Unit No. 12

INFORMATION HANDLING

Exercise No. 12.2

Question No. 1

Find the arithmetic mean in each of the following:

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

Data:

No. of Observations = n = 9

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

To Find:

Arithmetic Mean = A.M = ?

Solution:

$\Sigma x = 4 + 6 + 10 + 12 + 15 + 20 + 25 + 28 + 30$

$\Sigma x = 150$

$A.M = \frac{\Sigma x}{n}$

$A.M = \frac{150}{9}$

$A.M = 16.67$

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

Data:

No. of Observations = n = 7

x = 12, 18 19, 0, -19, -18, -12

To Find:

Arithmetic Mean = A.M = ?

Solution:

$\Sigma x = 12 + 18 + 19 + 0 + -19 + -18 + -12$

$\Sigma x = 0$

$A.M = \frac{\Sigma x}{n}$

$A.M = \frac{0}{7}$

$A.M = 0$

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

Data:

No. of Observations = n = 9

x = 6.5, 11, 12.3, 9, 8.1, 16, 18, 20.5, 25

To Find:

Arithmetic Mean = A.M = ?

Solution:

$\Sigma x = 6.5 + 11 + 12.3 + 9 + 8.1 + 16 + 18 + 20.5 + 25$

$\Sigma x = 126.4$

$A.M = \dfrac{\Sigma x}{n}$

$A.M = \dfrac{126.4}{9}$

$A.M = 14.04$

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

Data:

No. of Observations = n = 7

x = 8, 10, 12, 14, 16, 20, 22

To Find:

Arithmetic Mean = A.M = ?

Solution:

$\Sigma x = 8 + 10 + 12 + 14 + 16 + 20 + 22$

$\Sigma x = 102$

$A.M = \dfrac{\Sigma x}{n}$

$A.M = \dfrac{102}{7}$

$A.M = 14.57$

Question No. 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.

Data:

No. of Observations = n = 12

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

Arranged data:

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

To Find:

Median height = ?

Solution:

As n = 12 is an even number, So;

Median height $= \frac{1}{2}[(\frac{n}{2})^{th}$ observation $+ (\frac{n+2}{2})^{th}$ observation]

Median height $= \frac{1}{2}[(\frac{12}{2})^{th}$ observation $+ (\frac{12+2}{2})^{th}$ observation]

Median height $= \frac{1}{2}[(6)^{th}$ observation $+ (7)^{th}$ observation]

Median height $= \frac{1}{2}[56 + 57]$

Median height $= \frac{1}{2}[113]$

Median height = 56.5 inch

Question No. 3

Following are the earnings (in Rs.) of ten workers: 88, 70, 72, 125, 115, 95, 81, 90, 95, 90.

Calculate (i) Arithmetic Mean (ii) Median (iii) Mode

Data:

No. of Observations = n = 10

x = 88, 70, 72, 125, 115, 95, 81, 90, 95, 90

To Find:

(i) Arithmetic Mean = ?

(ii) Median = ?

(iii) Mode = ?

Solution:

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

(i) Finding Arithmetic Mean:

Σx = 88 + 70 + 72 + 125 + 115 + 95 + 81 + 90 + 95 + 90

Σx = 921

A.M $= \frac{\Sigma x}{n}$

A.M $= \frac{921}{10}$

A.M = 92.1 Rs.

(ii) Finding Median:

Arranged data:

x = 70, 72, 81, 88, **90, 90**, 95, 95, 115, 125

As n = 10 is an even number, So;

Median height $= \frac{1}{2}[(\frac{n}{2})^{th}$ observation $+ (\frac{n+2}{2})^{th}$ observation]

Median $= \frac{1}{2} [(\frac{10}{2})^{th}$ observation $+ (\frac{10+2}{2})^{th}$ observation]

Median $= \frac{1}{2} [(5)^{th}$ observation $+ (6)^{th}$ observation]

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

Median $= \frac{1}{2} [180]$

Median = 90 Rs.

(iii) Finding Mode:

Mode is the value that appears most frequently in a data set. In other words, it's the observation with the highest frequency.

Since, 90 and 95 appear twice each. So

Mode = Rs. 90 and 95

Question No. 4

The Marks obtained by the students in the subject of English are given below.

