CHAPTER 15

STATISTICS

IMPORTANT FORMULAE

For individual frequency distribution:

1. Mean, $\bar{x} = \frac{\sum x_i}{n}$, where n is the number of observations.

2. Median

   Working rule:

   a) Arranging the observations in ascending or descending order.
   b) Count the number of observations (n)
   c) If n is odd, median, $M = \left(\frac{n+1}{2}\right)^{th}$ observation.
   d) If n is even, median,

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

3. Mean deviation about mean. $MD_{(\bar{x})} = \frac{\sum |x_i - \bar{x}|}{n}$

4. Mean deviation about median.
   $MD_{(M)} = \frac{\sum |x_i - M|}{n}$

5. Variance, $\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$ OR
   $\sigma^2 = \frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2$

6. Standard deviation,
   $\sigma = \sqrt{Variance} = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$

For ungrouped or discrete series:

7. Mean, $\bar{x} = \frac{\sum f_i x_i}{N}$, where $N = \sum f_i$

8. Median, $M = Size\ of\ \left(\frac{N}{2}\right)^{th}\ observation.$ Find the cumulative frequency of the $\left(\frac{N}{2}\right)^{th}$ observation.
   a) If N is odd, M = the observation corresponding to the above cumulative frequency(c.f).
   b) If N is even, M = average of the observations of the c.f of $\left(\frac{n}{2}\right)^{th}$ and $\left(\frac{n}{2}+1\right)^{th}$ observations.

9. Mean deviation about mean.
   $MD_{(\bar{x})} = \frac{\sum f_i |x_i - \bar{x}|}{N}$

10. Mean deviation about median.
    $MD_{(M)} = \frac{\sum f_i |x_i - M|}{N}$

11. Variance, $\sigma^2 = \frac{\sum f_i x_i^2}{N} - \left(\frac{\sum f_i x_i}{N}\right)^2$

12. Standard deviation,
    $\sigma = \sqrt{Variance} = \sqrt{\frac{\sum f_i x_i^2}{N} - \left(\frac{\sum f_i x_i}{N}\right)^2}$

For grouped or continuous frequency distribution

13. Mean, $\bar{x} = a + \frac{\sum f_i u_i}{N} \times h$

    Where a = assumed mean; $u_i = \frac{x_i - a}{h}$; $N = \sum f_i$

    h = class interval

14. Median, $M = l + \frac{\frac{N}{2} - cf}{f} \times h$

    Where l = lower limit of the median class;

cf = cumulative frequency of the class just preceding (above) the median class,
f = frequency of the median class
h = class interval and $N = \sum f_i$.

15. Mean deviation about mean.

$$MD_{(\bar{x})} = \frac{\sum f_i |x_i - \bar{x}|}{N}$$

16. Mean deviation about median.

$$MD_{(M)} = \frac{\sum f_i |x_i - M|}{N}$$

17. Variance, $\sigma^2 = \left[\frac{\sum f_i u_i^2}{N} - \left(\frac{\sum f_i u_i}{N}\right)^2\right] \times h^2$

18. Standard deviation,

$$\sigma = \sqrt{Variance} = \sqrt{\left[\frac{\sum f_i u_i^2}{N} - \left(\frac{\sum f_i u_i}{N}\right)^2\right]} \times h$$

19. Coefficient of variation, $CV = \frac{\sigma}{\bar{x}} \times 100$

Note:

- A distribution having more CV is more variable and less consistent (stable).
- A distribution having less CV is less variable and more consistent (stable).

20. Range of observations =

Highest value – Lowest value

Improvement 2018

1. Consider the following table:

Marks	10 – 20	20 – 30	30 – 40
Frequency	2	3	8

40-50	50 – 60	60 – 70	70 – 80
14	8	3	2

a) Find the arithmetic mean of marks given in the above data. (2)
b) Find the standard deviation of marks in the above data. (3)
c) Find the coefficient of variation. (1)

March 2018

2. Consider the following distribution.

Class	10-20	20-30	30-40
Frequency	6	15	13

30-40	40-50	50-60
13	7	9

a) Calculate the mean of the distribution. (2)
b) Calculate the standard deviation of the distribution. (2)
c) Find the coefficient of variation of the distribution. (2)

Improvement 2017

3. Consider the following distribution.

Marks	30 – 40	40 – 50	50 – 60
Frequency	3	7	12

60 – 70	70 – 80	70 – 80	70 – 80
15	8	3	2

a) Find the mean. (2)
b) Find the standard deviation. (3)

March 2017

4. a) Find the variance for the observations 2,4,6,8 and 10. (2)

b) Consider the frequency distribution.

x	5	10	15	20	25
f	7	4	6	3	5

i) Find the mean. (1)
ii) Find the mean derivation about the mean. (2)

