

Exercise 12.2

Q. 1 Find the arithmetic mean in each of the following:

(i) 4,6,10,12,15,20,25,28,30

Solution:

$$x = 4, 6, 10, 12, 15, 20, 25, 28, 30$$

No. of observations = $n = 9$

We know that

$$\begin{aligned}\bar{X} &= \frac{\sum x}{n} \\ \bar{X} &= \frac{4 + 6 + 10 + 12 + 15 + 20 + 25 + 28 + 30}{9} \\ \bar{X} &= \frac{150}{9} \\ \bar{X} &= 16.67\end{aligned}$$

(ii) 12, 18, 19, 0, -19, -18, -12

Solution:

$$X = 12, 18, 19, 0, -19, -18, -12$$

No. of observations = $n = 7$

We know that

$$\begin{aligned}\bar{X} &= \frac{12 + 18 + 19 + 0 + (-19) + (-18) + (-12)}{7} \\ &= \frac{49 - 49}{7} \\ \bar{X} &= \frac{0}{7} \\ \bar{X} &= 0\end{aligned}$$

(iii) 6.5, 11, 12.3, 9, 8.1, 16, 18, 20.5, 25

Solution:

$$X = 6.5, 11, 12.3, 9, 8.1, 16, 18, 20.5, 25$$

No. of observations = $n = 9$

We know that

$$\begin{aligned}\bar{X} &= \frac{\sum x}{n} \\ \bar{X} &= \frac{6.5 + 11 + 12.3 + 9 + 8.1 + 16 + 18 + 20.5 + 25}{9} \\ \bar{X} &= \frac{126.4}{9} \\ \bar{X} &= 14.04\end{aligned}$$

(iv) 8,10,12,14,16,20,22

Solution:

$$\bar{X} = 8,10,12,14,16,20,22$$

No. of observations = $n = 7$

We know that


$$\begin{aligned}\bar{X} &= \frac{\sum x}{n} \\ \bar{X} &= \frac{8 + 10 + 12 + 14 + 16 + 20 + 22}{7} \\ \bar{X} &= \frac{102}{7} \\ \bar{X} &= 14.57\end{aligned}$$

Q. 2 Following are the heights in (inches) of 12 students. Find the median height.

55,53,54,58,60,61,62,56,57,52,51,63

Solution:

Arranged data:

$X = 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, 63$

No. of observations = $n = 12$ (Even)

We know that

Median($\tilde{x}$)

$$= \frac{1}{2} \left[\frac{12}{2} \text{th observation} + \frac{12+2}{2} \text{th observation} \right]$$

$$\tilde{X} = \frac{1}{2} [6^{\text{th}} \text{ observation} + 7^{\text{th}} \text{ observation}]$$

$$\tilde{X} = \frac{1}{2} [56 + 57]$$

$$\tilde{X} = \frac{1}{2} [113]$$

$$\tilde{X} = 56.5 \text{ inches}$$

Thus median height is 56.5 inches.

Q. 3 Following are the earnings (in Rs.) of ten workers.

88,70,72,125,115,95,81,90,95,90.

Calculate

(i) Arithmetic Mean

Solution:

Arithmetic Mean:

$$X = 88, 70, 72, 125, 115, 95, 81, 90, 95, 90$$

No. of observations = $n = 10$

We know that

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

$$\bar{X} = \frac{88 + 70 + 72 + 125 + 115 + 95 + 81 + 90 + 95 + 90}{10}$$

$$X = \frac{921}{10} = \text{Rs. } 92.1$$

(ii) Median

Arranged data

$$X = 70, 72, 81, 88, 90, 90, 95, 95, 115, 125$$

No. of observations = $n = (\text{Even})$

$$\text{Median} = \tilde{X} = \frac{1}{2} \left[\frac{n}{2} \text{th obs.} + \frac{n+2}{2} \text{th obs.} \right]$$

$$\tilde{X} = \frac{1}{2} \left[\frac{10}{2} \text{ th obs.} + \frac{10+2}{2} \text{ th obs.} \right]$$

$$\tilde{X} = \frac{1}{2} [5 \text{ th obs.} + 6 \text{ th obs.}]$$

$$\tilde{X} = \frac{1}{2} [90 + 90]$$

$$\tilde{X} = \frac{1}{2} (180)$$

$$\tilde{X} = \text{Rs. } 90$$

(ii) Mode

The most repeated values are 90 and 95 so mode = 90 and 95 .

