

**1. Mean** is the average of the given numbers and is calculated by dividing the sum of given numbers by the total number of numbers.

**Mean = Sum of the Given Data / Total number of Data**

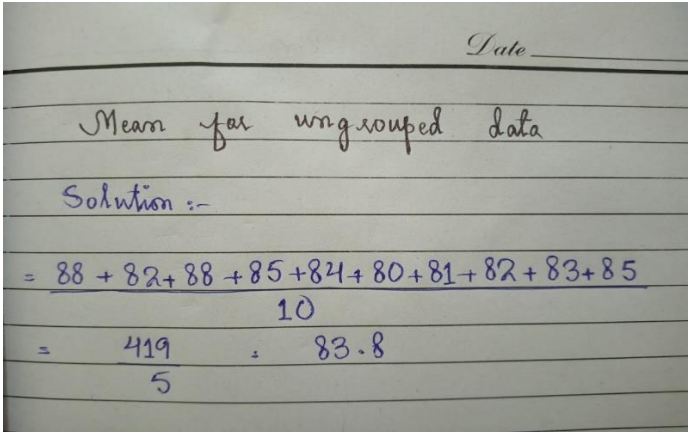
$$\bar{x} = \frac{\sum x}{n}$$

## Mean for Ungrouped Data

The example given below will help you in understanding **how to find the mean** of ungrouped data.

### Example:

In a class there are 20 students and they have secured a percentage of 88, 82, 88, 85, 84, 80, 81, 82, 83, 85, 84, 74, 75, 76, 89, 90, 89, 80, 82, and 83.



The image shows a handwritten solution on lined paper. At the top right, there is a 'Date' field. The title 'Mean for ungrouped data' is written in the center. Below it, 'Solution :-' is written. The calculation is shown as follows: the sum of the percentages (88 + 82 + 88 + 85 + 84 + 80 + 81 + 82 + 83 + 85 + 84 + 74 + 75 + 76 + 89 + 90 + 89 + 80 + 82 + 83) is divided by the total number of students (20). The result is 419 divided by 5, which equals 83.8.

$$\begin{aligned} &= \frac{88 + 82 + 88 + 85 + 84 + 80 + 81 + 82 + 83 + 85}{10} \\ &= \frac{419}{5} = 83.8 \end{aligned}$$

## Mean for Grouped Data

### Example:

Find the mean for the following distribution.

$x_i$	11	14	17	20
$f_i$	3	6	8	7

Solution:

$X_i$	$f_i$	$f_i X_i$
11	3	33
14	6	84
17	8	136
20	7	140
	24	393

$$\text{Mean} = \frac{\sum f_i X_i}{\sum f_i} = \frac{393}{24} = 16.4$$

**2. Median:** The median is the middle value of a dataset when it is ordered in ascending or descending order. If the number of data points is even, the median is the average of the two middle numbers.

## Ungrouped Data

1) Find the median of the following set of data

20, 25, 21, 24, 22, 32, 18

Date \_\_\_\_\_

First arrange the data

$$\left( \frac{n+1}{2} \right)^{\text{th}} = 4^{\text{th}} \text{ observation}$$

$$= 22$$

2) Find the median of the following set of data

13, 8, 19, 30, 15, 21, 9, 5

Therefore the median is:

observation = 4<sup>th</sup> and 5<sup>th</sup>

$$= \frac{13+15}{2} = 14$$

## Grouped Data

Compute the median from the following data.

Mid-value	5	15	25	35	45	55
Frequency	7	10	23	51	6	3

Mid value	Class	Frequency	C.F
5	0-10	7	7
15	10-20	10	17
25	20-30	23	40
35	30-40	51	91
45	40-50	6	97
55	50-60	3	100
$\text{Here, } N = 100 \quad \therefore \frac{N}{2} = 50$			

<p>We have,  <math>L = 30, f = 51, F = 40, h = 10</math></p> <p>We know,  <math display="block">\text{Median} = L + \frac{\frac{N}{2} - F}{f} \times h</math> <math display="block">= 30 + \frac{50 - 40}{51} \times 10</math> <math display="block">= 30 + \frac{10}{51} \times 10 = 30 + 1.96</math> <math display="block">= 31.96</math></p>			
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**3. Mode:** The mode is the value that appears most frequently in a dataset. A dataset may have one mode, more than one mode, or no mode at all.

