

# ASSIGNMENTS

**Week 1:**

**Practice Problems 1:**

**Q.1: Find the mean of 5,10,15,20,25.**

$$\begin{aligned}\text{Ans} - (5+10+15+20+25)/5 \\ = 15\end{aligned}$$

**Q.2: Find the mean of the given data set: 10,20,30,40,50,60,70,80,90.**

$$\text{Ans} - 50$$

**Q.3: Find the mean of the first 10 even numbers.**

$$\begin{aligned}\text{Ans} - (2+4+6+8+10+12+14+16+18+20)/10 \\ = 11\end{aligned}$$

**Q.4: Find the mean of the first 10 odd numbers.**

$$\begin{aligned}\text{Ans} - (1+3+5+7+9+11+13+15+17+19)/10 \\ = 10\end{aligned}$$

**Practice Problems 2:**

**1. The marks in a subject for 12 students are as follows:**

**31, 37, 35, 38, 42, 23, 17, 18, 35, 25, 35, 29**

**For the given data, find the range.**

$$\begin{aligned}\text{Ans: Highest Value} &= 42 \\ \text{Lowest Value} &= 17 \\ \text{Range} &= \text{Highest value} - \text{Lowest Value} = 42-17 \\ &= 25\end{aligned}$$

**2. Given below are heights of 15 students of a class measured in cm:**

**128, 144, 146, 143, 136, 142, 138, 129, 140, 152, 144, 140, 150, 142, 154**

**Find the range of the given data.**

$$\begin{aligned}\text{Ans: Range} &= 154 - 128 \\ &= 26\end{aligned}$$

**3. Calculate the range of the data given below:**

<b>Class</b>	<b>30 – 40</b>	<b>40 – 50</b>	<b>50 – 60</b>	<b>60 – 70</b>	<b>70 – 80</b>	<b>80 – 90</b>	<b>90 – 100</b>
<b>Frequency</b>	<b>2</b>	<b>3</b>	<b>8</b>	<b>15</b>	<b>12</b>	<b>7</b>	<b>3</b>