Q.4 The marks obtained by the students in the subject of English are given below.

Marks obtained	15 – 19	21 – 24	25 – 29	31 – 34	35 – 39
Frequency	3	13	35	17	5

Find

(i) Arithmetic mean of their marks by direct and short formula.

Solution:

Marks obtained	(f)	Midpoints (x)	fx
15 – 19	9	17	153
20 – 24	18	22	396
25 – 29	35	27	945
30 – 34	17	32	544
35 – 39	5	37	185
$\Sigma f = 84$			$\Sigma fx = 2223$

We know that

$$\bar{X} = \frac{\sum fx}{\sum f} = \frac{2223}{84} = 26.46$$

Arithmetic Mean by short formula

Let assumed mean = $A = 27$

Marks	(f)	Midpoints (x)	$D = x - A$	fD
15 – 19	9	17	$17 - 27 = -10$	-90
20 – 24	18	22	$22 - 27 = -5$	-90
25 – 29	35	27	$27 - 27 = 0$	0
30 – 34	17	32	$32 - 27 = 5$	85
35 – 39	5	37	$37 - 27 = 10$	50

$\Sigma f = 84$

We know that

$\Sigma fD = -45$
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$$\bar{X} = A + \frac{\sum fD}{\sum f}$$

$$\bar{X} = 27 + \frac{-45}{84}$$

$$\bar{X} = 27 - (0.54)$$

$$\bar{X} = 26.46$$

(ii) (Median of their marks)

Solution:

Marks	(f)	Class Boundaries	C.F
15 – 19	9	14.5 – 19.5	9
20 – 24	18	19.5 – 24.5	$9 + 18 = 27$

25 – 29	35	24.5 – 29.5	27 + 35 = 62
30 – 34	17	29.5 – 34.5	62 + 17 = 79
35 – 39	5	34.5 – 39.5	79 + 5 = 84
	$\Sigma f = 84$		

Median class = class having $\left(\frac{n}{2}\right)^{\text{th}}$ value.

= class having $\left(\frac{84}{2}\right)$ th value.

= class having 42th value.

Since, 42 th value lies in class (24.5-29.5) We know that

$$\tilde{X} = \ell + \frac{h}{f} \left(\frac{n}{2} - C \right)$$

Put $\ell = 24.5$, $h = 5$, $f = 35$, $n = 84$, $c = 27$

$$\tilde{X} = 24.5 + \frac{5}{35} (42 - 27)$$

$$\tilde{X} = 24.5 + \frac{5 \times 15}{35}$$

$$\tilde{X} = 24.5 + \frac{75}{35}$$

$$= 24.5 + 2.14$$

$$= 26.64$$

Q. 5 Given below is a frequency distribution.

Class Interval	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29
Frequency	1	8	18	11	2

Find the mode of the frequency distribution.

Solution:

Class intervals	(f)	Class Boundaries
5 – 9	1	4.5 – 9.5
10 – 14	$8 \rightarrow f_1$	9.5 – 14.5
15 – 19	$18 \rightarrow f_m$	14.5 – 19.5
20 – 24	$11 \rightarrow f_2$	19.5 – 24.5
25 – 29	2	24.5 – 29.5

Modal class is a class having maximum frequency so, modal class = (14.5 – 18.5)

We know that

$$\text{Mode}(\hat{X}) = \ell + \frac{(f_m - f_1)}{(f_m - f_1) + (f_m - f_2)} \times h$$

$$\text{Mode } \hat{X} = 14.5 + \frac{(18 - 8) \times 5}{(18 - 8) + (18 - 11)}$$

$$\hat{X} = 14.5 + \frac{10 \times 5}{10 + 7}$$

$$\hat{X} = 14.5 + \frac{50}{17} = 14.5 + 2.94 = 17.44$$

Q. 6 (a) Ten boys work on a petrol pump station. They get weekly wages as follows:

Wages (in Rs.) 4250, 4350, 4400, 4250, 4350, 4410, 4500, 4300, 4500, 4390. Find the arithmetic mean by short formula, median and mode of their wages.

