

# CLASS 10 · HOTS · OLYMPIAD PREPARATION · SHORT NOTES

## Chapter 14: HOTS: Probability (Class 10)

Topic-wise short notes with solved examples

Higher order thinking questions on probability for Class 10: cards, dice, coins, bags of balls and finding an unknown number from a given probability, each with a full solution.

### 1 Solved HOTS questions

- $P(E) = \frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$ , and  $P(E) + P(\text{not } E) = 1$ . List the sample space carefully: 36 outcomes for two dice, 4 for two coins, 52 cards in a pack (26 red, 26 black, 12 face cards, 4 aces).

**Example 1.1** Two dice are thrown together. Find the probability that the sum of the numbers is a prime number.

SOLUTION

Prime sums are 2, 3, 5, 7 and 11. Number of ways: 1, 2, 4, 6 and 2, which total 15.

There are 36 equally likely outcomes.

$$\frac{15}{36} = \frac{5}{12}$$

**Example 1.2** A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability that it is neither a king nor a red card.

SOLUTION

There are 4 kings and 26 red cards, and 2 cards are both a king and red. So the cards that are a king or red number  $4 + 26 - 2 = 28$ .

Cards that are neither:  $52 - 28 = 24$ .

$$\frac{24}{52} = \frac{6}{13}$$

**Example 1.3** A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double the probability of drawing a red ball, find the number of blue balls.

SOLUTION

Let the number of blue balls be  $x$ .  $P(\text{red}) = \frac{5}{5+x}$  and  $P(\text{blue}) = \frac{x}{5+x}$ .

$$\frac{x}{5+x} = 2 \times \frac{5}{5+x}, \text{ so } x = 10.$$

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**Example 1.4** A game consists of tossing a coin 3 times and noting the outcome. Hanif wins if all the tosses give the same result (three heads or three tails), and loses otherwise. Find the probability that Hanif loses.

SOLUTION

The 8 outcomes are HHH, HHT, HTH, HTT, THH, THT, TTH, TTT.

Hanif wins with HHH and TTT, which is 2 outcomes, so he loses with the other 6.

$$\frac{6}{8} = \frac{3}{4}$$

**Example 1.5** A box contains cards numbered 1 to 20. One card is drawn at random. Find the probability that the number is a multiple of 3 or of 5.

SOLUTION

Multiples of 3: 3, 6, 9, 12, 15, 18 (6 cards). Multiples of 5: 5, 10, 15, 20 (4 cards). The card 15 is in both.

Cards that are a multiple of 3 or 5:  $6 + 4 - 1 = 9$ .

$$\frac{9}{20}$$