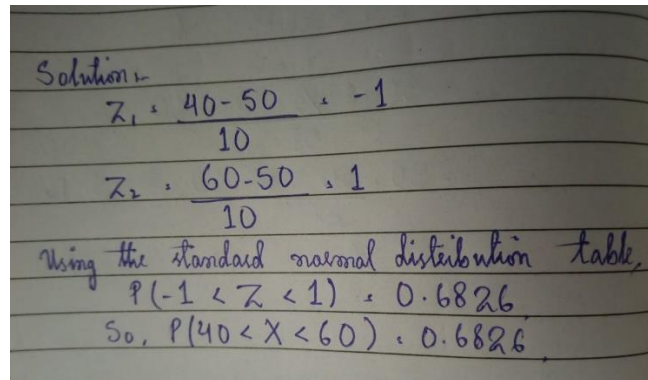
**Example:** The heights of 50 students are given below in cm. Find the mode.

Height (in cm)	125-130	130-135	135-140	140-145	145-150
Number of students	7	14	10	10	9

<p>Solution :-</p> <p>Maximum Frequency = 14</p> <p>Class = 130-135</p> <p><math>l = 130, h = 5, f_m = 14, f_1 = 7</math> and <math>f_2 = 10</math>.</p> <p><math display="block">\therefore \text{Mode} = L + \left[ \frac{f_m - f_1}{(f_m - f_1) + (f_m - f_2)} \right] \times h</math> <math display="block">= 130 + \left[ \frac{14 - 7}{(14 - 7) + (14 - 10)} \right] \times 5</math> <math display="block">= 130 + \left[ \frac{7}{7 + 4} \right] \times 5</math> <math display="block">= 133.18</math></p>	
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## Normal Distribution Problems

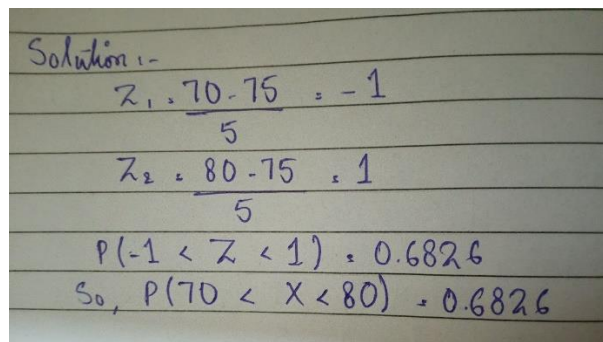
**Problem 1:** Given a normal distribution with mean  $\mu=50$  and standard deviation  $\sigma=10$ , find the probability that XXX is between 40 and 60.



Solution:-  
$$Z_1 = \frac{40-50}{10} = -1$$
$$Z_2 = \frac{60-50}{10} = 1$$

Using the standard normal distribution table,  
 $P(-1 < Z < 1) = 0.6826$   
So,  $P(40 < X < 60) = 0.6826$

**Problem 2:** Given a normal distribution with mean  $\mu=75$  and standard deviation  $\sigma=5$ , find the probability that XXX is between 70 and 80.

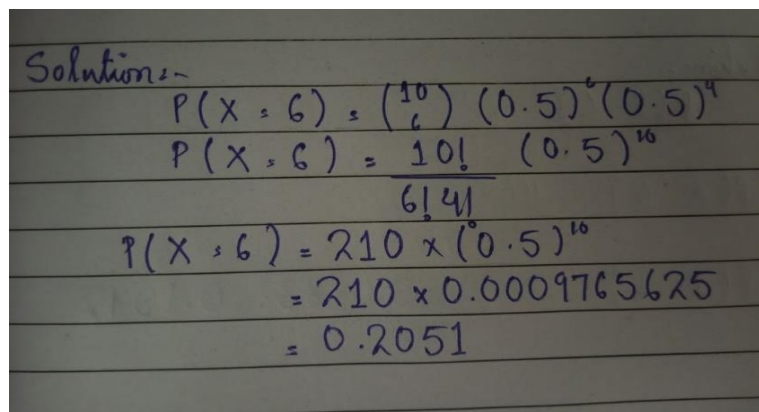


Solution:-  
$$Z_1 = \frac{70-75}{5} = -1$$
$$Z_2 = \frac{80-75}{5} = 1$$

$P(-1 < Z < 1) = 0.6826$   
So,  $P(70 < X < 80) = 0.6826$

## Binomial Distribution Problems

**Problem 1:** A coin is flipped 10 times. What is the probability of getting exactly 6 heads? (Assume  $p=0.5$ )



Solution:-  
$$P(X=6) = {}^{10}C_6 (0.5)^6 (0.5)^4$$
$$P(X=6) = \frac{10!}{6!4!} (0.5)^{10}$$
$$P(X=6) = 210 \times (0.5)^{10}$$
$$= 210 \times 0.0009765625$$
$$= 0.2051$$

**Problem 2:** A basketball player has a 70% chance of making a free throw. If she takes 8 shots, what is the probability of making exactly 5 shots?