Solution:

Arranged data

$$X = 4250, 4250, 4300, 4350, 4350, 4390, 4400, 4500, 4500$$

No. of obs = $n = 10$

(a) Arithmetic mean short formula

Let assumed mean = $A = 4350$

D	$= x - A$
4250	$4250 - 4350 = -100$
4250	$4250 - 4350 = -100$
4300	$4300 - 4350 = -50$
4350	$4350 - 4350 = 0$
4350	$4350 - 4350 = 0$
4390	$4390 - 4350 = 40$
4400	$4400 - 4350 = 90$
4410	$4410 - 4350 = 60$
4500	$4500 - 4350 = 150$
4500	$4500 - 4350 = 150$
	$\Sigma D = 200$

We know

$$\bar{X} = A + \frac{\Sigma D}{n}$$

$$\bar{X} = 4350 + \frac{200}{10} = 4350 + 20$$

$$\bar{X} = 4370$$

(b) Median

Solution:

Arranged data

$X = 4250, 4250, 4300, 4350, 4350, 4390, 4400, 4410, 4500, 4500.$ We know that

$$\begin{aligned}\tilde{X} &= \frac{1}{2} \left[\left(\frac{10}{2} \right) \text{th value} + \left(\frac{n+2}{2} \right) \text{th value} \right] \\ \tilde{X} &= \frac{1}{2} \left[\left(\frac{10}{2} \right) \text{th value} + \left(\frac{10+2}{2} \right) \text{th value} \right] \\ \tilde{X} &= \frac{1}{2} [5^{\text{th}} \text{ value} + 6^{\text{th}} \text{ value}] \\ \tilde{X} &= \frac{1}{2} [4350 + 4390] \\ \tilde{X} &= \frac{1}{2} [8,740] \\ \tilde{X} &= 4,370\end{aligned}$$

(C) Mode:

Since, most repeated value of data are 4250 ,
4350 and 4500, so

Mode = 4250, 4350 and 4500.

Q. 7 The arithmetic mean of 45 numbers is 80 . Find their sum.
Solution:

No, of obs. $N = 45$

Arithmetic mean = $\bar{X} = 80$

Sum = $\Sigma x = ?$

We know that

$$\begin{aligned}\bar{X} &= \frac{\Sigma x}{n} \\ 80 &= \frac{\Sigma x}{45}\end{aligned}$$

$$\begin{aligned}3,600 &= \Sigma x \\ 3,600 &= \Sigma x \\ \Rightarrow \Sigma x &= 3,600\end{aligned}$$

Q. 8 Five numbers are 1,4,0,7,9, Find their mean, median and mode.

Solution

Data = $x = 1, 4, 0, 9, 7$

(a) Mean: $x = 1, 4, 0, 7, 9$

$$\bar{X} = \frac{\sum x}{n} = \frac{1+4+0+7+9}{5} = \frac{21}{5} = 4.2$$

(b) Median: Arranged data = 0, 1, 4, 7, 9

No. of obs. = $n = 5$ (odd)

Median($\tilde{X}$) = $\frac{n+1}{2}$ th observation = $\frac{5+1}{2}$ th observation = $\frac{6}{2}$ th observation = 3rd observation

Since, 3rd observation in data set is 4 .

Median($\tilde{X}$) = 4

(c) Mode

Data have no mode

Q. 9 A set of data contains the values as 148, 145, 160, 157, 156, 160.

Show that Mode > Median > Mean.