Marks obtained	Frequency
15 - 19	9
20 - 24	18
25 - 29	35
30 - 34	17
35 - 39	5

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

(ii) Median of their marks.

Solution:

(i) Finding Arithmetic Mean by direct Method:

Marks obtained	f	x	f.x
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
	Σf = 84		**Σfx = 2223**

$\Sigma f = 84$

$\Sigma fx = 2223$

A.M $= \frac{\Sigma fx}{\Sigma f} = \frac{2223}{84} = 26.46$

(i) Finding Arithmetic Mean by indirect (short) Method:

Let; A = 27   (any no. from x can be taken)

Marks obtained	F	x	D = x – A
15 - 19	9	17	-10
20 - 24	18	22	-5
25 - 29	35	27	0
30 - 34	17	32	5
35 - 39	5	37	10
	Σf = 84		**ΣD = 0**

Σf = n = 84

ΣD = 0

A.M $= A + \frac{\Sigma D}{n} = 27 + \frac{0}{84} = 27$

(ii) Median of their marks:

Marks obtained	f	C.B	C.F
15 - 19	9	14.5 – 19.5	9
20 - 24	18	19.5 – 24.5	27
25 - 29	**35**	**24.5 – 29.5**	**62**
30 - 34	17	29.5 – 34.5	79
35 - 39	5	34.5 – 39.5	84
	Σf = 84		

Σf = n = 84

$$\text{Median Class} = \frac{n}{2} = \frac{84}{2} = 42$$

42nd Item lies in the class boundaries

24.5 – 29.5 ;

l = 24.5

h = 5

f = 35

c = 27

Usnig Formula:

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

$$\text{Median} = 24.5 + \frac{5}{35}\left(\frac{84}{2} - 27\right)$$

$$\text{Median} = 24.5 + \frac{1}{7}(42 - 27)$$

$$\text{Median} = 24.5 + \frac{1}{7}(15)$$

$$\text{Median} = 24.5 + \frac{15}{7}$$

Median = 24.5 + 2.143

Median = 26.643

Question No. 5

Given below is a frequency distribution.

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

Find the mode of the frequency distribution.

Solution:

Class Interval	f	C.B
5 - 9	1	4.5 – 9.5
10 - 14	8	9.5 – 14.5
15 - 19	18	14.5 – 19.5
20 - 24	11	19.5 – 24.5
25 - 29	2	24.5 – 29.5
Σf =>	40	

$l = 14.5$

$f_m = 18$

$f_1 = 8$

$f_2 = 11$

$h = 5$

Usnig Formula:

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

$$\text{Mode} = 14.5 + \frac{(18 - 8) \times 5}{(18 - 9) + (18 - 11)}$$

$$\text{Mode} = 14.5 + \frac{10 \times 5}{10 + 7}$$

$$\text{Mode} = 14.5 + \frac{50}{17}$$

$$\text{Mode} = 14.5 + 2.94$$

Mode = 17.44

Question No. 6

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.

Data:

x = 4250, 4350, 4400, 4250, 4350, 4410, 4500, 4300, 4500, 4390

Arranged Data:

x = 4250, 4250, 4300, 4350, 4350, 4390, 4400, 4410, 4500, 4500

n = 10

To Find:

Arithmetic Mean by short formula = ?

Median = ?

Mode = ?

Solution:

(i) Finding A.Mean by short formula:

Let; A = 4350

Weekly wages (Rs)	D = x - A
4250	-100
4250	-100
4300	-50
4350	0
4350	0
4390	40
4400	50
4410	60
4500	150
4500	150

$\Sigma D = 200$

n = 10

$A.M = A + \dfrac{\Sigma D}{n}$

$A.M = 4350 + \dfrac{200}{10}$

$A.M = 4350 + 20$

A.M = 4370 Rs.

(ii) Finding Median:

As n is even number, So,

$$\text{Median} = \frac{4350 + 4390}{2}$$

$$\text{Median} = \frac{8740}{2}$$

$$\text{Median} = \text{Rs. } 4370$$

(iii) Finding Mode:

Since, 4250, 4350 and 4500 appear twice each. So

Mode = Rs. 4250, 4350 and 4500

Question No. 7

The arithmetic mean of 45 numbers is 80. Find their sum.

