

### Mean, Median, and Mode

Q1: Calculate the mean, median, and mode for the following data set: 4, 8, 6, 5, 3, 8, 7.

$$\text{Mean} : \frac{4+8+6+5+3+8+7}{7} = \frac{41}{7} = 5.85$$

$$\text{Median} : 3, 4, 5, 6, 7, 8$$

$$\text{Median} = 6$$

$$\text{Mode} : \text{Mode} = 8$$

### Normal Distribution

Q2: In a normal distribution, 68% of the data falls within one standard deviation of the mean. If a dataset has a mean of 50 and a standard deviation of 5, between what two values does 68% of the data lie?

$$\text{Upper bound} = 50 - 5 = 45$$

$$\text{Lower bound} = 50 + 5 = 55$$

### Binomial Distribution

Q3: A fair coin is flipped 10 times. What is the probability of getting exactly 6 heads?

$$P(X=k) = \binom{n}{k} p^k (1-p)^{n-k}$$

$$n = 10, k = 6, p = 0.5$$

$$P(X=6) = \binom{10}{6} (0.5)^6 (0.5)^4 = \binom{10}{6} (0.5)^{10}$$

$${}^{10}C_6 = 210$$

$$P(X=6) = 210 \times (0.5)^{10} = 0.205$$



### Poisson Distribution

Q4: If the average number of emails received per hour is 3, what is the probability of receiving exactly 5 emails in an hour?

$$P(X=k) = \frac{\lambda^k e^{-\lambda}}{k!}$$
$$\lambda = 3 \quad k = 5$$
$$P(X=5) = \frac{3^5 e^{-3}}{5!} = \frac{243 e^{-3}}{120} \approx 0.1008$$

### Uniform Distribution

Q5: What is the probability of rolling a number between 3 and 6 (inclusive) on a fair 6-sided die?

$$P(3 \text{ to } 6) = \frac{\text{No. of favourable}}{\text{Total outcomes}} = \frac{4}{6} = \frac{2}{3} \approx 0.667$$

### Concepts of Probability

Q6: What is the probability of drawing an ace from a standard deck of 52 cards?

There are 4 aces

$$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13} \approx 0.077$$

Q7: If two dice are rolled, what is the probability of getting a sum of 7?

$$(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)$$
$$P(\text{Sum of } 7) = \frac{6}{36} = \frac{1}{6}$$