Solution:

Data: $X = 148, 145, 160, 157, 156, 160$ No. of observations = $n = 6$

(a) Mean

$$\begin{aligned}\bar{X} &= \frac{\sum x}{n} \\ \bar{X} &= \frac{148 + 145 + 160 + 157 + 156 + 160}{6} \\ \bar{X} &= \frac{926}{6} \\ \bar{X} &= 154.33\end{aligned}$$

(b) Median

Arranged data

$$X = 145, 148, 156, 157, 160, 160$$

$$\text{No. of obs.} = n = 6 \text{ (Even)}$$

$$\tilde{X} = \frac{1}{2} \left[\frac{n}{2} \text{ th obs.} + \frac{n+2}{2} \text{ th obs.} \right]$$

$$\tilde{X} = \frac{1}{2} \left[\frac{6}{2} \text{ th obs.} + \frac{6+2}{2} \text{ th obs.} \right]$$

$$\tilde{X} = \frac{1}{2} [3^{\text{rd}} \text{ obs.} + 4^{\text{th}} \text{ obs.}]$$

$$\tilde{X} = \frac{1}{2} [156 + 157] = \frac{1}{2} [313]$$

$$\tilde{X} = 156.5$$

(c) Mode

The most repeat value is 160 so

Mode = 160 (iii)

From (i), (ii) and (iii) $160 > 156.5 > 154.3$ i.e. Mode > Median > Mode

Q. 10 The monthly attendance of 10 students for their lunch in the hostel is recorded as: 21, 15, 16, 18, 14, 17, 15, 12, 13, 11. Find the median and mode of the attendance. Also find the mean if $D = A = 20$.

Solution:

Data: $x = 21, 15, 16, 18, 14, 17, 15, 12, 13, 11$

No. of observations = $n = 10$

Mean by short cut formula:

$$D = x - 20$$

$$D = x - A$$

$$\Rightarrow A = 20$$

X	$D = x - 20$
11	$11 - 20 = -9$
12	$12 - 20 = -8$
13	$13 - 20 = -7$
14	$14 - 20 = -6$

15	$15 - 20 = -5$
15	$15 - 20 = -5$
16	$16 - 20 = -4$
17	$17 - 20 = -3$
18	$18 - 20 = -2$
21	$21 - 20 = 1$
$\Sigma D = -48$	

We know that

$$\bar{X} = A + \sum D$$

$$\bar{X} = 20 + \left(\frac{-48}{10} \right)$$

$$\bar{X} = 20 - 4.8 = 15.2$$

$$\bar{X} = 15.2$$

(b): Median:

Arranged data:

$$X = 11, 12, 13, 14, 15, 15, 16, 17, 18, 21$$

Number of observations = $N = 10$ (even)

$$\begin{aligned}
 \text{Median}(\tilde{y}) &= \frac{1}{2} \left[\frac{n}{2} \text{th value} + \frac{n+2}{2} \text{th value} \right] \\
 &= \frac{1}{2} \left[\frac{10}{2} \text{th value} + \frac{10+2}{2} \text{th value} \right] \\
 &= \frac{1}{2} [5\text{th value} + 6\text{th value}] \\
 &= \frac{1}{2} (15 + 15) \\
 &= \frac{1}{2} (30) \\
 &= 15
 \end{aligned}$$

Thus median is 15 .

(C) Mode:

Since, most frequent value is 15 .

So, mode = 15.

Q. 11 On a prize distribution day, 50 students brought pocket money as under:

Rupees	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30
Frequency (f)	12	9	18	7	4

(i) Find the median and mode of the above data.

(ii) Find the arithmetic mean of the data given above using coding method.

Solution

(i) Median and mode

(a) Median

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Rupees	(f)	C.F
5 – 10	12	12
10 – 15	9	$12 + 9 = 21 \Rightarrow C$
15 – 20	$f \Rightarrow 18$	$21 + 18 = 39$
20 – 25	7	Median Group
25 – 30	4	$46 + 4 = 46$
$\Sigma f = 50$		

Since, the class containing $\frac{50}{2}$ th value = 25th value is a median class.

