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FACULTY OF ENGINEERING & TECHNOLOGY

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LECTURE- 17

BSc (AG)
2nd Year , IIIrd Sem.
Statistical Methods
AES-213

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Outline of lecture

- Measure of Dispersion
- Numerical problems on S.D. & Variance
- Problems on S.D. & Variance of Type I, II & III
- Suggested Readings & References

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Numerical problems based on Range, Standard Deviation & Variance

There are three types of numerical problems in range, standard deviation & variance according to the given observations.

- Type I
- Type II
- Type III

We discuss one by one both types.

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Numerical problems on S.D. & Variance Type I

Type - I

Question 1:- Find the standard deviation & Variance of following numbers.

20, 25, 32, 15 & 28.

Answer:- By using S.D. formula

$$\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{N}} \quad \text{---} \quad (1)$$

$$\text{mean}, \bar{x} = \frac{20 + 25 + 32 + 15 + 28}{5}$$

$$= \frac{120}{5} = 24$$

$$\boxed{\bar{x} = 24}$$

x	$(x - \bar{x})$	$(x - \bar{x})^2$
20	-4	16
25	1	1
32	8	64
15	-9	81
28	4	16
		178

Numerical problems on S.D. & Variance Type I & Type II

$$\sigma = \sqrt{\frac{\Sigma (x - \bar{x})^2}{N}}$$

$$\sigma = \sqrt{\frac{178}{5}}$$

$$\sigma = \sqrt{35.6}$$

Variance $= \sigma^2$

$= (\sqrt{35.6})^2$

$= 35.6$. Ans.

Type - II

Question : Find standard deviation and variance of the following data

Number (x)	7	9	11	13	15
frequency (f)	2	4	8	4	2

Answer :- Here frequency is given, so,

S.D, $\sigma = \sqrt{\frac{\Sigma f(x - \bar{x})^2}{N}}$

x	f	$f \cdot x$	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
7	2	14	$7 - 11 = -4$	16	32
9	4	36	$9 - 11 = -2$	4	16
11	8	88	$11 - 11 = 0$	0	0
13	4	52	$13 - 11 = 2$	4	16
15	2	30	$15 - 11 = 4$	16	32
	20	220			96

Numerical problems Type on S.D. & Variance II & Type III

mean, $\bar{x} = \frac{\Sigma fx}{N}$

$= \frac{220}{20}$

$\boxed{\bar{x} = 11}$

Put the values in (1)

$\sigma = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{N}}$

$= \sqrt{\frac{96}{20}}$

$\boxed{\sigma = \sqrt{4.8}}$

Variance, $\sigma^2 = 4.8$ Ans.

