

Introduction to Probability

Probability

↳ "chance"

On tossing a coin, probability of getting a head is $50\% = (\frac{1}{2})$

Possible outcomes: 'H' or 'T'

Tossing a coin is a "Random Experiment."

Probability

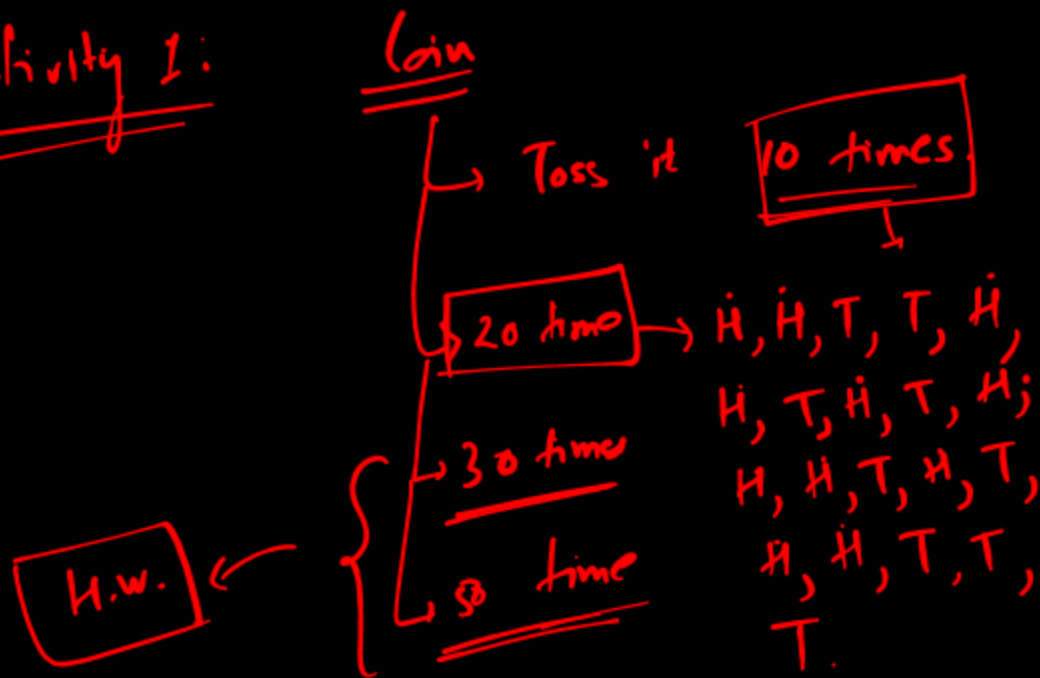
- Probably it may rain today.
- He is probably right.
- Indian team has good chance of winning world-cup.

Uncertainty in occurrence of an event

a tool in mathematics to measure this uncertainty

tool is called
Probability

Activity 1:



H	T	Trial
✓	✓	→ Trial
	✓	→ Trial
✓		
✓		
	✓	
✓		
	✓	
✓		
✓		

H=6 T=4

10 trials.

$$\left\{ \begin{array}{l} P(H) = \left(\frac{11}{20} \times 100 \right) \% = 55\% \\ P(T) = \left(\frac{9}{20} \times 100 \right) \% = 45\% \end{array} \right.$$

$$H = \left(\frac{6}{10} \times 100 \right) \%$$


P(H) = 60%

$$T = \left(\frac{4}{10} \times 100 \right) \%$$

P(T) = 40%

Activity 2:

A die

↳ Possible outcomes : 

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

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

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

$$P(4) = \frac{1}{6}$$

$$P(5) = \frac{1}{6}$$

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

H.W

Throw die

- ↳ 20 times ✓
- ↳ 40 times
- ↳ 60 times

Trial: → An action that results in one or several outcomes.

Random Experiment: Possible outcomes are known but the result cannot be predicted in advance.
ex. Tossing a coin ; throwing a die.

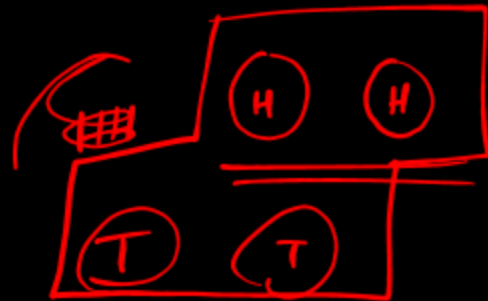
Event: Collection of some outcomes of a random experiment.

eg. tossing two coins simultaneously:

HH, HT, TH, TT → Possible outcomes

Event (getting at least one head)

HT, TH, HH
3 outcomes.