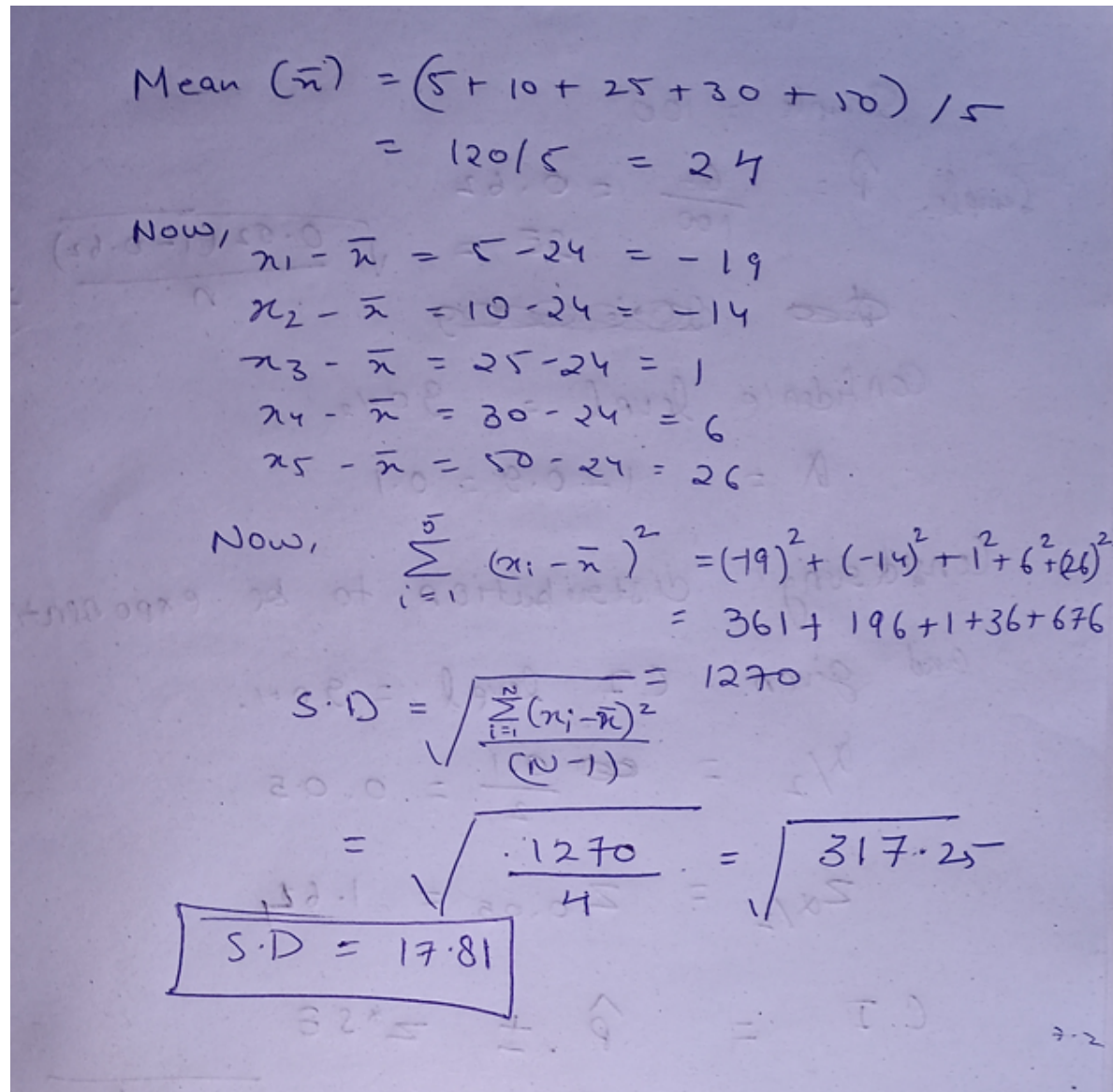
$$\text{Ans: Range} = 100-30 = 70$$

**Practice Problems on Standard Deviation:**

**1. Calculate the standard deviation of the following values:**

**5, 10, 25, 30, 50.**

**Ans:**



Handwritten solution for the standard deviation calculation:

$$\text{Mean } (\bar{x}) = (5 + 10 + 25 + 30 + 50) / 5$$
$$= 120 / 5 = 24$$

Now,

$$x_1 - \bar{x} = 5 - 24 = -19$$
$$x_2 - \bar{x} = 10 - 24 = -14$$
$$x_3 - \bar{x} = 25 - 24 = 1$$
$$x_4 - \bar{x} = 30 - 24 = 6$$
$$x_5 - \bar{x} = 50 - 24 = 26$$

Now,

$$\sum_{i=1}^5 (x_i - \bar{x})^2 = (-19)^2 + (-14)^2 + 1^2 + 6^2 + 26^2$$
$$= 361 + 196 + 1 + 36 + 676$$
$$= 1270$$
$$S.D = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{(n-1)}}$$
$$= \sqrt{\frac{1270}{4}} = \sqrt{317.5}$$

$S.D = 17.81$

2. Find the mean and standard deviation for the following data.

x	60	61	62	63	64	65	66	67	68
f	2	1	12	29	25	12	10	4	5

Ans:

$x_i$	$f_i$	$f_i x_i$	$x_i^2$	$f_i x_i^2$
60	2	120	3600	7200
61	1	61	3721	3721
62	12	744	3844	46128
63	29	1827	3969	115101
64	25	1600	4096	102400
65	12	780	4225	50700
66	10	660	4356	43560
67	4	268	4489	17956
68	5	340	4624	23120
$\sum f_i = N$ = 100		$\sum f_i x_i =$ 6400		$\sum f_i x_i^2 =$ 409886

$$\text{Mean} = \bar{x} = \frac{\sum f_i x_i}{N} = \frac{6400}{100} = 64$$

$$\sigma^2 = \left( \frac{1}{N} \sum f_i x_i^2 \right) - \left( \frac{1}{N} \sum f_i x_i \right)^2$$

$$= (4098.86) - 4096$$

$$\sigma^2 = 2.86$$

$$\text{S.D} = \sigma = \sqrt{2.86} = 1.69 \text{ km}$$

3. The diameters of circles (in mm) drawn in a design are given below:

Diameters	33 – 36	37 – 40	41 – 44	45 – 48	49 – 52
No. of circles	15	17	21	22	25

Calculate the standard deviation and mean diameter of the circles.