Solution:-

$$P(X=5) = \binom{8}{5} (0.7)^5 (0.3)^3$$

$$P(X=5) = \frac{8!}{5!3!} (0.7)^5 (0.3)^3$$

$$P(X=5) = 56 \times 0.16807 \times 0.027$$

$$= 0.2541$$

### Poisson Distribution Problems

**Problem 1:** If a bookstore sells an average of 3 books per hour, what is the probability that exactly 5 books will be sold in an hour?

Solution:-

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

$$P(X=5) = \frac{243 e^{-3}}{120}$$

$$P(X=5) = \frac{243 \times 0.0498}{120} = 0.1008$$

**Problem 2:** A car rental service rents an average of 4 cars per day. What is the probability of renting exactly 6 cars in a day?

Solution:-

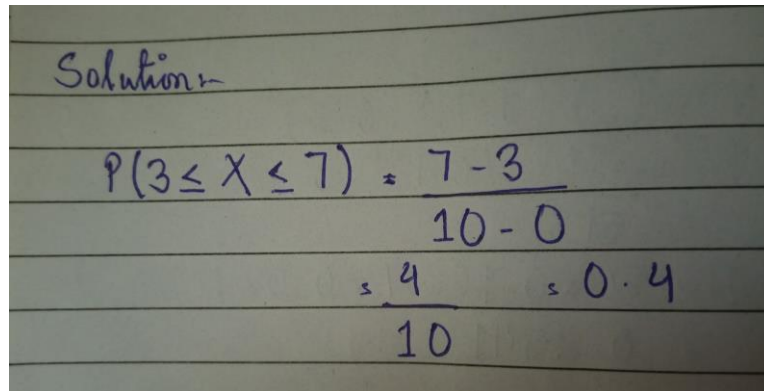
$$P(X=6) = \frac{4^6 e^{-4}}{6!}$$

$$P(X=6) = \frac{4096 e^{-4}}{720}$$

$$P(X=6) = \frac{4096 \times 0.0183}{720} = 0.1042$$

## Uniform Distribution Problems

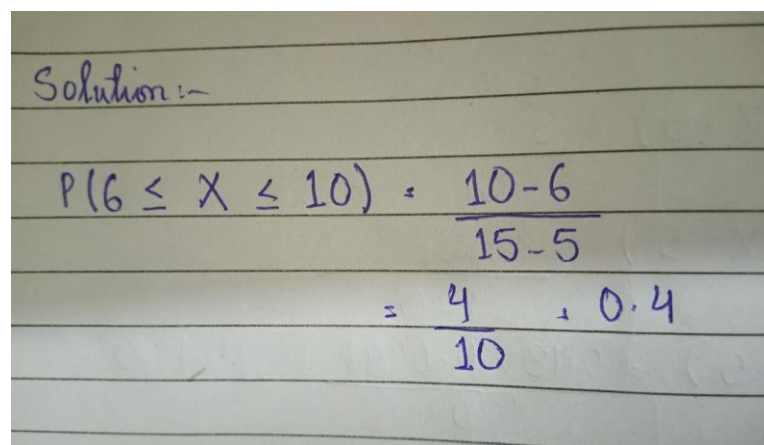
**Problem 1:** For a uniform distribution ranging from 0 to 10, what is the probability of selecting a value between 3 and 7?



A photograph of a piece of lined paper with handwritten text in blue ink. The word "Solution:-" is written at the top. Below it, the formula for the probability of a value falling between 3 and 7 in a uniform distribution from 0 to 10 is shown. The formula is  $P(3 \leq X \leq 7) = \frac{7-3}{10-0}$ . This is then simplified to  $= \frac{4}{10}$  and finally to  $= 0.4$ .

$$\begin{aligned} \text{Solution:-} \\ P(3 \leq X \leq 7) &= \frac{7-3}{10-0} \\ &= \frac{4}{10} = 0.4 \end{aligned}$$

**Problem 2:** For a uniform distribution ranging from 5 to 15, what is the probability of selecting a value between 6 and 10?



A photograph of a piece of lined paper with handwritten text in blue ink. The word "Solution:-" is written at the top. Below it, the formula for the probability of a value falling between 6 and 10 in a uniform distribution from 5 to 15 is shown. The formula is  $P(6 \leq X \leq 10) = \frac{10-6}{15-5}$ . This is then simplified to  $= \frac{4}{10}$  and finally to  $= 0.4$ .

$$\begin{aligned} \text{Solution:-} \\ P(6 \leq X \leq 10) &= \frac{10-6}{15-5} \\ &= \frac{4}{10} = 0.4 \end{aligned}$$

To be continued.....