{2}{12} = \frac{1}{6}$

$\therefore A \cap B = \{(H,3)\}$

$P(A \cap B) = \frac{1}{12}$

Now,

$P(A).(B) = \frac{1}{2}.\frac{1}{6} = \frac{1}{12} = P(A \cap B)$

$\because$ A and B are independent events.

6.

Sol - It is given that

$P(A) = 0.3$ and $P(B) = 0.4$

(i) $P(A \cap B) = P(A).P(B)$ [$\because$ A and B are independent events]

$= 0.3 \times 0.4 = 0.12$ Ans...

(ii) $P(A \cup B) = P(A) + P(B) - n(A \cap B)$

$= 0.3 + 0.4 - 0.12$

$= 0.7 - 0.12$

$= 0.58$ Ans...

(iii) $P\left(\frac{B}{A}\right) = \frac{P(A \cap B)}{P(A)} = \frac{0.12}{0.3} = 0.4$ Ans...

7.

Sol -

Total number of balls = 18

Number of red balls = 8

Number of black balls = 10

$\therefore$ Probability of getting a red ball in the first draw $= \frac{8}{18} = \frac{4}{9}$

$\therefore$ probability of getting a red ball in the second draw $= \frac{8}{18} = \frac{4}{9}$

$\therefore$ Probability of getting both balls red $= \frac{4}{9} \times \frac{4}{9} = \frac{16}{81}$

5 MARKS SOLUTION

1. Let E_1 and E_2 be the events of selecting first bag and second bag respectively

$\therefore P(E_1) = P(E_2) = \frac{1}{2}$

let A be the event of getting a red ball

$\therefore P\left(\frac{A}{E_1}\right) = P$(drawing a red ball from first bag)

$= \frac{4}{8} = \frac{1}{2}$

$\therefore P\left(\frac{A}{E_2}\right) = P$(drawing a red ball from second bag)

$= \frac{2}{8} = \frac{1}{4}$

The probaility of drawing a ball from the first bag , given that it is red, is given by $P\left(\frac{E_1}{A}\right)$

[By Baye's theorem]

$$\therefore P\left(\frac{E_1}{A}\right) = \frac{P(E_1).P\left(\frac{A}{E_1}\right)}{P(E_1).P\left(\frac{A}{E_1}\right) + P(E_2).P\left(\frac{A}{E_2}\right)}$$

$$= \frac{\frac{1}{2}\cdot\frac{1}{2}}{\frac{1}{2}\cdot\frac{1}{2}+\frac{1}{2}\cdot\frac{1}{4}} = \frac{\frac{1}{4}}{\frac{1}{4}+\frac{1}{8}} = \frac{\frac{1}{4}}{\frac{3}{8}}$$

$$= \frac{1}{4}\times\frac{8}{3} = \frac{2}{3} \text{ Ans...}$$

2.

Sol -

Let E_1, E_2 and E_3 be the respective events that the drivers are a scooter driver, a car driver and a truck driver.

Let A be the event that the person meets with an accident

Total no of drivers = 2000 + 4000 + 6000

= 12000

$\therefore P(E_1) = \frac{2000}{12000} = \frac{1}{6}$

$P(E_2) = \frac{4000}{12000} = \frac{1}{3}$

$P(E_3) = \frac{6000}{12000} = \frac{1}{2}$

$P\left(\frac{A}{E_1}\right)$ = P(scooter driver meet with an accident)

$= 0.01 = \frac{1}{100}$

$P\left(\frac{A}{E_2}\right)$ = P(car driver meet with an accident)

$= 0.03 = \frac{3}{100}$

$P\left(\frac{A}{E_3}\right)$ = P(truck driver meet with an accident)

$= 0.15 = \frac{15}{100}$

The probability that the driver is a scooter driver is

$$P\left(\frac{E_1}{A}\right) = \frac{P(E_1).P\left(\frac{A}{E_1}\right)}{P(E_1).P\left(\frac{A}{E_1}\right) + P(E_2).P\left(\frac{A}{E_2}\right) + P(E_3).P\left(\frac{A}{E_3}\right)}$$

$$= \frac{\frac{1}{6}\cdot\frac{1}{100}}{\frac{1}{6}\cdot\frac{1}{100}+\frac{1}{3}\cdot\frac{3}{100}+\frac{1}{2}\cdot\frac{15}{100}}$$

$$= \frac{\frac{1}{6}}{\frac{1}{6}+1+\frac{1}{2}} = \frac{\frac{1}{6}}{\frac{1+6+45}{6}}$$

$$= \frac{1}{6}\times\frac{6}{52} = \frac{1}{52}$$

3. Sol -

It is given that out of 30 bulbs 6 are defectives.

