Calculation of standard deviation: discrete series

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CALCULATION OF STANDARD DEVIATION- DISCERETE SERIES OR GROUPED DATA

Three Methods

a) Actual Mean Method or **Direct Method**

b) Assumed Mean Method or **Short-cut Method**

c) Step Deviation Method

a) Actual Mean Method or Direct Method

- The S.D. for the discrete series is given by the formula.

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

Where $\bar{x}$ is the arithmetic mean,

x is the size of items,

f is the corresponding frequency

and $n = \sum f$

b) Assumed Mean Method or Short-cut Method

Standard deviation=$\sigma = \sqrt{\frac{\sum f d^2}{n} - \left(\frac{\sum f d}{n}\right)^2}$

Where A is the assumed mean,

$d = x - A$

f is the corresponding frequency

and $n = \sum f$

Example:

Periods:	10	11	12	13	14	15	16
No. of patients:	2	7	11				

Solution:

Periods:(x)	No. of patients(f)	$d = x - A$, $A = 13$	fd	d^2	fd^2
10	2	-3	-6	9	18
11	7	-2	-14	4	28
12	11	-1	-11	1	11
13	15	0	0	0	0
14	10	1	10	1	10
15	4	2	8	4	16
16	1	3	3	9	9
Total	N=$\sum f$=50		$\sum fd$=-10		$\sum fd^2$=92

$$\text{Mean} = \bar{x} = A + \frac{\sum d}{n}$$

$$= 13 + \frac{(-10)}{50}$$

$$= 12.8$$

$\bar{x}$ = 12.8 is a fraction.

$$\sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2}$$

$$= \sqrt{\frac{92}{50} - \left(\frac{-10}{50}\right)^2}$$

$$= \sqrt{1.84 - 0.04}$$

$$= \sqrt{1.80}$$

$$= 1.342$$

c) Step Deviation Method

- We divide the deviation by a common class interval and use the following formula

$$\text{Standard deviation}=\sigma=\sqrt{\frac{\sum fd^2}{n}-\left(\frac{\sum fd}{n}\right)^2}\times i$$

Where $i =$ common class interval,

$$d=\frac{x-A}{i},$$

$A =$ is assumed mean

$f =$ f is the respective frequency.

Example:

B.P.(mmHg):	102	106	110	114	118	122	126
No. of days:	3	9	25	35	17	10	

Solution:

B.P.(mmHg)	No. of days (f)	$d = \frac{x-114}{4}$	fd	fd^2
102	3	-3	-9	27
106	9	-2	-18	36
110	25	-1	-25	25
114	35	0	0	0
118	17	1	17	17
122	10	2	20	40
126	1	3	3	9
Total	**N=100**		$\sum fd$=-12	$\sum fd^2$=154

A. $M = \bar{x} = A + \frac{\sum fd}{N} \times i$

$= 114 + \frac{(-12)}{100} \times 4$

$= 114 - 0.48$

$= 113.52$ mm Hg

$\sigma = \sqrt{\frac{\sum fd^2}{n} - \left(\frac{\sum fd}{n}\right)^2} \times i$

$= \sqrt{\frac{154}{100} - \left(\frac{-12}{100}\right)^2} \times 4$

$= \sqrt{154 - (-0.12)^2} \times 4$

$= \sqrt{154 - 0.0144} \times 4$

$= 1.235 \times 4$

$= 4.94$ mm Hg.


THANK YOU