1. A fair coin is tossed 30 times, the result of which is tabulated below. Study the table and answer the questions given below the table:

Event	Tally Marks	Frequency
Head	卌 卌 ||||	14
Tail	卌 卌 卌 |	16

(i) How many times does 'head' appear?

(ii) How many times does 'tail' appear?

(iii) Estimate the probability of the appearance of head?

(iv) Estimate the probability of the appearance of tail?

Solution. From the table, total outcomes $= 30 \Rightarrow n(S) = 30$

From the table, we see that

(i) Let A = event the times head appears $\Rightarrow n(A) = 14$

(ii) Let B = event the times tail appears $\Rightarrow n(B) = 16$

(iii) Probability that head appears $= P(A) = \dfrac{n(A)}{n(S)} = \dfrac{14}{30} = \dfrac{7}{15}$

(iv) Probability that tail appears $= P(B) = \dfrac{n(B)}{n(S)} = \dfrac{16}{30} = \dfrac{8}{15}$

2. A die is tossed 100 times. The result is tabulated below. Study the table and answer the questions given below the table:

Event	Tally Marks	Frequency
1	卌 卌 ||||	14
2	卌 卌 卌 ||	17
3	卌 卌 卌 卌	20
4	卌 卌 卌 |||	18
5	卌 卌 卌	15
6	卌 卌 卌 |	16

(i) How many times do 3 dots appear ?

(ii) How many times do 5 dots appear ?

(iii) How many times does an even number of dots appear ?

(iv) How many times does a prime number of dots appear ?

(v) Find the probability of each one of the above cases.

Solution. From the table, total outcomes $= 100 \Rightarrow n(S) = 100$

From the table, we see that

(i) Let A = event, the number of times, 3 dots appear $\Rightarrow n(A) = 20$

(ii) Let B = event, the number of times 5, dots appear $\Rightarrow n(B) = 15$

(iii) Let C = event, the number of times, even dots appear

$$\Rightarrow n(C) = 17 + 18 + 16 = = 51$$

(iv) Let D = event, the number of times, prime dots appear

$$\Rightarrow n(D) = 17 + 15 + 20 = 52$$

(v) Required probabilities are as :

$$P(A) = \frac{n(A)}{n(S)} = \frac{20}{100} = \frac{1}{5} \qquad P(B) = \frac{n(B)}{n(S)} = \frac{15}{100} = \frac{3}{20}.$$

$$P(C) = \frac{n(C)}{n(S)} = \frac{51}{100}, \qquad P(D) = \frac{n(D)}{n(S)} = \frac{52}{100} = \frac{13}{25}$$

3. The eggs supplied by a poultry farm during a week broke during transit as follows: 1%, 2%, $1\frac{1}{2}\%$, $\frac{1}{2}\%$, 1%, 2%, 1%

Find the probability of the eggs broke in a day. Calculate the number of eggs that will be broken in transiting the following number of eggs:

(i) 7,000 (ii) 8,400 (iii) 10,500

Solution.

Transit	Broken eggs	No. of eggs
1	1	100
2	2	100
3	$1\frac{1}{2} = 1.5$	100
4	$\frac{1}{2} = 0.5$	100
5	1	100
6	2	100
7	1	100

Total eggs $= n(S) = 700$

Let A = event the eggs broke $\Rightarrow n(A) = 1 + 2 + 1.5 + 0.5 + 1 + 2 + 1 = 9$

$$P(A) = \frac{n(A)}{n(S)} = \frac{9}{700}$$

(i) Number of eggs broke in 7000 $= 7000 \times \frac{9}{700} = 90$

(ii) Number of eggs broke in 8400 $= 8400 \times \frac{9}{700} = 108$

(i)ii Number of eggs broke in 10500 $= 10500 \times \frac{9}{700} = 135$

§ 7.7 ADDITION OF PROBABILITIES.

Notations.

We know that P(E) means the probability of an event E.

Now if A and B are any two events, then

$P(A)$ = probability of occurrence of the event A

$P(B)$ = probability of occurrence of the event B

$P(A \cup B)$ = probability of occurrence of the event A or B

$P(A \cap B)$ = probability of occurrence of the event A and B

Theorems of Addition of Probabilities.

I. $P(A \cup B) = P(A \text{ or } B) = P(A) + P(B)$, when A and B are disjoint

II. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$, when A and B are overlapping