Mean:-

The average of a set of numbers. Calculated by summing all numbers and divided by the count of numbers

$$\text{Mean} = \frac{\Sigma(\text{all values})}{\text{Number of values}}$$

Example # 01

Find the mean of the first 10 odd integers.

Sol First 10 odd integers;

1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Now:-

$$\text{Mean} = \frac{\Sigma(\text{all values})}{\text{Number of values}}$$

$$= \frac{1+3+5+7+9+11+13+15+17+19}{10}$$

$$= 100/10$$

$$= 10$$

Therefore, the mean of the first 10 odd integers is 10.

Median:

The middle value of a list of number. If the count is even, it is the average of the two middle numbers.

Example # 01:

What is the median of the following data set?

32, 6, 21, 10, 8, 11, 12, 36, 17, 16, 15, 18, 40, 24, 21, 23, 24, 29, 16, 32, 31, 10, 30, 35, 32, 18, 39, 12, 20.

Sol Number of values in the data set = 30

Now:

$n/2 \Rightarrow 30/2 \Rightarrow 15$

15^{th} value is 21

$(n/2)+1 = 16$

16^{th} value = 21

$$\text{Median} = \left((n/2) + (n/2)+1\right)/2$$

$$= (15^{th}\text{ value} + 16^{th}\text{ value})/2$$

$$= \frac{21+21}{2}$$

$$= 21$$

Mode :-

The number that appears most frequently in a data set.

Example # 02

Identify the mode for the following data set.

21, 19, 62, 21, 66, 48, 79, 59, 28, 62, 28
63, 63, 48, 66, 59, 66, 94, 79, 19, 94

Sol

Let us write the given data set in ascending order as follows:

19, 19, 21, 21, 28, 28, 48, 48, 59, 59
62, 62, 63, 63, 66, 66, 66, 66, 79, 79,
94, 94

Now,

Here we can observe that the number 66 occoured the maximum number of times.

Thus, the mode of the given data set is 66.

Binomial Distribution:

Example # 02

A coin is flipped 10 times. What is the probability of getting exactly 6 heads? $(p = 0.5)$

Sol

As we know that;

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

Given Data:

No of trails $(n) = 10$

No of successes $(k) = 6$

probability of success $(p) = 0.5$

Now;

calculate the binomial coefficient $\binom{10}{6}$.

$$\binom{10}{6} = \frac{10!}{6!(10-6)!} = \frac{10\times 9\times 8\times 7}{4\times 3\times 2\times 1} = 21$$

Applying formula:

$$P(X=6) = 210 \times (0.5)^6 \times (0.5)^4$$

$$= 210 \times 0.015625 \times 0.0625$$

$$= 210 \times 0.00097$$

$$= 0.205$$

ANSWER

Poisson Distribution:

Example # 01

The average number of cars that pass through a toll booth in an hour is 5 what is the probability that exactly 3 cars pass through in an hour?

Sol As we know that:

$$P(X=K) = \frac{\lambda^K e^{-\lambda}}{K!}$$

Given Data:

Average Rate $(\lambda) = 5$

No of events $(K) = 3$

Applying formula:

$$P(X=3) = \frac{5^3 e^{-5}}{3!} = \frac{125 \times e^{-5}}{6}$$

$$= \frac{125 \times 0.00067}{6} \approx \frac{0.8375}{6}$$

$$= 0.140$$

ANSWER

Normal Distribution:-

Example # 02

The height of a population are normally distributed with a mean of 170 cm and a standard deviation of 10cm. What is the probability that a randomly selected person is taller than 180 cm?

Sol For normal distribution, we use the z-score formula:

$$z = \frac{x - \mu}{\sigma}$$

Given Data:-

x is the value we are interested in = 180

μ is the mean = 170cm

σ is the standard deviation = 10cm

Now:-

$$z = \frac{180-170}{10} \Rightarrow \frac{10}{10} \Rightarrow 1$$

For z = 1, the z table gives a value of approximately 0.8413, meaning there is an 84.13 chances a value is below 180cm.

Now:- $P(x > 180) = 1 - P(X \leq 180) = 1 - 0.8413$
$= 0.1587$

The probability that a randomly selected person is taller than 180cm is 0.1587

Probability of single event:

The probability of a single event occuring is calculated by dividing the number of favorable outcomes by the total number of possible outcomes.

$$P(A) = \frac{\text{No of favorable outcomes}}{\text{total No of outcomes}}$$

Example # 01

What is the probability of rolling a 4 on a fair six-sided die?

Sol

Now:

total outcomes = (1, 2, 3, 4, 5, 6)

Favorable outcomes = 4

So;

$$P(\text{rolling a } 4) = \frac{1}{6}$$

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Complementary Event:

The probability of the complement of an event A (denoted as A') is calculated as;

$$P(A') = 1 - P(A)$$

Example # 01

What is the probability of not rolling a 4 on a fair six-sided die?

Sol: From the previous example:

$$P(\text{rolling a } 4) = \frac{1}{6}$$

Probability of not rolling a 4:

$$P(\text{not rolling a } 4) = 1 - P(\text{rolling a } 4)$$

$$= 1 - \frac{1}{6}$$

$$= 5/6$$

ANSWER