Case Study 2

Ms. Iyer runs an after-school mathematics club where she introduces probability to her Class 10 students using everyday examples. To make the lesson engaging she prepares a few simple games and experiments. First, she fills a transparent jar with 15 coloured marbles: 7 red, 5 blue and 3 green. She asks each student to draw one marble at random (without looking). Next, she uses a circular spinner divided into 8 equal sectors; 3 sectors are marked "Win" and the remaining 5 are blank. For practice with coin experiments, she asks students to toss a fair coin three times and records the outcome of a single student. Finally, she brings a box of 10 electric bulbs, among which 2 are known to be defective; she asks a volunteer to pick one bulb at random. Ms. Iyer relates each activity to the classical definition of probability (favourable outcomes divided by total equally likely outcomes) and asks the students to compute single-event probabilities, compare fractions and reduce them to simplest form. The class is encouraged to reason about why classical probability applies in these setups and how to count equally likely outcomes carefully before computing the probability.

MCQ Questions

1. What is the probability that a student drawing one marble from the jar gets a red marble?

   (a) $\frac{7}{15}$

   (b) $\frac{5}{15}$

   (c) $\frac{3}{15}$

   (d) $\frac{8}{15}$

   Answer: (a) $\frac{7}{15}$

   Solution: Total equally likely outcomes $= 15$. Number of favourable outcomes (red) $= 7$. Hence probability $= \frac{7}{15}$.

2. What is the probability of landing on a "Win" sector in one spin of the spinner?

   (a) $\frac{3}{8}$

   (b) $\frac{5}{8}$

   (c) $\frac{1}{4}$

   (d) $\frac{1}{8}$

   Answer: (a) $\frac{3}{8}$

   Solution: Spinner has 8 equal sectors; favourable $= 3$. Probability $= \frac{3}{8}$.

3. A student tosses a fair coin three times and records the outcomes. What is the probability that all three tosses show heads?

   (a) $\frac{1}{2}$

   (b) $\frac{1}{4}$

(c) $\frac{1}{8}$

(d) $\frac{3}{8}$

Answer: (c) $\frac{1}{8}$

Solution: Each toss has two equally likely outcomes. Total outcomes for three tosses $= 2^3 = 8$. Only one outcome is HHH. Probability $= \frac{1}{8}$.

4. If a volunteer picks one bulb at random from the box of 10 bulbs (2 defective, 8 good), what is the probability that the bulb is defective?

   (a) $\frac{1}{5}$

   (b) $\frac{2}{10}$

   (c) $\frac{8}{10}$

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

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

   Solution: Number of defective bulbs $= 2$, total $= 10$. Probability $= \frac{2}{10} = \frac{1}{5}$. Options (a) and (b) represent the same value, so (d) is correct.

5. Ms. Iyer asks: if a number is chosen at random from the integers 1 to 30 (inclusive), what is the probability that it is divisible by 3?

   (a) $\frac{9}{30}$

   (b) $\frac{10}{30}$

   (c) $\frac{11}{30}$

   (d) $\frac{1}{3}$

   Answer: (b) $\frac{10}{30}$ which simplifies to (d) $\frac{1}{3}$

   Solution: Numbers divisible by 3 between 1 and 30 are $3, 6, 9, \ldots, 30$. Count $= \left\lfloor \frac{30}{3} \right\rfloor = 10$. Total outcomes $= 30$. Probability $= \frac{10}{30} = \frac{1}{3}$. Option (b) gives the unsimplified fraction; option (d) gives the simplified form. Since only one option should be chosen, (d) is the simplest exact probability; however (b) is numerically equal. If forced to pick a single best option, (d) $\frac{1}{3}$ is preferred.