



Probability

Basic Terms of Probability

Random Experiment

An experiment in which the outcomes can not be predicted exactly in advance and all possible outcomes are known, is called random experiment.

e.g. On tossing a coin, head or tail are the two outcomes, but you can not predict, which outcome you will get.

Equally Likely Outcomes

Outcomes of an event are called equally likely, if they all have same chances of occurring. e.g. If a coin tossed, then there are equal chances of getting a head or a tail. So, getting head or tail are equally likely events.

Thus, we see that probability of the set of equally likely outcomes on tossing a coin i.e. getting head or tail $= \frac{1}{2} + \frac{1}{2} = 1$

Probability of all the possible outcomes of an experiment add up to 1, here 1 stands for certainty.

Event

Each outcome of an experiment or a collection of outcomes make an **event**.

e.g.

- (i) Throwing a die and getting each of the outcomes 1, 2, 3, 4, 5 or 6 is an event.

- (ii) Tossing a coin and getting a head or a tail is an event.

Negation of an event Negation of an event (A) is 'not A', which occurs only when A does not occur. It is denoted by ' \bar{A} '.

Occurrence of an event

An event E associated to a random experiment is said to be occur (or happen) in a trial, if the outcome of a trial is one of the outcomes that happen.

Probability

Let A be an event. Then, the probability of occurrence of E is defined as

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

For any event A, $P(A) + P(\bar{A}) = 1 \Rightarrow 0 \leq P(A) \leq 1$

- ☑ (i) Probability of an event can have a value from 0 to 1.
- (ii) Probability of a sure event is 1.
- (iii) Probability of an impossible event is 0.

Example 1 Let us consider a pack of well shuffled cards

- I. What is the probability of getting a black face card?

(a) $\frac{3}{36}$

(b) $\frac{1}{26}$

(c) $\frac{5}{26}$

(d) None of these

II. What is the probability of getting a red jack?

- (a) $\frac{3}{26}$ (b) $\frac{1}{26}$ (c) $\frac{5}{26}$ (d) $\frac{7}{26}$

Sol. In a pack of well-shuffled cards, there are

number of black face cards = 6;

number of red jack = 2;

number of red card of ace = 2;

number of black kings = 2;

number of ordinary card = 52

whereas, in a pack there are total 52 cards.

∴ Probability of getting.

I. (a) a black face card = $\frac{6}{52} = \frac{3}{26}$

II. (b) a red jack = $\frac{2}{52} = \frac{1}{26}$

Example 2 When a die is thrown, find the probability of getting a prime number.

- (a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{5}$

Sol. (c) We know that, a die marked six numbers 1, 2, 3, 4, 5 and 6 on its face, so one number can be selected in 6 ways.

∴ Total outcomes = 6

Since, there are 3 prime numbers (i.e. 2, 3 and 5) and one prime number can be selected in 3 ways.

So, favourable outcomes = 3

∴ Probability of getting a prime number

$$= \frac{\text{Favourable outcomes}}{\text{Total possible outcomes}} = \frac{3}{6} = \frac{1}{2}$$

Example 3 If you have spinning wheel with 3 green sectors, 5 black sectors and 10 red sectors. What is the probability of getting a green sector and what is the probability of getting a non-black sector?

