# Probability

# Probability

Chances.

to describe certainity or uncertainity of happening of an event.

=> Probability is based on possible outcomes.

Tossing a coin:

Possible outcomes → (H) or (T)

Throwing a die: 1 or 2 or 3 or 4 or 5 or 6

Possible outcomes.

Experimental Probability

⇒ 1st Experiment is tossing a coin.

| Toss | H | T |
|---|---|---|
| 1 | ✓ | |
| 2 | | ✓ |
| 3 | | ✓ |
| 4 | ✓ | |
| 5 | ✓ | |
| 6 | | ✓ |
| 7 | | ✓ |
| 8 | | ✓ |
| 9 | ✓ | |
| 10 | | ✓ |
| | 4 | 6 |

Total no. of times tossed the coin = 10

No. of times H comes up = 4

No. of times T comes up = 6

$$\text{Probability (of H)} = \frac{\text{No. of times H comes up}}{\text{Total no. of times the coin is tossed}}$$

$$= \frac{4}{10}$$

$$= 0.4$$

$$= 40\%$$

Tossing of coin is an experiment.

↓

Possible outcomes.

↓

Head and Tail

↓

outcomes in which we are interested

↓

(event)

↓

E

$P(E)$ ⇒ Probability of occurance of event E.

$$P(E) = \frac{\text{No. of favourable outcomes to } E}{\text{Total possible outcomes}}$$

Probability of impossible events is zero.

Probability of sure events is 1

# When we throw a die

1, or 2 or 3 or 4 or 5 or 6

Probability (of getting 2)

Total possible outcome on throwing a die = 6

no. of favourable outcome = 1.

$$P(\text{getting 2}) = \frac{1}{6}$$

$$P(\text{getting 6}) = \frac{1}{6} = 0.16$$

$$P(\text{even no.}) = \frac{\text{favourable outcome}}{\text{possible outcome}}$$

$$= \frac{3}{6}$$

$$= \frac{1}{2} = 0.5$$

$$0 \leq P(E) \leq 1$$

# Important terms

**Experiment :** Actions that gives certain outcomes.

**Trials :** A trail is an action which result in one or more outcomes.

**Random experiment :** An experiment in which possible outcomes are known but results cannot be predicted in advance.

**Event:-** Collection of some outcomes of random experiment.

**Occurance of event / Happening of event :-**

eg: Getting 4 on throwing a die

↳ occurance of event

⇒ Getting an even no.

## Empirical Probability

## Experimental Probability

: If a total no. of trials in a random experiment is $n$, Then the empirical / experimental probability of happening of event $E$ is defined as.

$$P(E) = \frac{\text{no. of trails in which even } E \text{ happened / occured}}{\text{Total no. of trail.}}$$

$$P(E) = \frac{\text{no. of favourable outcomes to even } E}{\text{Total possible outcomes}}$$

Q. A coin is tossed 100 times in which head is obtained 55 times. On tossing a coin at random, find the probability of getting (i) a head (ii) a tail.

Total no. of trial = 100.

No. of times head comes up = 55

No. of times tail comes up = (100 - 55) = 45

$$\therefore \text{Probability of getting a head} = \frac{\text{No. of heads}}{\text{Total no. of trials}} = \frac{55}{100} = 0.55$$

$$\text{Probability of getting a tail} = \frac{45}{100} = 0.45$$

If we add both the probability = 0.55 + 0.45

= 1

Q. A die is thrown 200 times and the outcomes are noted in the table:

| outcomes | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| frequency | 35 | 30 | 31 | 28 | 37 | 39 |

If a die is thrown at random; find the probability of getting.

(i) 1 (ii) 4 (iii) 6 (iv) even no. (v) odd no.

