Assignment

QUESTIONS AND ANSWERS BELOW:-

Q1 A die is rolled. What is the probability of getting:
(a) An even number
(b) A number greater than 4

ANS:-This is a classic probability problem involving a fair six-sided die numbers 1 to 6.

(a) Probability of an Even Number

- Possible outcomes of a die: {1, 2, 3, 4, 5, 6}
- Even numbers: {2, 4, 6}
- Count of favorable outcomes = 3
- Total outcomes = 6

P= 3/6= 1/2

So, the probability is ***0.5 or 50%.***

(b) Probability of a Number Greater than 4

- Numbers greater than 4: (5, 6)
- Count of favorable outcomes = 2
- Total outcomes = 6

P=2/6=1/3

So, the probability is ***0.333… or about 33.3%***.

Q2 In a class of 50 students:
20 like Mathematics (M)
15 like Science (S)
5 like both subjects
What is the probability that a student chosen at random likes Mathematics or Science?

ANS:- We have:

- Total students = 50
- Students who like Mathematics (M) = 20

- Students who like Science (S) = 15
- Students who like **both** subjects = 5
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$$P(M \cup S)=n(M)+n(S)-n(M \cap S)/N(total)$$

n(M) = number who like Mathematics
n(S) = number who like Science
n(M∩S) = number who like both
n(Total) = total students

$$P(M \cup S)= 20+15-5/50$$
$$=30/50 = 3/5$$

Probability = 30 out of 50 = ***3/5 = 60%.***

Q3 : 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) ?
ANS:- Situation

- Bag contains: 3 red balls + 2 blue balls = 5 balls total.
- The first ball drawn is **red**.
- Since it's **without replacement**, that red ball is not put back.

After removing one red ball:

- Red balls left = 2
- Blue balls left = 2
- Total balls left = 4

Probability of Next Ball Being Red :- P(Red)= red ball left/total ball left
= 2/4= 1/2

Probability = 2 out of 4 = ***1/2 = 50%.***

Q4 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?

ANS:- Simple Random Sampling: Everyone has the same chance to be picked. But since there are more boys (60%), the sample will also have more boys.

- **Stratified Sampling**: We divide the students into groups (boys and girls) first. Then we pick equal numbers from each group. This way, boys and girls are balanced in the sample.

Use Stratified Sampling because it makes sure boys and girls are equally represented.

Q5 The average height of 1000 students = 160 cm. A sample of 100 students shows an average height = 158 cm. Find the sampling error.?

ANS:- Population average height (mean) = 160 cm

Sample average height (mean) = 158 cm

Sample size = 100 students

Sampling error is the **difference between the population mean and the sample mean**.

$$\text{Sampling Error} = \text{Sample Mean} - \text{Population Mean}$$

$$\text{Sampling Error} = 158 - 160 = -2 \text{ cm}$$

The sampling error is -2 cm. This means the sample average height is 2 cm lower than the population average.The negative sign indicates the sample mean is **below** the population mean.

Q6 The population mean salary is ₹50,000 with σ = ₹5,000. If we take a sample of 100 employees, what is the standard error of the mean (SEM)?

ANS:- Population mean salary is ₹50,000

Population standard deviation (σ) = ₹5,000 σ = population standard deviation

Sample size (n) = 100 employees n = sample size

Standard Error of the Mean (SEM) is given by:-

$$SEM = \sigma/\sqrt{n}$$

σ=5000, n=100

$\sqrt{100}$ = 10

SEM= 5000/10 = 500

Q7 In a group of 100 students:

(a)40 like Cricket ©

(b)30 like Football (F)

(c)10 like both Cricket and Football

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

ANS:- Total students = 100

Cricket lovers = 40

Football lovers = 30

Both = 10

Students who like **at least one sport** = 40+30−10=60

Probability= 60/100= 0.6=60%

Q8 From a deck of 52 cards, two cards are drawn without replacement. What is the probability that both are Aces?

ANS:- Deck has 52 cards, with 4 Aces.

First card Ace: 4/52

Second card Ace (after one Ace removed): 3/51

4/52* 3/51=1/221

= 0.45%

Q9 A factory produces bulbs with a 2% defective rate. If 5 bulbs are chosen at random, what is the probability that all are non-defective?

ANS:- Defective rate = 2% So, non-defective rate = 100% – 2% = 98% = 0.98We choose 5 bulbs at random.

1 Probability that **one bulb** is non-defective = 0.98

2 For **5 bulbs**, multiply this probability 5 times:

$$P=(0.98)2$$

= 0.9030

Q10 Differentiate between discrete and continuous random variables with examples?

ANS:- Discrete random variable → takes countable values (like 0, 1, 2, 3…).

Example: Number of students in a class, number of heads in coin tosses.

Continuous random variable → takes measurable values (can be decimals, infinite possibilities).

Example: Height of students, time taken to finish a race.