Type – II

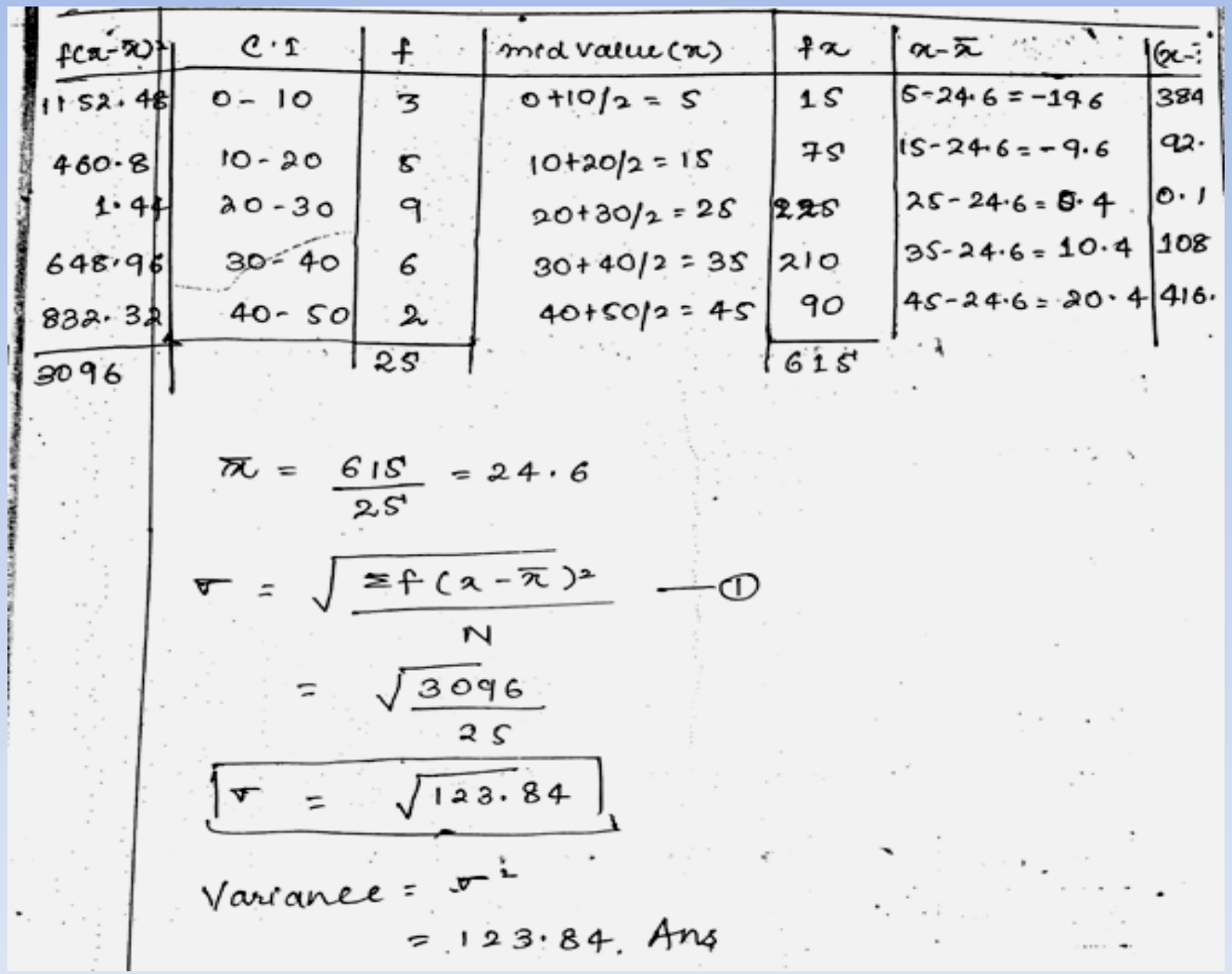
Find standard daviation and variation of following distribution.

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	9	6	2

$\sigma = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{N}}$ — (1)

$\bar{x} = \frac{\Sigma fx}{N}$ — (2)

Numerical problems on S.D. & Variance Type III



$f(x-\bar{x})^2$	C.I	f	mid value (x)	fx	$x-\bar{x}$	$(x-\bar{x})^2$
1152.48	0 - 10	3	0+10/2 = 5	15	5-24.6 = -19.6	384
460.8	10 - 20	5	10+20/2 = 15	75	15-24.6 = -9.6	92.
1.44	20 - 30	9	20+30/2 = 25	225	25-24.6 = 0.4	0.1
648.96	30 - 40	6	30+40/2 = 35	210	35-24.6 = 10.4	108
832.32	40 - 50	2	40+50/2 = 45	90	45-24.6 = 20.4	416.
3096		25		615		

$$\bar{x} = \frac{615}{25} = 24.6$$

$$\sigma = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{N}} \quad \text{—①}$$

$$= \sqrt{\frac{3096}{25}}$$

$$\boxed{\sigma = \sqrt{123.84}}$$

Variance = σ^2

= 123.84. Ans

Suggested Readings & References

1) Statistical Methods: P.N. Arora, Sumeet Arora & S. Arora; S. Chand & Company Ltd.

2) Fundamental of Mathematical Statistics: S.C. Gupta & V. Kapoor; Sultan Chand & Sons.

3) Statistics: M.R. Spiegel; Schaum's Outline Series, Mc-Graw Hill Publication.

4) Advanced Engineering Mathematics: Erwin Kreyszig; John Wiley & Sons Inc.

5) Elements of Statistics: J.P. Chauhan & S. Kumar; Krishna Publication.

* THANK YOU *