(i) $P(\text{getting } 1) = \frac{35}{200} =$

(ii) $P(\text{getting } 4) = \frac{28}{200}$

(iii) $P(\text{getting } 6) = \frac{39}{200} =$

(iv) $P(\text{even no.}) = \frac{30+28+39}{200}$

(v) $P(\text{odd no.}) = \frac{35+31+37}{200}$

$= \frac{103}{200}$

$= \frac{97}{200}$

# Lens → Microscope

$$m - \frac{m-1}{3} = 1 - \frac{m-2}{3}$$

$$\frac{3m}{3} - \frac{m-1}{3} + \frac{m-2}{3} = 1$$

$$\frac{3m - (m-1) + (m-2)}{3} = 1$$

$$\frac{3m - m + 1 + m - 2}{3} = 1$$

$$\frac{(3m-1)}{3} \times 3 = 1 \times 3$$

$$3m - 1 = 3$$

$$3m = 3 + 1$$

$$\frac{3m}{3} = \frac{4}{3}$$

$$\boxed{m = \frac{4}{3}}$$

(1) In a cricket match, a batsman hits a boundary 6 times out of 90 balls he plays. Find the probability that he

(i) hit a boundary

(ii) did not hit a boundary.

Total no. of trials = 90

No. of trials in which batsman hits a bandy = 6

$$P(\text{of hitting a boundary}) = \frac{\text{No. of time he hit the boundary}}{\text{total no. of trials}}$$

$$= \frac{6}{90} = \frac{1}{15}$$

No. of balls in which batsman did not hit a boundary = 90 − 6
= 84

$$P(\text{Not hitting a boundary}) = \frac{84}{90} = \frac{14}{15}$$

**Q.** There are 6 marbles in a bag with numbers from 1 to 6. marked on each of them. What is the probability of drawing a marble with (i) number 2?

ii) number 5 (ii) number more than 3.

Total marbles = 6

$P(\text{number } 2) = \frac{1}{6}$ | $P(\text{no. } 5) = \frac{1}{6}$ | $P(\text{no.} > 3) = \frac{3}{6} = \frac{1}{2}$

3. In a survey of 200 girls it was found that 85 like tea while 115 dislike it. Out of these one girl is chosen at random. What is the probability that the chosen girl:

(i) likes tea?

(ii) dislikes tea?

Total no. of girl = 200

$$P(\text{likes tea}) = \frac{85}{200} = \frac{17}{40}$$

$$P(\text{dislikes tea}) = \frac{115}{200} = \frac{23}{40}$$

4. What is the probability of drawing a red card from the deck of 52 cards.

Total no. cards = 52

Total red cards = 26 (13 + 13)

$$P(\text{red card}) = \frac{26}{52} = \boxed{\frac{1}{2}}$$

$$P(\text{blue card}) = \frac{0}{52} = 0$$

5. What is the probability of drawing a Queen from well shuffled deck of 52 card.

$$P(\text{Queen}) = \frac{4}{52} = \frac{1}{13}.$$

Q. A bag contains 4 green balls, 4 red balls and 2 blue balls. If a ball is drawn from the bag, what is the probability of getting

(i) a red ball.

(ii) green or blue ball.

(iii) Not a blue ball.

(iv) neither green nor red ball.

(i) $P(\text{red}) = \frac{4}{10} = \frac{2}{5}$

(ii) $P(\text{green or blue}) = \frac{6}{10} = \frac{3}{5}$

(iii) $P(\text{Not a blue ball}) = \frac{8}{10}$

(iv) $P(\text{neither green nor red}) = \frac{2}{10}$.

$P(E) = \frac{1}{2}$ $\Rightarrow$ neither likely nor unlikely.

$P(E) = 0$ $\Rightarrow$ impossible events

$\boxed{P(E) = 1}$ $\Rightarrow$ Sure events.

$P(E) = 0.9$ $\Rightarrow$ likely event

$P(E) = 0.1$ $\Rightarrow$ Unlikely event

If a die is rolled 800 times, ~~what~~ wow

| 1 | 2 | 3 | 4 | 5 | 6 | |
|---|---|---|---|---|---|---|
| 150 | 50 | 200 | 80 | 120 | 200 | |

what is the probability of getting 2 or 3?

# End of the chapter