Ans:

Making data Continuous,

Diameters (in mm)	No. of Circles (f)	Mid value ( $x_i$ )	$f x_i$	$f x_i^2$
32.5 – 36.5	15	34.5	517.5	17853.75
36.5 – 40.5	17	38.5	654.5	25198.25
40.5 – 44.5	21	42.5	892.5	37931.25
44.5 – 48.5	22	46.5	1023	47569.5
48.5 – 52.5	25	50.5	1262.5	63756.25
	$\Sigma f_i = 100$		$\Sigma f x_i = 4350$	$\Sigma f x_i^2 = 192309$

$$\text{Mean } (\bar{x}) = \frac{\Sigma f x_i}{\Sigma f_i} = \frac{4350}{100} = 43.5$$

$$\text{Variance } (\sigma^2) = \frac{1}{(\Sigma f_i - 1)} \left( \Sigma f x_i^2 - \frac{1}{N} (\Sigma f x_i)^2 \right)$$

$$= \frac{1}{99} \left( 192309 - \frac{1}{100} (4350)^2 \right)$$

$$= \frac{1}{99} (192309 - 189225)$$

$$= \frac{3084}{99} = 31.15$$

$$\text{Standard deviation } (\sigma) = \sqrt{31.15} = 5.58 \text{ mm}$$

### Probability Problems:

**1. Two dice are thrown together. Find the probability that the product of the numbers on the top of the dice is: (i) 6 (ii) 12 (iii) 7**

Ans:

i) Two dice are thrown together

So, total possible outcomes =  $6 \times 6 = 36$

Desirable Outcomes =  $\{(1,6), (6,1), (2,3), (3,2)\}$

Probability =  $4/36 = 1/9$

ii) Total possible outcomes =  $6 \times 6 = 36$

Desirable Outcomes =  $\{(2,6), (6,2), (4,3), (3,4)\}$

Probability =  $4/36 = 1/9$

iii) Since, no combination can result in the product=7, so,

Probability = 0

**2. A bag contains 10 red, 5 blue and 7 green balls. A ball is drawn at random. Find the probability of this ball being a (i) red ball (ii) green ball (iii) not a blue ball**

i) Total possible outcomes =  $10+5+7 = 22$

Desirable Outcomes = 10

Probability =  $10/22 = 5/11$

ii) Total possible outcomes = 22

Desirable Outcomes = 7

Probability =  $7/22$

iii) Total possible outcomes = 22

Desirable Outcomes =  $7+10=17$

Probability =  $17/22$

**3. All the jacks, queens and kings are removed from a deck of 52 playing cards. The remaining cards are well shuffled and then one card is drawn at random. Giving ace a value 1 similar value for other cards, find the probability that the card has a value (i) 7 (ii) greater than 7 (iii) less than 7**

i) Total possible outcomes =  $52 - (4 \times 3) = 40$

Desirable Outcomes =  $1 \times 4 = 4$

Probability =  $4/40 = 1/10$

ii) Total possible outcomes = 40

Desirable Outcomes =  $3 \times 4 = 12$

Probability =  $12/40 = 3/10$

iii) Total possible outcomes = 40

Desirable Outcomes =  $6 \times 4 = 24$

Probability =  $24/40 = 6/10 = 3/5$

**4. A die has its six faces marked 0, 1, 1, 1, 6, 6. Two such dice are thrown together and the total score is recorded. (i) How many different scores are possible? (ii) What is the probability of getting a total of 7?**

i) Possible scores are =  $\{(0+1), (1+1), (1+6), (0+6), (6+6), (0+0)\}$   
= 6 different scores are possible.

ii) For a total of 7, 1 dice must show 1 and the other dice must show 6.

