

Q. ~~Q.1~~

5, 8, 12, 15, 18, 22

⇒ Mean :-

~~5+8~~

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{5 + 8 + 12 + 15 + 18 + 22}{6}$$

$$= \frac{80}{6}$$

$$\bar{x} = 13.3$$

⇒ Median
~~Mode~~ :-

5, 8, 12, 15, 18, 22

Median

~~Mode~~ :-

5, 8, 12, 15, 18, 22

$$= \frac{12 + 15}{2}$$

$$= \frac{27}{2}$$

$$\text{Median} \\ \text{Mode} = 13.5$$

⇒ Mode :-

5, 8, 12, 15, 18, 22

There is no mode.

Q22

Data set :- 7, 14, 3, 8, 4, 4, 5

⇒ Mean :-

$$\bar{x} = \frac{\sum x}{n}$$

$$\bar{x} = \frac{7 + 14 + 3 + 8 + 4 + 4 + 5}{7} = \frac{45}{7}$$

$$\bar{x} = 6.42$$

⇒ Median :-

7, 14, 3, 8, 4, 4, 5

Median = 8

⇒ Mode :-

7, 14, 3, 8, 4, 4, 5

Mode is 4.

Normal distributionse

- 1- The height of group of people are normally distributed with a mean of 170cm and a standard deviation of 6cm. what is probability that a person selected at random has a height between 164cm and 176cm?

Solutione

$$Z = \frac{X - \mu}{\sigma}$$

For 164 cm ::

$$Z = \frac{164 - 170}{6} = \frac{-6}{6} = -1$$

For 176 cm ::

$$Z = \frac{176 - 170}{6} = \frac{6}{6} = 1$$

By using Z table we get

Probability of $Z = -1$ is 0.1587

Probability of $Z = 1$ is 0.8413

$$\begin{aligned}
 P(164 \leq X \leq 176) &= P(Z \leq 1) - P(Z \leq -1) \\
 &= 0.8413 - 0.1587 \\
 &= 0.6826
 \end{aligned}$$

The probability of is that the person selected at random has a height between 164 cm and 176 cm is 68.26% or 0.6826.

2- The test score of a large group of students are normally distributed with a mean of 80 and a standard deviation of 10. What is probability that a randomly selected student has a test score between 75 and 90?

Solution:

$$Z = \frac{X - \mu}{\sigma}$$

For 75:

$$Z = \frac{75 - 80}{10} = \frac{-5}{10} = -0.5$$

For 90:

$$Z = \frac{90 - 80}{10} = \frac{10}{10} = 1$$

By using Z-table we get
cumulative probabilities of

$$\begin{aligned}P(Z \leq -0.5) &= 1 - P(Z \leq 0.5) \\&= 1 - 0.6915 \\&= 0.3085\end{aligned}$$

$$\begin{aligned}P(75 \leq X \leq 90) &= P(Z \leq 1) - P(Z \leq -0.5) \\&= 0.8413 - 0.3085 \\&= \boxed{0.5328}\end{aligned}$$

The probability is 53.28% or 0.5328
that randomly select student will have
a test skill between 75 and 90.

Binomial Distribution

Q3:

Suppose a fair coin is flipped 10 times.
What is the probability of getting
exactly 6 heads?

Solution

$$n = 10$$

$$K = 6$$

$$P = 0.5$$

Binomial coefficient

$$\binom{n}{K} = \binom{10}{6} = \frac{10!}{6!(10-6)!} = \frac{10!}{6!4!}$$

$$= \frac{10 \times 9 \times 8 \times 7 \times \cancel{6} \times \cancel{5} \times \cancel{4} \times \cancel{3} \times \cancel{2} \times \cancel{1}}{6! \times 4 \times 3 \times 2 \times 1} = 210$$

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

$$P(X=6) = \binom{10}{6} (0.5)^6 (1-0.5)^{10-6}$$

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

$$= 210 \times (0.5)^{10}$$

$$= 210 \times \frac{1}{1024}$$

$$= \frac{210}{1024} = 0.2051$$

Answer
of
probability

Poisson Distribution

Q1.

A call center receive an average of 3 calls per minute. What is the probability that exactly 5 calls are received in a given minute?

Solution

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

$$\lambda = 3$$

$$k = 5$$

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

$$= \frac{243 \times 0.0498}{5 \times 4 \times 3 \times 2 \times 1} = \frac{12.1014}{120}$$

$$= \boxed{0.100845}$$

Probability of 5 calls in a minute is 0.100845.

Uniform Distribution.

Q1.

Suppose waiting time for a bus at a particular bus stop is uniformly distributed between 0 and 20 minutes. What is the probability that a person has to wait between 5 and 10 minutes?

Solution

$$f(x) = \frac{1}{b-a} \text{ for } a \leq x \leq b$$

$$\text{interval} = [0, 20]$$

$$\frac{b-a}{b-a} = 20 - 0 = 20$$

$$f(x) = \frac{1}{20} \text{ for } 0 \leq x \leq 20$$

$$P(5 \leq x \leq 10) = \int_5^{10} f(x) dx$$
$$= \int_5^{10} \frac{1}{20} dx$$

$$= \frac{1}{20} \times (10-5)$$

$$= \frac{1}{20} \times 5$$

$$= \frac{5}{20} = \frac{1}{4} = \boxed{0.25}$$

probability
is
0.25