Data:

Arithmetic Mean = A.M = 80

No. of Observations = n = 85

To Find:

Sum = Σx = ?

Solution:

$\text{A.M} = \frac{\Sigma x}{n}$

$80 = \frac{\Sigma x}{45}$

$$\Sigma x = 80 \times 45$$

$$\Sigma x = 3600$$

Question No. 8

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

Data:

Observations = x = 1, 4, 0, 7, 9

Arranged data = 0, 1, 4, 7, 9

No. of Observations = n = 5

To Find:

Mean = A.M = ?

Median = ?

Mode = ?

Solution:

(i) Finding A.Mean:

$\text{A.M} = \frac{\Sigma x}{n}$

$$\Sigma x = 1 + 4 + 0 + 7 + 9 = 21$$

A.M $= \frac{21}{5}$

A.M = 4.2

(ii) Finding Median:

As n = 5 odd number, So

Median = 4 (from arranged data)

(iii) Finding Mode:

There is no value which is repeated or most occuring. So data have **no Mode**.

Question No. 9

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

Show that Mode > Median > Mean.

Data:

Obs. = x = 148, 145, 160. 157, 156, 160

Arranged data = 145, 148, 156, 157, 160, 160

No. of Observations = n = 6

To Find:

Mean = A.M = ?

Median = ?

Mode = ?

Solution:

(i) Finding A.Mean:

A.M $= \frac{\Sigma x}{n}$

$\Sigma x \ = \ 148 + 145 + 160 + 157 + 156 + 160$

$\Sigma x \ = \ 926$

A.M $= \frac{926}{6}$

A.M = 154.33

(ii) Finding Median:

As n = 5 even number, So

Median $= \frac{15 + 15}{2}$ (from arranged data)

Median $= \frac{30}{2} = 15$

(iii) Finding Mode:

Since 160 repeats twice, So;

Mode = 60

Conclusion:

As; $160 > 156.5 > 154.33$

Hence proved that:

Mode > Median > Mean

Question No. 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).

Data:

No. of students = n = 10

Obs. = x = 21, 15, 16, 18, 14, 17, 15, 12, 13, 11

Arranged Data = 11, 12, 13, 14, 15, 15, 16, 17, 18, 21

To Find:

Median = ?

Mode = ?

Mean = ?

Solution:

(i) Finding Median:

As n = 10 even number, So

Median $= \dfrac{15 + 15}{2}$ (from arranged data)

Median $= \dfrac{30}{2} = 15$

(ii) Finding Mode:

Since 15 repeats twice, So;

Mode = 15

(iii) Finding A.Mean:

A = 20

X	D = x - A
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
n = 10	**ΣD = -48**

A.Mean $= A + \dfrac{\Sigma D}{n}$

A.Mean $= 20 + \dfrac{-48}{10}$

A.Mean $= 20 - 4.8$

A.Mean = 15.2

Question No. 11

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

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

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

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

To Find:

(i). a) Median = ?

b) Mode = ?

(ii). Arithmetic Mean = ?

Solution:

(i) a). Finding Median:

Rupees	Frequency (f)	c.f
5 – 10	12	12
10 - 15	9	12 + 9 = 21
15 - 20	18	21 + 18 = 39
20 – 25	7	39 + 7 = 46
25 - 30	4	46 + 4 = 50
	Σf = 50	

n = Σf = 50

Median Class $= \dfrac{50}{2} = 25$

25 lies in 15 – 20 Class. So,

L = 15

h = 5

$$f = 18$$

$$c = 21$$

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

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

$$\text{Median} = 15 + 0.28\,(25 - 21)$$

$$\text{Median} = 15 + 0.28\,(4)$$

$$\text{Median} = 15 + 1.12$$

$$\text{Median} = 16.12$$

b). Finding Mode:

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

$$l = 15$$

$$fm = 18$$

$$f1 = 9$$

$$f2 = 7$$

$$h = 5$$

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

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

$$\text{Mode} = 15 + \frac{(9) \times 5}{9 + 11}$$

$$\text{Mode} = 15 + \frac{45}{20}$$

$$\text{Mode} = 15 + 2.25$$

$$\text{Mode} = 17.25$$

(iii) Finding Mean by Coding Method:

$$A = 18$$

Rupees	F	x	D = x - A	$U = \frac{D}{h}$	fU
5 – 10	12	7.5	-10.5	-2.1	-25.2
10 - 15	9	12.5	-5.5	-1.1	-9.9
15 - 20	18	17.5	-0.5	-0.1	-1.8
20 – 25	7	22.5	4.5	0.9	6.3

25 - 30	4	27.5	9.5	1.9	7.6
	$\Sigma f = 50$				$\Sigma fU = -23$

$$\text{Mean} = A + \frac{\Sigma fU}{\Sigma f} \times h$$

$$\text{Mean} = 18 + \frac{-23}{50} \times 5$$

$$\text{Mean} = 18 - \frac{23}{10}$$

$$\text{Mean} = 18 - 2.3$$

$$\text{Mean} = 15.7$$

Question No. 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 age of the remaining boys?

Data:

Mean of Ages = 13 years, 4 months and 5 days

$$\text{Mean of Ages} = 13 + \frac{4}{12} + \frac{5}{365}$$

$$\text{Mean of Ages} = 13 + \frac{1}{3} + \frac{1}{73}$$

Mean of Ages = $13 + 0.333 + 0.0137$

Mean of Ages = **13.3467 years**

No. of boys = n = 20

To Find:

Average age of the Remaining Boys = ?

Solution:

$$\text{A.M} = \frac{\Sigma x}{n}$$

$$13.3466 = \frac{\Sigma x}{20}$$

$$\Sigma x = 13.3467 \times 20$$

$$\Sigma x = 266.934$$

$$\Sigma x = 266 \text{ years, } 0.934 \times 12 \text{ months}$$

$$\Sigma x = 266 \text{ years, } 11.208 \text{ months}$$

$$\Sigma x = 266 \text{ years, } 11 \text{ months, } 0.208 \times 30 \text{ days}$$

$$\Sigma x = 266 \text{ years, } 11 \text{ months, } 6 \text{ days}$$

Given that one boy has age exactly 15 years.

Remaining Sum = (266 years, 11 months, 6 days) – (15 years)

Remaining Sum = 251 years, 11 months and 6 days = 251.932 years

Now;

Remeining Boys = 20 – 1 = 19

$n = 19$

$\Sigma x = 251.932$ years

Average Age of Rem. Boys $= \dfrac{251.932}{19}$

Average Age of Rem. Boys $= 13.259$ years

Average Age of Rem. Boys $= 13$ years, 0.259×12 Months

Average Age of Rem. Boys $= 13$ years, 3 Months and 0.108×30 days

Average Age of Rem. Boys $= 13$ years, 3 Months and 4 days

Question No. 13

Calculate the arithmetic mean from the following information:

(i) If D = X - 140, ΣD = 500 and n = 10

Data:

A = 140

D = X – 140

ΣD = 500

n = 10

To Find:

Arithmetic Mean = A.M = ?

Solution:

$$A.M = A + \frac{\Sigma D}{n}$$

$A.M = 140 + \dfrac{500}{10}$

$A.M = 140 + 50$

$A.M = 190$

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

Data:

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

A = 130

h = 5

ΣU = -150

n = 15

To Find:

Arithmetic Mean = A.M = ?

Solution:

$$\text{A.M} = A + \frac{\Sigma U}{n} \times h$$

$\text{A.M} = 130 + \frac{-150}{15} \times 6$

$\text{A.M} = 130 - 10 \times 6$

$\text{A.M} = 130 - 60$

$\text{A.M} = 70$

(iii) If D = X - 25, ΣfD = 300 and Σf = 20

Data:

D = X – 25

A = 25

ΣfD = 300

Σf = 20

To Find:

Arithmetic Mean = A.M = ?

Solution:

$$\text{A.M} = A + \frac{\Sigma fD}{\Sigma f}$$

$$\text{A.M} = 25 + \frac{300}{20}$$

$$\text{A.M} = 25 + 15$$

$$\text{A.M} = 40$$

(iv) If U = $\frac{x-120}{5}$, ΣfU = 60 and Σf = 100

Data:

U = $\frac{x-30}{5}$

A = 120

h = 5

ΣfU = 60

n = Σf = 100

To Find:

Arithmetic Mean = A.M = ?