Happening of an event
or
Occurrence of an event

} If any one of the outcomes satisfies the definition of the event.

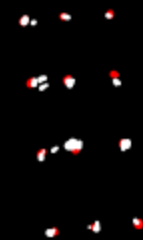
Throwing a die \Rightarrow outcome is $\boxed{4}$ $\boxed{\therefore}$
 \downarrow
following event has happened/occurred:

- (i) getting a 4 ✓
- (ii) getting an even no.
- (iii) getting a multiple of 2.
- (iv) getting a number greater than 3 or 2, 1.

Probability: (Experimental Probability) | Empirical probability.

If n be the total no. of trials of a random experiment.
Then, the probability of happening an event is defined as:

$$P(E) = \frac{\text{No. of trials in which the event has happened}}{\text{total no. of trials.}}$$



Q.

Coin is tossed 100 times

55 times is Head

find the probability of getting

(i) a head.

(ii) a tail.

$$\left\{ \begin{aligned} P(H) &= \frac{55}{100} \\ P(T) &= \frac{45}{100} \end{aligned} \right\} = \left\{ \begin{aligned} &\boxed{0.55} \\ &\boxed{0.45} \end{aligned} \right\} = \begin{aligned} &\underline{55\%} \\ &45\% \end{aligned}$$

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

$$0\% < P(E) \leq 100\%$$

Q.

Hits a boundary 6 times out of 90 ball he plays.

Find the probability that he hits a boundary
(ii) did not hit a boundary.

$$P(H) = \frac{6}{90} = \left(\frac{1}{15} \right)$$

$$P(\text{not hit}) = \frac{84}{90} = \left(\frac{14}{15} \right)$$

Q. There are 6 marbles in a bag with nos. from 1 to 6 marked on each of them. What is the probability of drawing a marble with number (i) 2 (ii) 5?

Q. A survey of 250 girls of a school was conducted and it was found that 105 girls like tea while 145 ~~girl~~ dislike it. Out of these girls, a girl is selected at random. what is the probability that the selected girl (i) like tea (ii) dislike tea?

Q. Two dice are thrown simultaneously 500 times. Each time, the sum of the two numbers appearing on their tops is noted and recorded as given below:

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	22	30	40	56	64	70	64	26	53	39	28

If the two dice are thrown once more, then what is the probability of getting sum:

(i) 5? $\longrightarrow \frac{56}{500} = \frac{14}{125}$

(ii) more than 9? $= \frac{120}{500} = \frac{12}{50} = \frac{6}{25}$

(iii) less than or equal to 6? $= \frac{220}{500} = \frac{22}{50} = \frac{11}{25}$

(iv) between 6 and 10? $= \frac{160}{500} = \frac{16}{50} = \frac{8}{25}$

$$\frac{56^{14}}{500, 125}$$

Q. An unbiased die is thrown. What is the probability of getting:

(i) on even no.

(ii) a multiple of 3.

(iii) an even no. \boxed{x} a multiple of 3.
↑

(iv) an even no. and a multiple of 3.

(v) a number 3 or 4

(vi) an odd no.

(vii) a no. less than 5

(viii) a no. greater than 3.

(ix) a no. between 3 and 6.

1, 2, 3, 4, 5, 6

$$P(\text{even no.}) = \frac{3}{6} = \frac{1}{2}$$

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

$$P(\text{iii}) = \frac{4}{6}$$

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

Q. 17 cards numbered 1, 2, 3, ..., 17 are put in a box and mixed.
One person draws a 2 card from the box. Find the probability that
the number on the card is:

(i) odd

(i)

$$P(\text{odd}) = \frac{9}{17}$$

(ii) a prime

(ii)

$$P(\text{prime}) = \frac{7}{17}$$

(iii) divisible by 3

(iii)

$$P(\text{divisible by 3}) = \frac{5}{17}$$

(iv) divisible by 3 and 2 both.

(iv)

$$P(2 \& 3 \text{ both}) = \frac{2}{17}$$

Two dice are thrown simultaneously. Find the probability of getting:

- (i) an even no. as the sum. \Rightarrow
- (ii) the sum as a prime number.
- (iii) a total of at least 10.
- (iv) a doulet of even number.

1, 2, 3, 4, 5, 6

1, 2, 3, 4, 5, 6

(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

End of the chapter