

CLASS 9 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

Chapter 7: HOTS: Introduction to Probability (Class 9)

Topic-wise short notes with solved examples

Higher order thinking questions on probability for Class 9: sample spaces of coins and dice, counting favourable outcomes, experimental and theoretical probability, each with a full solution.

1 Solved HOTS questions

- $P(E) = \frac{\text{favourable outcomes}}{\text{all possible outcomes}}$, always between 0 and 1. List the sample space in an organised way (a table or a tree diagram) so that no outcome is missed. Experimental probability uses the results of real trials: $\frac{\text{number of times the event happened}}{\text{number of trials}}$.

Example 1.1 A coin is tossed three times. Write the sample space and find the probability of getting exactly two heads.

SOLUTION

The outcomes are HHH, HHT, HTH, HTT, THH, THT, TTH and TTT: 8 in all.

Exactly two heads: HHT, HTH and THH, which is 3 outcomes.

$$\frac{3}{8}$$

Example 1.2 Two dice are thrown together. Find the probability that the sum of the numbers is less than 5.

SOLUTION

The sums less than 5 are: 2 from (1,1); 3 from (1,2) and (2,1); 4 from (1,3), (3,1) and (2,2). That is 6 outcomes.

There are 36 outcomes in all.

$$\frac{6}{36} = \frac{1}{6}$$

Example 1.3 A bag has 4 red, 5 green and 6 blue balls. A ball is drawn at random. Find the probability that it is not green.

SOLUTION

Total balls = 15. Balls that are not green = $4 + 6 = 10$.

(Or $1 - P(\text{green}) = 1 - \frac{5}{15}$.)

$$\frac{2}{3}$$

Example 1.4 A die is thrown 50 times and the number 6 comes up 9 times. Find the experimental probability of getting a 6 and compare it with the theoretical probability.

SOLUTION

Experimental probability = $\frac{9}{50} = 0.18$.

Theoretical probability = $\frac{1}{6} \approx 0.167$.

The two are close. With more throws the experimental value usually comes closer to the theoretical one.

0.18, which is close to $\frac{1}{6}$

Example 1.5 A letter is chosen at random from the word MATHEMATICS. Find the probability that it is a vowel, and that it is the letter M.

SOLUTION

The word has 11 letters: M, A, T, H, E, M, A, T, I, C, S.

The vowels are A, E, A, I, which is 4 letters. The letter M appears 2 times.

$\frac{4}{11}$ for a vowel and $\frac{2}{11}$ for M