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Batch: Data Analytics Dec Live Batch

Assignment: 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 numbers = {2, 4, 6} → **3**
P(Even) = 3/6 i.e **1/2**

b) Numbers greater than 4 = {5, 6} → **2**
P(>4) = 2/6 i.e **1/2**

Question 2: 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?

Answer:

P(M U S) $= \frac{20+15-5}{50} = \frac{30}{50} = \frac{3}{5}$

P = 3/5

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:

- Red balls = 3
- Blue balls = 2
- Total balls = 5

One red ball is already taken.

Remaining:

- Red = 2
- Total balls = 4

$$P(\text{Next red}) = \frac{2}{4} = \frac{1}{2}$$

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:

Stratified Sampling

Because,

- Ensures proper representation of each group
- More accurate than random sampling

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

Formula:

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

Sampling Error = –2 cm

Question 6: 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)?

Answer:

- Population standard deviation (σ) = ₹5000
- Sample size (n) = 100

Formula:

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

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:

- Like Cricket (C) = 40
- Like Football (F) = 30
- Like both = 10
- Total students = 100

$$P(C \cup F) = \frac{40 + 30 - 10}{100} = \frac{60}{100} = \frac{3}{5}$$

P = 3/5

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

Answer:

Total cards = 52
Total Aces = 4

First Ace: 4/52

Second Ace (without replacement): 3/51

$$P = \frac{4}{52} \times \frac{3}{51} = \frac{1}{13} \times \frac{1}{17} = \frac{1}{221}$$

P = 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:

Defective rate = 2%
Non-defective rate = 98% = 0.98

For 5 bulbs:

$$P = (0.98)^5 \approx 0.9039$$

Question 10: Differentiate between discrete and continuous random variables with examples.

Answer:

Discrete Random Variable

- Takes countable values
- Whole numbers
- Example: number of students
- Example: number of cars

Continuous Random Variable

- Takes infinite values
- Decimal values
- Example: height, weight
- Example: time, temperature