Solution:

$$\text{A.M} = A + \frac{\Sigma fU}{\Sigma f} \times h$$

$$\text{A.M} = 120 + \frac{60}{100} \times 5$$

$$A.M = 120 + \frac{300}{100}$$

$$A.M = 120 + 3$$

$$A.M = 123$$

Question No. 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	Maham scores	Minal scores
50	75	80
55	60	77
70	60	66
85	45	42
90	53	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:

i). Total Scores made by Haris $= 50 + 55 + 70 + 85 + 90 = 350$

Average score $= \frac{350}{5} = 70$

ii). Total Scores made by Maham $= 75 + 60 + 60 + 45 + 53 = 293$

Average score $= \frac{293}{5} = 58.6 = 59$

ii). Total Scores made by Minal $= 80 + 77 + 66 + 42 + 48 = 313$

Average score $= \frac{313}{5} = 62.6 = 63$

Conclusion:

$70 > 63 > 58$

Haris > Minal > Maham

Haris will get the awarded amount.

Question No. 15

Given below is a frequency distribution derived by making a substitution as

$D = X - 20$. Calculate the arithmetic mean.

D	f
-6	1
-4	3
-2	6
0	20
2	26

4	12
6	2

Solution:

A = 20

D	f	fD
-6	1	-6
-4	3	-12
-2	6	-12
0	20	0
2	26	52
4	12	48
6	2	12
	Σf = 70	**ΣfD = 82**

$\Sigma f = 70$

$\Sigma fD = 82$

$$A.M = A + \frac{\Sigma fD}{\Sigma f}$$

$$A.M = 20 + \frac{82}{70}$$

$$A.M = 20 + 1.17$$

$$\textbf{A.M = 21.17}$$

Question No. 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.

No. of Points	D = x - A
45	-13
51	-7
58	0
61	3
74	16

48	-10
46	-12
50	-8
	ΣD = -31

A = 58

n = 8

ΣD = -31

$A.M = A + \frac{\Sigma D}{n}$

$A.M = 58 + \frac{-31}{8}$

A.M = 58 – 3.875

A.M = 54.125 = 54.13

Question No. 17

A person purchased the following food items:

Food 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)	Cost per Kg (in Rs.)
Rice	10	96
Flour	12	48
Ghee	4	190
Sugar	3	49
Mutton	2	650
	Σw = 31	**Σp = 1033**

$A.M = \frac{\Sigma p}{\Sigma w}$

$A.M = \frac{1033}{31}$

A.M = Rs. 120.74

Question No. 18

For the following data, find the weighted mean.

Item	Quantity (W)	Cost of item (x) (in thousands)	WX
Washing Machine	5	35	175
Heater	3	5	15
Stove	2	13	26
Dispenser	6	18	108
	Σw = 16		ΣWX = 324

A.M $= \frac{\Sigma WX}{\Sigma w}$

A.M $= \frac{324}{16}$

A.M = Rs. 20.25 thousand

Question No. 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.

Data:

Yearly Budget (in million) = X = 5, 7, 8, 6, 7

No. of years = n = 5 years

To Find:

Average Budget for Next Year = ?

Solution:

Sum of yearly budget = ΣX = 5+7+8+6+7 = 33

Average Budget for Next Year $= \frac{\Sigma X}{n}$

Average Budget for Next Year $= \frac{33}{5}$

= 6.6 (million)

Question No. 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.

Subjects	Marks
Urdu	78
English	65
Science	80
Math	90

Islamiyat	85
Computer	72

Solution:

Subjects	Marks (X)	Weighs (W)	WX
Urdu	78	5	390
English	65	4	260
Science	80	2	160
Math	90	3	270
Islamiyat	85	2	170
Computer	72	4	288
		Σw = 18	Σwx = 1538

Weighted Mean = Xw = $\frac{\Sigma WX}{\Sigma w}$

$= \frac{1538}{20}$

= **76.9 = 77 Marks**