Median class = (15 – 20)

We know that

$$\text{Median}(\tilde{X}) = \ell + \frac{h}{f} \left(\frac{n}{2} - c \right)$$

$$\tilde{X} = 15 + \frac{5}{18} \left(\frac{50}{2} - 21 \right)$$

$$\tilde{X} = 15 + \frac{5}{18} (25 - 21) = 15 + \frac{5}{18} (24)$$

$$\tilde{X} = 15 + \frac{20}{18}$$

$$X = 16.11$$

(b) Mode



Rupees	(f)
5 – 10	12
10 – 15	$f_1 \rightarrow 9$
15 – 20	$f_m \rightarrow 18$
20 – 25	$f_2 \rightarrow 7$
25 – 30	4

Since, group having maximum frequency is a modal group. So modal class = (15 – 20)

We know that

$$\text{Mode} (\hat{X}) = \ell + \frac{(f_m - f_1) \times h}{(f_m - f_1) + (f_m - f_2)}$$

$$\hat{X} = 15 + \frac{(18 - 9) \times 5}{(18 - 9) + (18 - 7)}$$

$$\hat{X} = 15 + \frac{9 \times 5}{9 + 11}$$

$$\hat{X} = 15 + \frac{45}{20}$$

$$\hat{X} = 15 + 2.25$$

$$\hat{X} = 17.25$$

(ii) Arithmetic Mean by using coding

Let assumed mean = $A = 17.5$

Coding variable = $U = \frac{D}{h}$, Here, $D = x - A$, h = size of class interval.

Rupces	(f)	Midpoints (x)	$U = \frac{D}{h} = \frac{x - A}{h}$	U	fU
5-10	12	7.5	$\frac{7.5 - 17.5}{5} = \frac{-10}{5} = -2$	-2	-24
10-15	9	12.5	$\frac{12.5 - 17.5}{5} = \frac{-5}{5} = -1$	-1	-9
15-20	18	17.5	$\frac{17.5 - 17.5}{5} = \frac{0}{5} = 0$	0	0
20-25	7	22.5	$\frac{22.5 - 17.5}{5} = \frac{5}{5} = 1$	1	7
25-30	4	27.5	$\frac{27.5 - 17.5}{5} = \frac{10}{5} = 2$	2	8
	$\Sigma f = 50$				-18

We know that

$$\bar{X} = A + \frac{\sum fU}{\sum f} \times h$$

$$\bar{X} = 17.5 + \left(\frac{-18}{50} \right) \times 5$$

$$\bar{X} = 17.5 + \left(\frac{-90}{50} \right)$$

$$\bar{X} = 17.5 + (-1.8)$$

$$\bar{X} = 17.5 - 1.8$$

$$\bar{X} = 15.7$$

Q. 12 The arithmetic mean of the ages of 20 boys is 13 years, 4 months and 5 days. Find the sum of their ages. If one of the boys is of age exactly 15 years. What is the average of the remaining boys.

Solution

No. of boys = $n = 20$

Mean of ages = $\bar{X} = 13y, 4 \text{ months}, 5 \text{ days}$

Sum of ages = $\sum r = ?$

We know that

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

$$\Rightarrow n \times \bar{X} = \sum x$$

$$\Rightarrow \sum x = 20(13y + 4M + 5D)$$

$$= 260y + 80M + 100D$$

$$= 260y + 83M + 10D$$

$$= 260y + 6y + 11M + 10D$$

$$= 266y + 11M + 10D$$

Thus the sum of ages of 20 boys is $266y + 11M + 10D$.

