CHAPTER ONE

STATISTICS – PART TWO

Determination of the mean by the use of an assumed mean:

- This is another method of finding the mean.
-- For example if we want to find the mean of 1,3,4,5 and 8, using an assumed mean, we go
through these steps:

1.We write the numbers in a column form i.e.

        1
        3
        4
        5
        8

2. We next choose one of these numbers as the assumed mean. This number must be the middle
number or must be positioned around the middle. For the given example, we therefore
choose 4 as the assumed mean.

3. We then calculate the deviation of each of these numbers, with reference to the assumed
mean.

4. The deviation (d) of a given number is given by d = x – assumed mean, where x = the number.
The assumed mean is represented by the letter A. i.e.

Number, X	deviation $d = (x - A)$ $d = (x - 4)$
1	-3
3	-1
4	0
5	1
8	4

$$\sum d = 1$$

5.   We then find the total deviation i.e. $\sum d$.

6.   We then calculate the mean using the formula mean $= A + \frac{\Sigma d}{N}$, where A = assumed mean and N = the number of items or numbers under consideration, which is 5 in the given example.

7.   For the given example, the mean
$= 4 + {}^1/_5 = 4 + 0.2 = 4.2$.

NB: The deviation $d = (x - A) = (x - 4)$ in the given example.
-    If the number $x = 1$, then $d = (1 - 4) = -3$.

-    Also if the number $x = 5$, then $d = (5 - 4)$
$= 1$.

-    Lastly if the number $x = 8$, then $d = (8 - 4) = 4$

Q1.   Find the mean of 5,7, 5, 4, 3, 8 by using an assume mean.

Solution

Number, X	deviation $d = (x - 5)$
5	0
7	2
5	0
4	- 1
3	- 2
8	3

$$\Sigma d = 2$$

Since there are six numbers => N = 6.

The mean $= \overline{x} = A + \dfrac{\Sigma d}{N}$

$=> \overline{x} = 5 + {}^2/_6 = 5 + {}^1/_3 = 5 + 0.33$

$=> x = 5.33$

Determination of the mean by means of an assumed mean, when frequencies are involved:

Whenever frequencies are involved, the mean is determined using the formula $x = A + \dfrac{\Sigma Fd}{\Sigma F}$

Q2.Find the mean of this given data, by using an assumed mean.

X	1	2	5	8
F	6	2	4	3

Solution
Let assumed mean = 5

X	d = (x – A)	F	Fd
1	- 4	6	- 24
2	- 3	2	- 6
5	0	4	0
8	3	3	9

$$\sum f = 15 \quad \sum Fd = -21$$

The mean $= \bar{x} = A + \dfrac{\sum Fd}{\sum f}$

$= 5 + \dfrac{(-21)}{15}$

$= 5 + (-1.4) = 5 - 1.4 = 3.6$

NB: To get the value of the Fd, we multiply the d by F.

Q3

Age / yrs	2	1	3	5
Freq	3	1	2	3

The given table shows the age distribution of a group of friends. By using an assumed mean, calculate the mean

Solution

Let assumed mean = 3.

Age x	d = (x – 3)	F	Fd
2	- 1	3	- 3
1	- 2	1	- 2
3	0	2	0
5	2	3	6

$$\sum F = 9 \quad \sum Fd = 1$$

Mean $= A + \sum Fd = 3 + \underline{1} = 3.1.$

$\overline{\sum F}$ 9

Determination of the arithmetic mean or the mean from a grouped data, using an assumed mean:

Q1.

Weight / kg	2 – 4	5 – 7	8 – 10	11 -13
Freq.	5	8	10	2

The weights of stones used for a project are as shown in the given table. By means of an assumed mean, calculate the mean.

Solution

Let assumed mean = 6, since it is located around the middle of the class mark Colum.

Group or Weight /kg	Class Mark (x)	Freq. F	$d = (x - 6)$	Fd.
2 – 4	3	5	- 3	- 15
5 – 7	6	8	0	0
8 – 10	9	10	3	30
11 – 13	12	2	6	12

$\sum F = 25$ $\sum Fd = 27$

The mean $= A + \dfrac{\sum Fd}{\sum F} = 6 + \dfrac{27}{25} = 6 + 1.08 = 7.08$.

Q2. You are given the following numbers

2	9	3	2	4	6	6	10
2	2	2	4	4	3	8	9
9	9	4	3	4	7	8	10

By using an assumed mean and the grouping 0 – 2, 2 – 5 and so on
, calculate the mean.

Solution N/B: Assumed mean = 4

Group x	Class mark F	Freq.	d = (x -4)	Fd
0 – 2	1	5	- 3	- 15
3 – 5	4	8	0	0
6 – 8	7	5	3	15
9 – 11	10	6	6	36
		$\sum F = 24$		$\sum Fd = 36$

The arithmetic mean $= A + \dfrac{\sum Fd}{\sum F} = 4 + \dfrac{36}{24} = 4 + 1.5 = 5.5.$

Q3.   The given table shows the marks scored in a mathematics class work given by a teacher.