IMPROVEMNT 2016

5. a) If the variance of a certain distribution is 8, write its standard deviation. (2)

b) Find the mean, standard deviation and coefficient of variation for the following frequency distribution. (3)

Marks	0 – 10	10 – 20	20 – 30
Frequency	5	8	15
	30 – 40	40 – 50	
	16	6	

MARCH 2016

6. a) Suppose the mean of a certain number of observations is 50 and the sum of all the observation is 450. Write down the number of observations. (2)

b) Find the mean deviation about mean for the following data: (3)

x_i	2	5	6	8	10	12
f_i	2	8	10	7	8	5

IMPROVEMNT 2015

7. a) The sum of all the deviations of the observations of a data from it's A.M. is…….
i) Zero ii) Maximum
iii) Minimum iv) Negative number (1)

b) Calculate the Mean, Variance and Standard deviations of the following frequency distribution: (4)

Class	0-10	10-20	20-30
Frequency	5	8	15
	30-40	40-50	
	16	6	

MARCH 2015

8. a) If $\bar{x}$ is the mean and σ is the standard deviation of a distribution, then the coefficient of variation is ……...
a) $\frac{\bar{x}}{\sigma}\times 100$ b) $\frac{\sigma}{\bar{x}}$
c) $\frac{\sigma}{\bar{x}}\times 100$ iv) $\frac{\sigma}{\bar{x}}\times 50$ (1)

b) Find the standard deviation for the following data: (4)

x_i	3	8	13	18	23
f_i	7	10	15	10	6

IMPROVEMNT 2014

9. Find the standard deviation for the following data:

x_i	3	8	13	18	23
f_i	7	10	15	10	6

MARCH 2014

10. Consider the frequency distribution:

Class	30-40	40-50	50-60
Frequency	3	7	12
60-70	70-80	80-90	90-100
15	8	3	2

a) Find the mean (2)

b) Calculate the variance and the standard deviation. (3)

IMPROVEMNT 2013

11. Consider the following distribution.

Marks	0-10	10-20	20-30
Frequency	5	8	15
	30-40	40-50	
	16	6	

a) Find the mean of marks. (1)

b) Find the standard deviation of marks. (2)

c) Find the coefficient of variation of marks. (2)

MARCH 2013

12. Consider the following frequency distribution:

x_i	8	11	17	20	25	30	35
f_i	2	3	4	1	5	7	3

a) Find mean (2)

b) Calculate the variance and standard deviation. (3)

IMPROVEMNT 2012

13. Calculate mean, variance and standard deviation for the following distribution. (5)

Score	300-400	400-500	500-600
Frequency	3	7	12
600-700	700-800	800-900	900-1000
15	8	3	2

MARCH 2012

14. Consider the following distribution.

Class	10-20	20-30	30-40
Frequency	6	15	13
	30-40	40-50	50-60
	13	7	9

a) Calculate the mean of the distribution. (2)

b) Calculate the standard deviation of the distribution. (3)

IMPROVEMENT 2011

15. Table gives scores of 50 students of a class in their Mathematics examination.

Score	30-40	40-50	50-60	60-70	70-80
No. of students	5	9	17	13	6

a) Find the mean of scores. (1)

b) Find the standard deviation of scores. (2)

c) Find the coefficient of variation. (3)

MARCH 2011

16. A public opinion polling agency surveyed 200 government employees. The following table shows the ages of the employees interviewed:

Age	Number of employees
21-25	20
26-30	30
31-35	40
36-40	50
41-45	30
46-50	20
51-55	10

i) Calculate the mean age of the employees interviewed. (2)
ii) Compute the mean deviation of the ages about the mean age. (3)

IMPROVEMNT 2010

17. The scores of two batsman A and B in 5 innings during a certain match are as follows:

A	10	15	80	70	25
B	8	9	7	10	6

Find :

a) Mean score of each batsman. (2)
b) Standard deviation of the scores of each batsman. (2)
c) Which of the batsman is more consistent ? (1)

MARCH 2010

18. Consider the numbers: 4, 7, 8, 9, 10,12,13,17.

a) Find the mean of the numbers. (1)
b) Find the mean deviation about the mean (2)
c) Find the standard deviation. (2)

IMPROVEMENT 2009

19. Consider the following data:

6,8,10,12,14,16,18,20,22,24.

i) Find its mean. (1)
ii) Find its mean deviation about mean. (1)
iii) Find its variance and standard deviation. Also find the coefficient of variation of data. (3)

MARCH 2009

20. For the frequency distribution:

Class	0-10	10-20	20-30	30-40	40-50
frequency	5	8	15	16	6

a) Find the mean (2)
b) Calculate the variance. (3)

MARCH 2008

21. Consider the following data:

3,9,5,3,12,10,18,4,7,19,21

i) The median of the above data is ……. (2)
ii) Find the Mean deviation from the Median. (3)