If age of boy is 15 year, then

Sum of ages of

$$19 \text{ boys} = \sum Z = 266y + 11M + 10D - 15y$$

$$\sum Z = 251y + 11M + 10D$$

$$\sum Z = (251 \times 365)D + (11 \times 30)D + 10D$$

$$= (91,615D + 330D + 10D)$$

$$\sum Z = 91,955D$$

Average of ages of 19 boys

$$\bar{Z} = \frac{\sum Z}{19} = \frac{91,955}{19} D$$

$$= 4,839.74D$$

$$\bar{Z} = \frac{4,839.74}{365} = 13.26y \text{ (1 year = 365 Days)}$$

$$\begin{aligned}\bar{Z} &= 13y + 0.26y \\ \bar{Z} &= 13y + (0.26y \times 12)M \\ \bar{Z} &= 13y + 3.12M \\ \bar{Z} &= 13y + 3M + 0.12M \\ \bar{Z} &= 13y + 3M + (0.12 \times 30)D \\ \bar{Z} &= 13y + 3M + 3.6D \\ \bar{Z} &= 13y + 3M + 4D (\because 3.6 \approx 4)\end{aligned}$$

Thus average of ages of 19 boys is 13 years, 3 months, 4D approximately.

Q. 13 Calculate the arithmetic mean from the following information:

(i) If $D = X - 140$, $\Sigma D = 500$ and $n = 10$

Solution:

$$D = X - 140, \Sigma D = 500 \text{ and } n = 10$$

We know that



$$\begin{aligned}\bar{X} &= A + \frac{\Sigma D}{n} \\ \bar{X} &= 140 + \frac{500}{10} \\ \bar{X} &= 140 + 50 \\ \bar{X} &= 190 \\ \because D &= x - A \\ D &= x - 140 \\ \Rightarrow A &= 140\end{aligned}$$

(ii) If $U = \frac{x-130}{6}$, $\Sigma U = -150$ and $n = 15$

Solution:

$$U = \frac{x - 130}{6}, \Sigma U = -150 \text{ and } n = 15$$

We know that

$$U = \frac{x - A}{h}$$

$$U = \frac{x - 130}{6}$$

By comparing we get

$$A = 130, h = 6$$

We also know that

$$\bar{X} = A + \frac{\sum U}{n} \times h$$

Putting the values

$$\bar{X} = 130 + \frac{-150}{15} \times 6$$

$$\bar{X} = 130 - 60 \Rightarrow \bar{X} = 70$$

Solution:

$$D = x - 25, \sum D = 300 \text{ and } \sum f = 20$$

Since,

$$D = x - A,$$

Given that,

$$D = x - 25$$

$$\Rightarrow A = 25$$

We know that

$$\bar{X} = A + \frac{\sum fD}{\sum f}$$

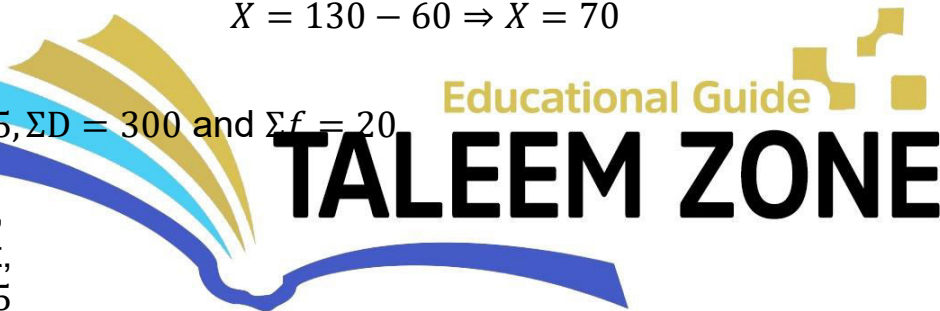
$$\bar{X} = 25 + \frac{300}{20}$$

$$\bar{X} = 25 + 15$$

$$\bar{X} = 40$$

(iv) If $U = \frac{x-120}{5}, \sum fU = 60$ and $\sum f = 100$

Solution:



$$U = \frac{x - 120}{5}, \Sigma fU = 60 \text{ and } \Sigma f = 100$$

We know that $U = \frac{x-A}{h}$

Given that $U = \frac{x-120}{5}$

By comparing we get $A = 120$ and $h = 5$

We also know that

$$\bar{X} = A + \frac{\Sigma fU}{\Sigma f} \times h$$

$$\bar{X} = 120 + \frac{60}{100} \times 5$$

$$\bar{X} = 120 + \frac{300}{100}$$

$$\bar{X} = 120 + 3$$

$$\bar{X} = 123$$

Q. 14 The three children Haris, Maham and Minal made the following scores in a game conducted by a group of teachers in the school.