45	68	65	67	61
55	79	60	64	68
59	67	64	63	50
54	64	76	57	68
72	53	80	74	70
59	71	63	55	57

By using the grouping 45 – 49, 50 – 54 etc, determine the mean by using an assumed mean.

Solution

Let assumed mean = 62

Group	Class mark X	Freq. F	d = (x – 62)	Fd
45 – 49	47	1	- 15	- 15
50 – 54	52	3	- 10	- 30
55 – 59	57	6	- 5	- 30
60 – 64	62	7	0	0
65 – 69	67	6	5	30
70 – 74	72	4	10	4
75 – 79	77	2	15	30
80 – 84	82	1	20	20
		$\sum F = 30$		$\sum Fd = 45$

Mean = $A + \dfrac{\sum Fd}{\sum f} = 62 + \dfrac{45}{30} = 62 + 1.5 = 63.5$.

Q4. By means of an assumed mean, calculate the mean of the following group of numbers:

10	11	10	12	14
10	11	10	15	13
13	14	13	9	9
15	12	13	15	14

Solution

Let assumed mean = 12

Number X	Deviation d = (x − 12)	Freq. F	Fd
9	-3	2	-6
10	-2	4	-8
11	-1	2	-2
12	0	2	0
13	1	4	4
14	2	3	6
15	3	3	9
		$\sum F = 20$	$\sum Fd = 3$

Mean = $A + \dfrac{\sum Fd}{\sum F} = 12 + \dfrac{3}{20} = 12 + 0.15 = 12.15$

The mean deviation:

- Basically two types of mean deviations may be said to exist, and these are:

i. The mean deviation of ungrouped data.

ii. The mean deviation of grouped data.

Mean deviation of ungrouped data:

This can be in two forms and these are
a. the mean deviation which is not associated with frequencies.
b. the mean deviation which is associated with frequencies.

Mean deviation which is not associated with Frequencies:

In this case, the mean deviation $= \dfrac{\sum \left| x - \overline{x} \right|}{N}$

Where $\overline{x}$ = the mean, and N = the total number of items under consideration.

Q1.   Find the mean deviation of the following set of numbers 11, 12, 13, 14, 15.

<div align="center">Solution</div>

Determine the mean first

The mean $= \overline{x} = \dfrac{11 + 12 + 13 + 14 + 15}{5}$

$= \dfrac{65}{5} = 13.$

We then construct the next table

Number or x	$\left\| x - \overline{x} \right\|$ $\|x - 13\|$
11	- 2
12	- 1
13	0
14	1
15	2

$$\sum \left| x - \overline{x} \right| = 0$$

Since five numbers are given, then N = 5.

Mean deviation $= \dfrac{\sum \left| x - \overline{x} \right|}{N} \quad = \dfrac{0}{5} = 0.$

b. **Mean deviation which is associated with frequencies:**

-     In this case, the mean deviation $= \dfrac{\sum F \left| x - \overline{x} \right|}{\sum F}$

Q2.

Number	10	11	12	13
Frequency	5	2	1	10

Determine the mean deviation of the given table.

Solution

First determine the mean

Number x	Frequency F	FX
10	5	50
11	2	22
12	1	12
13	10	130

$$\sum F = 18 \qquad \sum FX = 214$$

Mean $= \overline{x} = \dfrac{\sum FX}{\sum F} = \dfrac{214}{18} = 11.9$

We then draw the table next in which $\overline{x} = 11.9$.

Number X	$|x - \overline{x}|$	Frequency F	$F|x - \overline{x}|$
10	- 1.9	5	- 9.5
11	- 0.9	2	- 1.8
12	0.1	1	0.1
13	1.1	10	11

$$\sum F = 18, \quad \sum F|x - \overline{x}| = - 0.2$$

Mean deviation

$= \dfrac{\sum F|x - \overline{x}|}{\sum F} = -\dfrac{0.2}{18} = - 0.011.$

The mean deviation of a grouped data:

With reference to grouped data, we shall consider two types and these are:

a) the mean deviation of the adjusted class distribution.

   a) the mean deviation of the unadjusted class distribution.

Mean deviation of the adjusted class distributions:

-- For this type, the frequencies must always be given.

-- The mean must first be determined and used to solve the question to completion.

Q3
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Height/m	2 - 4	4 - 6	6 - 8	8 - 10
Frequency	10	5	1	2

The table shows the lengths of cables used by a company. Determine the mean deviation.

NB: We must determine the mean first.
Solution

Group or Height/m	Class mark X	Frequency F	FX
2 – 4	3	10	30
4 – 6	5	5	25
6 – 8	7	1	7
8 – 10	9	2	18
		$\sum F = 18$	$\sum FX = 80$

$$\text{Mean} = \frac{\sum F X}{\sum F} = \frac{80}{18} = 4.4.$$

Now using the value of the class marks, the frequencies and the mean, we move further to complete the solution to the question.