$P(\text{defective bulb}) = \frac{1}{5}$

no of non defective bulbs = 30 - 6 = 24

$P(\text{non - defective bulb}) = \frac{4}{5}$

4 bulbs are drawn from the lot with replacement.

Let x be the random variable that denotes the number of defective bulbs in the selected bulbs.

$\therefore P(x=0) = P(4 \text{ - non defective and 0 defective})$

$= {}^4C_0 . \left(\frac{1}{5}\right)^0\left(\frac{4}{5}\right)^4 = \frac{256}{625}$

$P(x=1) = P(3 \text{ non defective and 1 defective})$

$= {}^4C_1 . \frac{1}{5} . \left(\frac{4}{5}\right)^3 = \frac{256}{625}$

$P(x=2) = P(2 \text{ non defective and 2 defective})$

$= {}^4C_2 . \left(\frac{1}{5}\right)^2 . \left(\frac{4}{5}\right)^2 = \frac{96}{625}$

$P(x=3) = P(1 \text{ non defective and 3 defective})$a

$= {}^4C_3 . \left(\frac{1}{5}\right)^3 . \frac{4}{5} = \frac{16}{625}$

$P(x=4) = P(0 \text{ non defective and 4 defective})$

$= {}^4C_4 . \left(\frac{1}{5}\right)^4 . \left(\frac{4}{5}\right)^0 = \frac{1}{625}$

hence, the required probability distribution is as follows –

X	0	1	2	3	4
P(x)	$\frac{256}{625}$	$\frac{256}{625}$	$\frac{96}{625}$	$\frac{16}{625}$	$\frac{1}{625}$

4.

Sol -

When a die is tossed two time, we obtain $(6 \times 6) = 36$ number of observation,

Let x be the random variable, which represents the number of successes.

(i) Here, success refers to the number greater than 4.

$P(x=0)$ = P(number less than or equal to 4 on both tosses)

$= \frac{4}{6}\cdot\frac{4}{6} = \frac{4}{9}$

$P(x=1) = P\left(\begin{matrix}\text{number less than or equal to 4 on first toss} \\ \text{and greater than 4 on second toss}\end{matrix}\right)$

$+ P\left(\begin{matrix}\text{number greater than 4 on first toss and} \\ \text{less than or equal to 4 on second toss}\end{matrix}\right)$

$= \frac{4}{6} \times \frac{2}{6} + \frac{2}{6} \times \frac{4}{6} = \frac{4}{9}$

$P(x = 2) = P$ (number greater than 4 on both the tosses)

$= \frac{2}{6} \times \frac{2}{6} = \frac{1}{9}$

then the probability distribution is as follows -

x	0	1	2
P(x)	$\frac{4}{9}$	$\frac{4}{9}$	$\frac{1}{9}$

(ii) Here, success mean six appears on at least one die

$P(Y = 0) = P$ (six does not appear on any of the dice)

$= \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$

$P(Y = 1) = P$ (six appears on at least one of the dice)

$= \frac{11}{36}$

The required probability distribution is as follows

Y	0	1
P(Y)	$\frac{25}{36}$	$\frac{11}{36}$

5.

Sol -

Let x denote the success of getting head .

$\therefore$ samle space is

$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

It can be seen that x can take the value of 0, 1, 2 or 3.