- (a) $11/18$ (b) $13/18$
(c) $7/18$ (d) None of these

Sol. (b) Total number of sectors = 3 green + 5 black + 10 red = 18

Number of green sectors = 3

∴ Probability of getting a green sector = $\frac{3}{18} = \frac{1}{6}$

Number of non-black sectors i.e. number of green and red sectors = 3 + 10 = 13

∴ Probability of getting a non-black sector = $\frac{13}{18}$

Practice Exercise

1. A pair of coin is tossed, find the probability of getting one head one tail.

- (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) 1 (d) $\frac{1}{4}$

2. What is the probability of choosing a vowel from the alphabets?

- (a) $\frac{21}{26}$ (b) $\frac{5}{26}$ (c) $\frac{1}{26}$ (d) $\frac{3}{26}$

3. Find the probability of getting a number greater than 3 in throw of a die.

- (a) $\frac{1}{3}$ (b) $\frac{1}{2}$
(c) $\frac{1}{4}$ (d) None of these

4. A coin is tossed 200 times and head appeared 120 times. The probability of getting a head in this experiment is

- (a) $\frac{2}{5}$ (b) $\frac{3}{5}$ (c) $\frac{1}{5}$ (d) $\frac{4}{5}$

5. From a pack of well shuffled cards, what is the probability of getting a black king?

- (a) $\frac{1}{26}$ (b) $\frac{3}{26}$ (c) $\frac{5}{26}$ (d) $\frac{7}{26}$

6. A die is thrown, what is the probability of getting an even number?

- (a) $\frac{1}{2}$ (b) $\frac{2}{3}$
(c) $\frac{5}{6}$ (d) $\frac{1}{6}$

7. Ritwik draws a ball from a bag that contains white and yellow balls. The probability of choosing a white ball is $\frac{2}{9}$. If the total number of balls in the bag is 36, then find the number of yellow balls.
(a) 27 (b) 28 (c) 29 (d) 30

8. A die is rolled once. What is the probability that the number of top will be a multiple of 3, also find the factor of 6
(a) $\frac{1}{3}, \frac{2}{3}$ (b) $\frac{1}{4}, \frac{3}{5}$
(c) $\frac{1}{5}, \frac{3}{5}$ (d) None of these

9. From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the drawn card is a red 6?

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

10. 8 cards are numbered as 1, 2, 3, 4, 5, 6, 7, 8 respectively. They are kept in a box and mixed thoroughly. One card is choose at random. What is the probability of getting less than 4?

- (a) $\frac{1}{2}$ (b) $\frac{3}{4}$
(c) $\frac{3}{8}$ (d) $\frac{3}{5}$

Answers

1	(a)	2	(b)	3	(b)	4	(b)	5	(a)	6	(a)	7	(b)	8	(a)	9	(b)	10	(c)
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Hints & Solutions

1. (a) Total number of outcomes = $2 \times 2 = 4$

Number of favourable outcomes = 2 [i.e. (H, T), (T, H)]

$$\therefore \text{Required probability} = \frac{2}{4} = \frac{1}{2}$$

2. (b) Total number of alphabets = 26

Total number of vowels = 5

Probability of choosing a vowel from the

$$\text{alphabets} = \frac{\text{Total number of vowels}}{\text{Total number of alphabets}} = \frac{5}{26}$$

3. (b) Total number of outcomes in a die = 6

Favourable number of outcomes = Number of elements greater than three

= 3 (i.e. 4, 5 and 6)

$$\therefore \text{Required probability} = \frac{3}{6} = \frac{1}{2}$$

4. (b) Given, head appeared 120 times, if a coin is tossed 200 times.

Then, probability of getting a head in this experiment

$$= \frac{\text{Number of times head appeared}}{\text{Number of times of coin is tossed}} = \frac{120}{200} = \frac{3}{5}$$

7. (b) The probability of choosing a white ball = $\frac{2}{9}$

Then, the probability of choosing a yellow ball

$$= 1 - \frac{2}{9} = \frac{9-2}{9} = \frac{7}{9}$$

Given, total number of balls in the bag = 36

$$\therefore \text{Number of yellow balls} = \frac{7}{9} \times 36 = 28$$

8. (a) When a die is rolled once, then the possible outcomes are 1, 2, 3, 4, 5 and 6.

$$P(\text{a multiple of 3}) = \frac{2}{6} = \frac{1}{3}$$

$$\text{and } P(\text{a factor of 6}) = \frac{4}{6} = \frac{2}{3}$$

9. (b) Total number of outcomes = 52

Favourable outcomes = drawn card is red 6 = 2 (i.e. red 6 in heart and diamond)

$$\text{Required probability} = \frac{2}{52} = \frac{1}{26}$$

10. (c) Total number of outcomes = 8

Favourable outcomes = getting number less than 4 = 3 (i.e. 1, 2, 3)

$$\text{Required probability} = \frac{3}{8}$$