Class marks X	$\left|x - \bar{x}\right|$ or $\left|x - 4.4\right|$	Frequency F	$F\left|x - \bar{x}\right|$
3	- 1.4	10	- 14

5	0.6	5	3
7	2.6	1	2.6
9	4.6	2	9.2

$$\Sigma F = 18, \quad \Sigma F \left| x - \overline{x} \right| = 0.8$$

Mean deviation $= \dfrac{\Sigma F \left| x - \overline{x} \right|}{\Sigma F} = \dfrac{0.8}{18} = 0.044.$

b. Mean deviation of the unadjusted class distribution:

-- For this type, the frequencies may either be given, or have to be computed.

-- The mean must first be determined.

Q4.

Mass/kg	2 – 4	5 – 7	8 – 10	11 – 13
Frequency	8	2	5	10

The masses of blocks used for the construction of a dam, are as shown in the given table. Determine the mean deviation..

Solution

Mass/kg or Group	Class mark X	Frequency F	FX
2 – 4	3	8	24
5 – 7	6	2	1 2
8 – 10	9	5	45
11 –13	12	10	120
		$\Sigma F = 25,$	$\Sigma FX = 201$

Mean $= \dfrac{\Sigma FX}{\Sigma F} = \dfrac{201}{25} = 8.$

Class marks X	$\left| x - \overline{x} \right|$ or $\left| x - 8 \right|$	Frequency F	$F \left| x - \overline{x} \right|$
3	- 5	8	- 40

6	- 2	2	- 4
9	1	5	5
12	4	10	40

$$\sum F = 125, \quad \sum F \left| x - \overline{x} \right| = 1$$

$$\text{Mean deviation} = \frac{\sum F \left| x - \overline{x} \right|}{\sum F} = \frac{1}{25} = 0.04.$$

Q5. The Marks recorded by a class teacher after a test are as follows:

2	9	3	2	4	6	6	10
2	2	2	4	4	3	8	9
9	9	4	3	4	7	8	10

By using the grouping 0 – 2, 3 – 5 etc, determine the mean deviation.

NB: First determine the mean.

Solution

Marks or Group	Class mark X	Frequency F	FX
0 – 2	1	5	5
3 – 5	4	8	32
6 – 8	7	5	35
9 – 11	10	6	60
		$\sum F = 24,$	$\sum FX = 132$

$$\text{Mean} = \overline{x} = \frac{\sum FX}{\sum F} = \frac{132}{24} = 5.5.$$

Class marks X	$\left| x - \overline{x} \right|$ or $\left| x - 5.5 \right|$	Frequency F	$F \left| x - \overline{x} \right|$
1	- 4.5	5	- 23
4	- 1.5	8	- 12

| 7 | 1.5 | 5 | 7.5 |
| 10 | 4.5 | 6 | 27 |

$$\sum F = 24, \quad \sum F \left| x - \overline{x} \right| = -0.5$$

Mean deviation $= \dfrac{\sum F \left| x - \overline{x} \right|}{\sum F} = \dfrac{-0.5}{24} = -0.02$

Questions

1.

Number		2	3	4	5	6
Frequency		5	3	8	10	1

By using an assumed mean, find the mean of the given data.   Ans: 3.96

Q2.   The weights of goats in kilogram sold by a farmer are as follows:

15	12	13	14	12
13	14	10	9	15
10	11	10	13	9
10	11	13	14	15

By means of an assumed mean, find the mean weight of the   goats sold   .
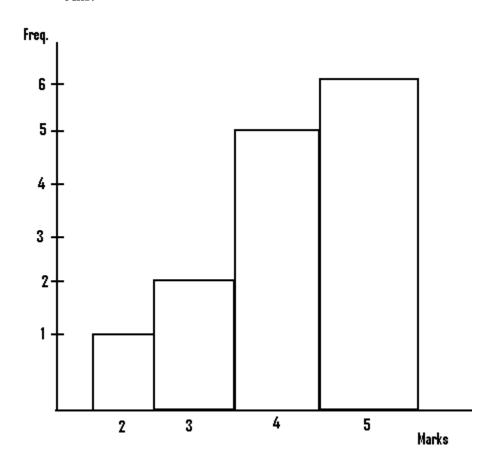.   Ans: 12.2kg

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Q3.

Marks	2	3	4	5
Frequency	1	X	2x + 1	6

The marks scored by school candidates in an examination are indicated in the given table. If the
        mean mark is given as 4.14,
a.   determine the value of x.   Ans: 2

   a. Represent the data on a histogram

Ans:

Q4)

Weight/kg	0-9	10-19	20-29	30-39	40-49
Freq.	2	5	10	7	1

The given table shows the weights of rabbits kept by the a boy. Determine
   (a) the mean.   Ans: 24.5
   (b) the mean deviation   . Ans: -0.1.

Q5) The given data shows the age distribution of the elderly people within a community in years.

57	55	63	71	59
72	53	80	74	70
54	64	76	57	68
59	67	64	63	50
55	79	60	64	68
45	68	65	67	61

By using an assume mean and the class interval 45 – 49, 50 – 54 and so on, calculate the mean.   Ans: 63.5yrs.

Q6.

Number	3	6	9	12
Frequency	8	2	5	10

Determine the mean deviation.   Ans: - 0.36.