Haris scores	55	65	70	85	90
Maham scores	75	60	60	45	53
Minal scores	80	77	66	42	48

It is decided that the candidate who gets the highest average score will be awarded rupees 1000 . Who will get the awarded amount?

Solution:

No. of games: $n = 5$

Average of Haris scores:

$$x = 50, 55, 70, 85, 90$$

$$n = 5$$

$$\bar{X} = \frac{\sum x}{n} = \frac{50 + 55 + 70 + 85 + 90}{5}$$

$$\bar{X} = \frac{350}{5} = 70$$

$$\bar{X} = 70$$

Average of Mahm's scores

$$y = 75, 60, 60, 45, 53$$

$$n = 5$$

$$\bar{Y} = \frac{\sum x}{n} = \frac{75 + 60 + 60 + 45 + 53}{5}$$

$$\bar{Y} = \frac{293}{5} = 58.6$$

$$\bar{Y} = 58.6$$

Average of Minal scores

$$Z = 80, 77, 66, 42, 48$$

$$n = 5$$

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

$$\bar{Z} = \frac{80 + 77 + 66 + 42 + 48}{5}$$

$$= \frac{313}{5} = 62.6$$

From (i), (ii) and (iii) we observe that Average score of Haris is highest so Haris will get award of Rs. 1000.

Q. 15 Given below is frequency distribution derived by making a substitution as $D = X - 20$. Calculate the arithmetic mean.

Solution

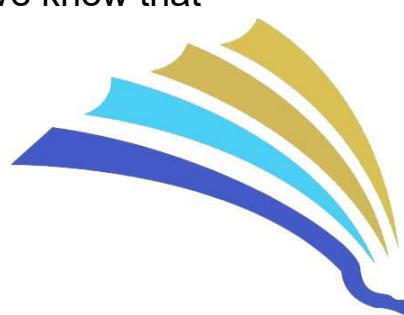
$$D = X - A \text{ (known)}$$

$$D = X - 20 \text{ (Given)}$$

D	$\hat{f}$	fD
-6	1	-6
-4	3	-12
-2	6	-12
0	20	0
2	26	52
4	12	48
6	2	12

$$\Sigma f = 70 \quad \Sigma fD = 82$$

We know that



$$\bar{X} = A + \frac{\Sigma fD}{\Sigma f}$$

$$\bar{X} = 10 + \frac{(82)}{(70)}$$

$$\bar{X} = 20 + 1.17$$

$$\bar{X} = 21.17$$

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Q. 16 Being partners Hafsa and Fatima took part in a quiz programme. They made the following number of points 45 , 51,58,61,74,48,46 and 50 . Compute the average number of points using deviation $D = x - 58$.

Solution:

$$X = 45, 51, 58, 61, 74, 48, 46, 50$$

No. of obs. = $n = 8$

Given that $D = X - 58$

We know that $D = X - A$

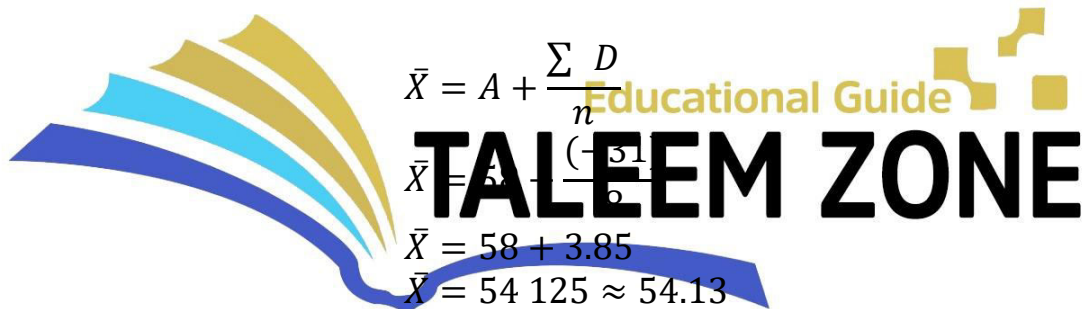
$$\Rightarrow A = 58$$

X	$D = X - A$
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45	$45 - 58 = -13$
51	$51 - 58 = -7$
58	$58 - 58 = 0$
61	$61 - 58 = 3$
74	$74 - 58 = 16$
48	$48 - 58 = -10$
46	$46 - 58 = -12$
50	$50 - 58 = -8$

$$\Sigma D = -31$$

We know that



$$\bar{X} = A + \frac{\Sigma D}{n}$$

$$\bar{X} = 58 + \frac{(-31)}{8}$$

$$\bar{X} = 58 - 3.875$$

$$\bar{X} = 54.125 \approx 54.13$$

Q. 17 A person purchased the following food items:

Found item	Quantity (in Kg)	Cost per Kg (in Rs.)
Rice	10	96
Flour	12	48
Ghee	4	190
Sugar	3	49
Mutton	2	650

What is the weighted mean of cost of food items per kg?

Solution:

Food item	Quantity (in kg) W	Cost per kg (Rs.) X	WX
Rice	10	96	960
Flour	12	48	576
Ghee	4	190	760
Sugar	3	49	147
Mutton	2	650	1300
	$\Sigma W = 31$		$\Sigma WX = 3,743$

We know that weighted mean

$$\bar{X}_w = \frac{\Sigma wx}{\Sigma w} = \frac{3,743}{31} = 120.74$$

Thus cost of food item per kg is Rs. 120.74

Q. 18 For the following data, find the weighted mean.

Solution:

Item	Quantity (W)	Cost of item (in thousands)
Washing Machine	5	35
Heater	3	5
Stove	2	13
Dispenser	6	18

Solution:

Weighted Mean

Item	Quantity (W)	Cost of item in thousand	WX
Washing machine	5	35	175
Heater	3	5	15
Stove	2	13	26
Dispenser	6	18	108
	$\Sigma W = 16$	$\Sigma WX = 324$	

We know that

$$\bar{X}_w = \frac{\sum wx}{\sum w}$$

$$\bar{X}_w = \frac{324}{16}$$

$$\bar{X}_w = 20.25 \text{ in thousands}$$

Educational Guide

TALEEM ZONE

Q. 19 A company is planning its next year marketing budget across five years: yearly budgets (in million) are: 5,7,8,6, 7. Find the average budget for the next year.

Solution:

$$x = 5,7,8,6,7 \text{ (in millions)}$$

No. of observations $n = 5$

We know that

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

$$\bar{X} = \frac{5 + 7 + 8 + 6 + 7}{5} = \frac{33}{5} = 6.6$$

$$\bar{X} = 6.6 \text{ (in millions)}$$

Thus the average budgets is 6.6 millions for next year.

Q. 20 Ahmad obtained the following marks in a certain examination.

Find the weighted mean if weights 5,4,2,3,2,4 respectively are allotted to the subjects.

$$\bar{X}_w = 76.9$$

Solution

Urdu	Eng.	Sci.	Math	Isl.	Comp.
78	65	80	90	85	72

Subjects	Marks (x)	Weights	$W x$
Urdu	78	5	390
English	65	4	260
Science	80	2	160
Math	90	3	270
Islamiyat	85	2	170
Computer	72	4	288
		$\Sigma W = 20$	$\Sigma WX = 1538$

We know that

$$\bar{X}_w = \frac{\Sigma wX}{\Sigma w}$$

$$\bar{X}_w = \frac{1538}{20}$$

$$\bar{X}_w = 76.9$$