Case Study 3

The neighbourhood school organises an annual F̈un and Learnf̈air where the Mathematics Department runs a raffle and a few chance-based stalls to teach students about probability through real-life examples. For the raffle, 100 numbered tickets (1 to 100) are sold and exactly 8 tickets are printed as winners; one ticket will be drawn at random to pick a lucky winner. At the S̈weet Pickstall a volunteer blind-picks one sweet from a sealed box containing 20 sweets: 6 chocolates, 8 toffees and 6 biscuits. The mathematics teacher also prepares a small number-draw activity with tickets numbered 1 to 100 to discuss divisibility — students are asked to estimate the chance of picking a number divisible by 7. At the craft corner there is a transparent bag with 20 beads: 5 blue, 7 red and 8 yellow; a child picks one bead without looking. Finally, for a quick classroom exercise the teacher asks a student to pick a single ticket from numbers 1 to 50 (inclusive) to discuss primes and asks the probability that the chosen number is prime. All selections are single random draws with all outcomes assumed equally likely; students are required to use the classical definition of probability and reduce fractions to simplest form.

MCQ Questions

1. A ticket is drawn at random from the 100 raffle tickets among which 8 are winners. What is the probability that the drawn ticket is a winning ticket?

   (a) $\frac{1}{12}$
   (b) $\frac{2}{25}$
   (c) $\frac{8}{90}$
   (d) $\frac{1}{10}$

   Answer: (b) $\frac{2}{25}$

   Solution: Total outcomes $= 100$. Favourable outcomes $= 8$. Probability $= \frac{8}{100} = \frac{2}{25}$.

2. One sweet is chosen at random from the sealed box of 20 sweets (6 chocolates, 8 toffees, 6 biscuits). What is the probability that the chosen sweet is a chocolate?

   (a) $\frac{3}{10}$
   (b) $\frac{6}{10}$
   (c) $\frac{6}{20}$
   (d) Both (a) and (c) are equivalent and correct

   Answer: (d) Both (a) and (c) are equivalent and correct

   Solution: Total outcomes $= 20$. Favourable $= 6$. Probability $= \frac{6}{20} = \frac{3}{10}$. Options (a) and (c) represent the same value; hence (d) is correct.

3. A ticket numbered from 1 to 100 is chosen at random. What is the probability that the number on the ticket is divisible by 7?

   (a) $\frac{14}{100}$

(b) $\frac{1}{7}$

(c) $\frac{15}{100}$

(d) $\frac{7}{50}$

Answer: (d) $\frac{7}{50}$

Solution: Numbers divisible by 7 up to 100 are $7, 14, \ldots, 98$. Count $= \left\lfloor \frac{100}{7} \right\rfloor = 14$. Probability $= \frac{14}{100} = \frac{7}{50}$. Option (a) is the unsimplified fraction; (d) is the simplified equivalent.

4. A bead is picked at random from a bag containing 5 blue, 7 red and 8 yellow beads (total 20). What is the probability that the bead is not red?

(a) $\frac{13}{20}$

(b) $\frac{7}{20}$

(c) $\frac{5}{20}$

(d) $\frac{8}{20}$

Answer: (a) $\frac{13}{20}$

Solution: Total $= 20$. Number of red beads $= 7$. Not red $= 20 - 7 = 13$. Probability $= \frac{13}{20}$.

5. A single ticket is chosen at random from integers 1 to 50 inclusive. What is the probability that the chosen number is a prime number?

(a) $\frac{15}{50}$

(b) $\frac{3}{10}$

(c) $\frac{7}{25}$

(d) Both (a) and (b) are equivalent and correct

Answer: (d) Both (a) and (b) are equivalent and correct

Solution: Primes ≤ 50 are $2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47$; count $= 15$. Total outcomes $= 50$. Probability $= \frac{15}{50} = \frac{3}{10}$. Options (a) and (b) are numerically the same; therefore (d) is correct.