PROBABILITY BASICS ASSIGNMENT

QUESTION 1- *A die is rolled. What is the probability of getting:*

(a) An even number.
(b) A number greater than 4.

ANSWER- (a) *Even number: favourable = {2,4,6} = 3 outcomes. Total = 6.* $P = \frac{3}{6} = \frac{1}{2}$.

(b) *Number > 4: favourable = {5,6} = 2 outcomes.* $P = = \frac{2}{6} = \frac{1}{3}$.

QUESTION 2- *In a class of 50 students:*

- *20 like Mathematics (M)*
- *15 kike Science (S)*
- *5 like both subjects*

What is the probability that a student chosen at random likes Mathematics or Science?

ANSWER- *Inclusive – Exclusive:* $n(M \cup S) = n(M) + n(S) - n(M \cap S) = 20 + 15 - 5 = 30.$

Probability = $\frac{30}{50} = \frac{3}{5} = 0.6.$

QUESTION 3- *A bag has 3 red and 2 blue balls. If one ball is drawn randomly and is red, what is the probability that the next ball is also red (without replacement)?*

ANSWER- *One drawn and it's red — without replacement: After drawing red: reds left = 2, total left = 4.*

P (next red | first red) = $\frac{2}{4} = \frac{1}{2}$.

QUESTION 4- *The population of a school is divided into 60% boys and 40% girls. If you want equal representation of both genders in the sample, which method should you use: Simple Random Sampling or Stratified Sampling? Why?*

ANSWER - *We will choose* ***Stratified Sampling*** *and then select equal numbers from each stratum (gender). Why? Because stratified sampling lets us force equal representation from each subgroup, simple random sampling would keep the 60:40 split and not give equality.*

QUESTION 5- *The average height of 1000 students = 160 cm. A sample of 100 students shows an average height = 158 cm.*

Find the sampling error.

ANSWER- *Population mean = 160 cm. Sample mean = 158 cm.*

Sampling error = sample mean – population mean = 158 – 160 = -2 cm. (Magnitude 2 cm: negative = underestimate.)

QUESTION 6- *The population's mean salary is ₹50,000 with a = ₹5,000. If we take a sample of 100 employees, what is the standard error of the mean (SEM)?*

ANSWER- *STANDARD ERROR OF THE MEAN (SEM)*

Population SD $\sigma = 5000, n = 100.$

SEM = $\frac{\sigma}{\sqrt{n}} = \frac{5000}{\sqrt{100}} = \frac{5000}{10} = 500.$

So, SEM = ₹500.

QUESTION 7- *In a group of 100 students:*

- *40 like Cricket (C)*
- *30 like Football (F)*
- *10 like both Cricket and Football*

Find the probability that a student likes at least one sport.

ANSWER- *40 Cricket, 30 Football, 10 Both*

$$n(C \cup F) = 40 + 30 - 10 = 60.$$

Probability at least one sport = $\frac{60}{100} = 0.6.$

QUESTION 8- *From a deck of 52 cards, two cards are drawn without replacement. What is the probability that both are Aces?*

ANSWER- *First card ace: 4/52. Second ace: 3/51. Multiply:*

$$P = \frac{4}{52} \times \frac{3}{51} = \frac{12}{2652} = \frac{1}{221}.$$

QUESTION 9- *A factory produces bulbs with 2% defective rate. If 5 bulbs are chosen at random, what is the probability that all are non-defective?*

ANSWER- *Defect rate 2% → non-defective = 98% per bulb. 5 chosen. All non-defective?*

Independent picks (approx): $P = (0.98)^5 \approx 0.90392$ → *about 90.39%.*

QUESTION 10- *Difference between discrete and continuous random variables with examples.*

ANSWER- A discrete random variable *can take only specific, countable values. These values can be listed, even if the list is long. You usually get them by counting. Examples include the number of students absent in a class, the number of goals scored in a match, the number of red balls drawn, or the number of calls received in an hour. Probabilities for discrete variables are given using a* ***probability mass function (PMF)****, where each value has its own probability.*

A continuous random variable *can take any value within an interval or range. The set of possible values is uncountably infinite. You usually get them by measuring. Examples include height, weight, temperature, time taken to run a race, or the exact amount of milk in a packet. For continuous variables, probabilities are described using a* ***probability density function (PDF)****, and individual values have probability 0; instead, we find probabilities over intervals (like the probability that height lies between 150 and 160 cm).*

DISCRETE*= counted values.*

CONTINUOUS*= measured values.*