$\therefore P(X = 0) = P(TTT) = P(T).P(T).P(T)$

$= \frac{1}{2} . \frac{1}{2} - \frac{1}{2} = \frac{1}{8}$

$\therefore P(X = 1) = P(HTT) + P(THT) + P(TTH)$

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

$= \frac{3}{8}$

$P(X = 2) = P(HHT) + P(HTH) + P(THH)$

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

$= \frac{3}{8}$

$P(X = 3) = P(HHH)$

$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

The required probability distribution is as follows -

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

Means of X, $E(X) = M = \sum X_i P(X_i)$

$= 0.\frac{1}{8} + 1.\frac{3}{8} + 2.\frac{3}{8} + 3.\frac{1}{8}$

$= \frac{12}{8} = \frac{3}{2}$

6. Sol -

Let x denotes the number of balls marked with the digit 0 among the 4 balls drawn.

x has a binomial distribution with n = 4

and $P = \frac{1}{10}$

$\therefore q = 1 - \frac{1}{10} = \frac{9}{10}$

$\therefore P(X = x) = {}^nC_x q^{n-x} P^x, \quad x = 1, 2, 3.....n$

$\therefore P(\text{none marked with } 0) = P(X = 0)$

$= {}^4C_0 \left(\frac{9}{10}\right)^4 . \left(\frac{1}{10}\right)^0$

$= 1 . \left(\frac{9}{10}\right)^4 = \left(\frac{9}{10}\right)^4$

7. Sol -

Let E_1 and E_2 be the respective events of choosing a diamond card and a card which is not diamond.

Let A denote the lost card .

out of 52 cards , 13 cards are diamond and 39 cards are not diamond.

$\therefore P(E_1) = \frac{13}{52} = \frac{1}{4}, P(E_2) = \frac{39}{52} = \frac{3}{4}$

When one diamond card is lost -

$P\left(\frac{A}{E_1}\right) = \frac{{}^{12}C_2}{{}^{51}C_2} = \frac{12!}{2!10!} \times \frac{2!49!}{51!}$

$= \frac{11 \times 12}{50 \times 51} = \frac{22}{425}$

When one card is lost which is not diamond is

$P\left(\frac{A}{E_2}\right) = \frac{{}^{13}C_2}{{}^{51}C_2} = \frac{13!}{2!11!} \times \frac{2!49!}{51!}$

$= \frac{13 \times \cancel{12}^{2}}{{}^{17}\cancel{51} \times \cancel{50}_{25}} = \frac{26}{425}$

The probability of getting two cards,
when one card is lost which is not diamond is

$$P\left(\frac{E_1}{A}\right) = \frac{P(E_1).\,P\left(\frac{A}{E_1}\right)}{P(E_1).\,P\left(\frac{A}{E_1}\right) + P(E_2).\,P\left(\frac{A}{E_2}\right)}$$

$$= \frac{\frac{1}{4}\cdot\frac{22}{425}}{\frac{1}{4}\cdot\frac{22}{425} + \frac{3}{4}\cdot\frac{26}{425}}$$

$$= \frac{22}{22+78} = \frac{22}{100} = \frac{11}{50} \text{ Ans...}$$

8.

Sol -

Let repeated tossing of the die are
Bernoulli trils .

Let X represents the number of times
of getting sixes in 6 throws of the dice.

Probability of getting six in a single
throw of dice -

$P = \frac{1}{6}$

$\therefore q = 1 - \frac{1}{6} = \frac{5}{6}$

clearly , x has a binomial distribution
with n = 6

$P(X = x) = {}^nC_x q^{n-x} p^x = {}^6C_x \left(\frac{5}{6}\right)^{6-x} \left(\frac{1}{6}\right)^x$

$P(\text{at most 2 sixes}) = P(X \le 2)$

$$= P(X=0) + P(X=1) + P(X=2)$$

$$= {}^6C_0\left(\frac{5}{6}\right)^6.\left(\frac{1}{6}\right)^0 + {}^6C_1\left(\frac{5}{6}\right)^5.\frac{1}{6} + {}^6C_2\left(\frac{5}{6}\right)^4\left(\frac{1}{6}\right)^2$$

$$= \left(\frac{5}{6}\right)^6 + 6.\left(\frac{5}{6}\right)^5.\frac{1}{6} + 15\left(\frac{5}{6}\right)^4.\frac{1}{36}$$

$$= \left(\frac{5}{6}\right)^4\left[\frac{25}{36} + \frac{5}{6} + \frac{5}{12}\right]$$

$$= \left(\frac{5}{6}\right)^4\left[\frac{25+30+15}{36}\right]$$

$$= \frac{70}{36}.\left(\frac{5}{6}\right)^4$$

$$= \frac{35}{18}.\left(\frac{5}{6}\right)^4 \text{ Ans....}$$