So, Probability of dice showing 1 =  $3/6 = 1/2$

Probability of dice showing 6 =  $2/6 = 1/3$

Therefore, total probability =  $1/2 \times 1/3 + 1/3 \times 1/2 = 2/6 = 1/3$

**Practice Questions:**

**1) Differentiate  $f(x) = 6x^3 - 9x + 4$**

Ans:  $18x^2 - 9$

**2) Differentiate  $f(x) = x^3 - 2x^2 + x - 1$**

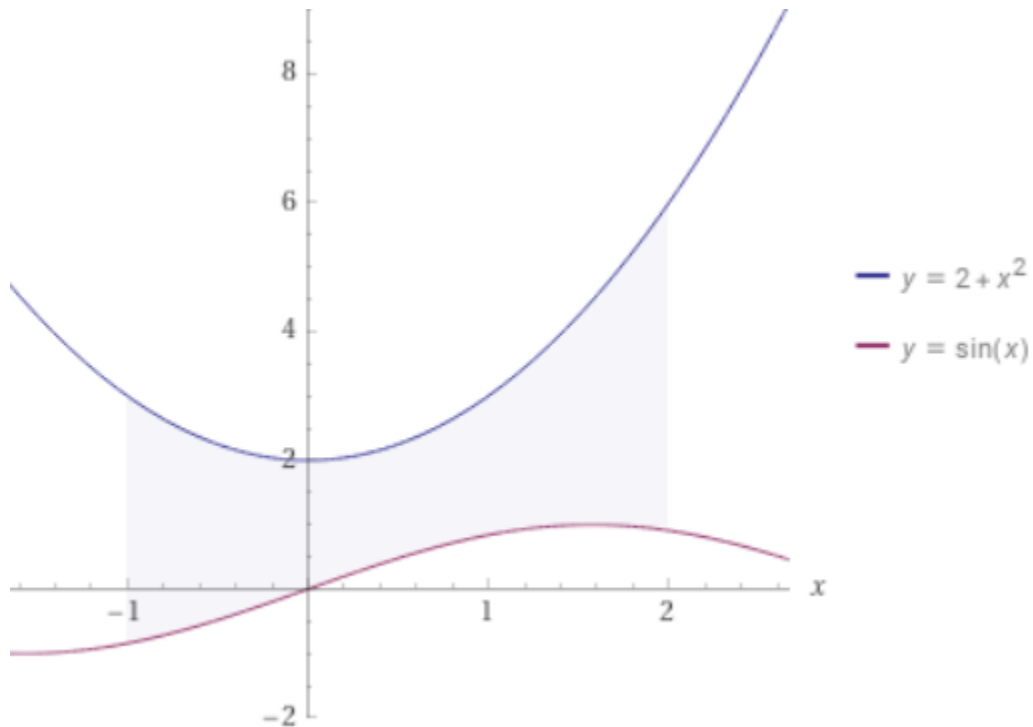
Ans:  $3x^2 - 4x + 1$

**3) Find:  $\int 6x^5 - 18x^2 + 7 \, dx$**

Ans:  $x^6 - 6x^3 + 7x + c$

4) Find the area under the curve for  $y = x^2 + 2$ ,  $y = \sin x$ ,  $x = -1$  and  $x = 2$

Ans:



$$\begin{aligned}\text{Area enclosed} &= \int_{-1}^2 (2 + x^2 - \sin(x)) dx \\ &= \int_{-1}^2 \left( 2x + \frac{x^3}{3} + \cos(x) \right) dx \\ &= \left[ 4 + \frac{8}{3} + \cos(2) \right] - \left[ -2 - \frac{1}{3} + \cos(-1) \right] \\ &= 9 - \cos(1) + \cos(2) \\ &= 8.043 \text{ sq. units}\end{aligned}$$