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Σ

($x_1, x_2, \dots, x_n$)

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$$\sum_{i=1}^n x_i = x_1 + x_2 + \dots + x_n$$

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i = \frac{1}{5}(315) = 63$$

:

$$\sum_{i=1}^5 x_i = 63 + 63 + 63 + 63 + 63 = 315$$

.

 $f_1, f_2, \dots, f_k$ $(x_1, x_2, \dots, x_k)$ k

:

$$\begin{aligned} \bar{x} &= \frac{f_1 x_1 + f_2 x_2 + \dots + f_k x_k}{f_1 + f_2 + \dots + f_k} \\ &= \frac{\sum_{i=1}^k f_i x_i}{\sum_{i=1}^k f_i} \\ &= \frac{1}{n} \sum_{i=1}^k f_i x_i \end{aligned}$$

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$$n = \sum_{i=1}^k f_i$$

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 $\bar{x}$

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	5-6	7-8	9-10	11-12	13-14
	2	5	8	4	1

:

:

	(x)	(f)	$x f$
5-6	5.5	2	11
7-8	7.5	5	37.5
9-10	9.5	8	76
11-12	11.5	4	46
13-14	13.5	1	13.5
		20	184

$$\bar{x} = \frac{1}{n} \sum_{i=1}^k f_i x_i = \frac{1}{20}(184) = 9.2$$

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$$(d_1, d_2, \dots, d_n)$$

$$(x_1, x_2, \dots, x_n)$$

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$$d_i = x_i - \bar{x}, \quad i = 1, 2, \dots, n$$

$$\sum_{i=1}^n (x_i - \bar{x}) = \sum_{i=1}^n d_i = 0$$

:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i \Rightarrow n \bar{x} = \sum_{i=1}^n x_i \quad \dots (1)$$

$$\therefore \sum_{i=1}^n (x_i - \bar{x}) = \sum_{i=1}^n x_i - \sum_{i=1}^n \bar{x} = \sum_{i=1}^n x_i - n \bar{x} = 0 \quad \dots (2)$$

$$(x_1, x_2, \dots, x_n)$$

 x

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$$: (d_1, d_2, \dots, d_n)$$

 b x

$$d_i = x_i \pm b, \quad i = 1, 2, \dots, n$$

:

$$\bar{x} = \bar{d} \mp b$$

:

$$\therefore d_i = x_i \pm b, \quad i = 1, 2, \dots, n$$

$$\Rightarrow \sum_{i=1}^n d_i = \sum_{i=1}^n (x_i \pm b) = \sum_{i=1}^n x_i \pm n b$$

$$\Rightarrow \frac{1}{n} \sum_{i=1}^n d_i = \frac{1}{n} \sum_{i=1}^n x_i \pm b$$

$$\Rightarrow \bar{d} = \bar{x} \pm b$$

$$\Rightarrow \bar{x} = \bar{d} \mp b$$

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$$\sum_{i=1}^5 d_i$$

$$b = 50$$

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$$\sum_{i=1}^5 d_i = (60 - 50) + (72 - 50) + (40 - 50) + (80 - 50) + (63 - 50)$$

$$= 10 + 22 - 10 + 30 + 13 = 65$$

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40, 60, 63, 72, 80

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) 63 ()

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72, 60, 72, 40, 80, 63

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40, 60, 63, 72, 72, 80

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$$\text{Med} = (63+72) / 2 = 67.5$$

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n

$(\frac{n}{2})$

-

$\frac{n}{2}$

f_2

f_1

-

A

:

L

$$\text{Med} = A + \frac{(\frac{n}{2} - f_1)}{f_2 - f_1} L$$

f_2

f_1

:

()

:()

:

:

< 4.5	0
< 6.5	2
< 8.5	7
< 10.5	15
< 12.5	19
< 14.5	20

15, 7

10

$(\frac{20}{2} = 10)$

$\frac{n}{2}$

:

10

$A = 8.5,$
 $f_1 = 7,$
 $f_2 = 15,$
 $L = 10.5 - 8.5 = 2$

:

$Med = 8.5 + \frac{10 - 7}{15 - 7} \cdot 2 = 9.25,$

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$\frac{n}{2}$

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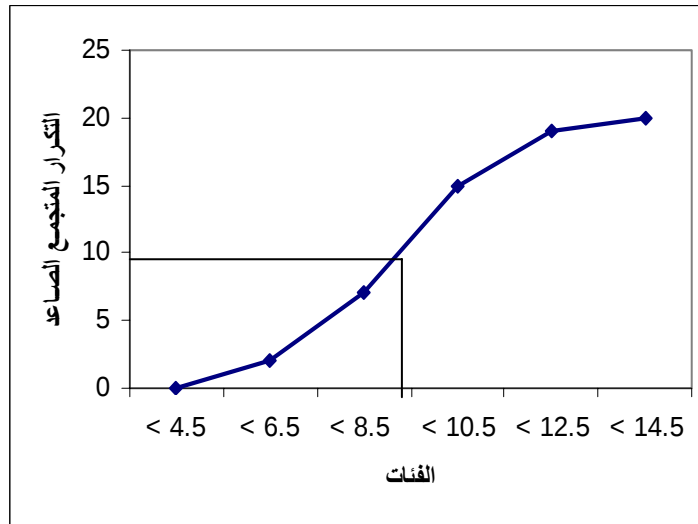
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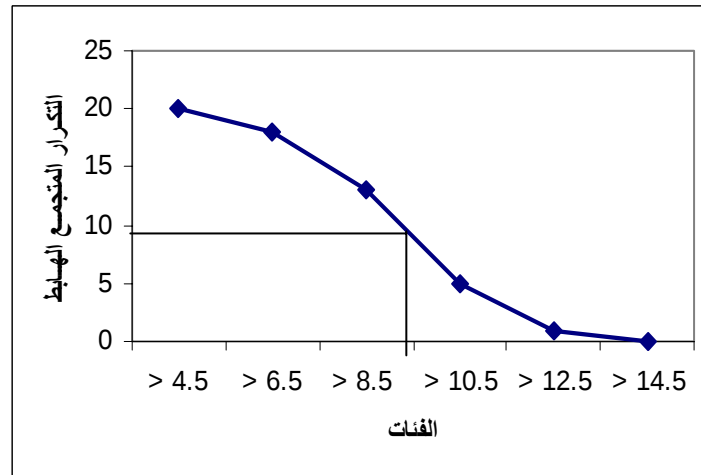
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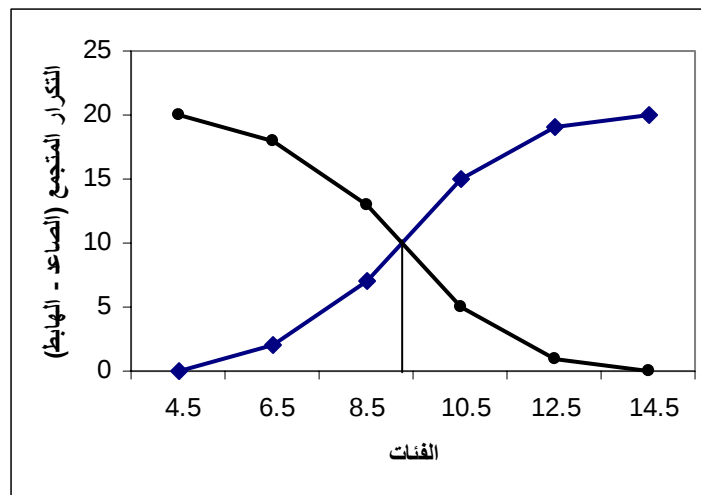
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$\sum_{i=1}^n |x_i - Med| \leq \sum_{i=1}^n |x_i - a|$

$a \neq Med$:

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2, 6, 9, 4, 6, 10, 6

6

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4, 3, 7, 9, 4, 4, 7, 4

4

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5, 7, 5, 7, 8, 9, 7, 5, 10

() : /

7 5 :
.5,7

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4, 9, 8, 12, 11, 7, 15

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f_2 f_1 f -
 f A -
 L -

:

$$Mod = A + \frac{f - f_1}{2f - f_1 - f_2} \cdot L$$

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	5 – 6	7 – 8	9 – 10	11 – 12	13 – 14
	2	5	8	4	1

:

$$f = 8, \quad f_1 = 5, \quad f_2 = 4, \quad A = 8.5$$

$$L = 10.5 - 8.5 = 2$$

:

$$Mod = 8.5 + \frac{8 - 5}{16 - 5 - 4} \cdot 2$$

$$Mod = 9.36$$

$$\frac{(\quad)}{: /}$$

$$:(\quad)$$

$$3, 5, 6, 6, 7, 10, 12$$

$$:$$

$$\text{G.M.} = \sqrt[7]{3.5.6.6.7.10.12}$$

$$:$$

$$\text{Log G.M.} = \frac{1}{7} (\text{Log } 3 + \text{Log } 5 + \text{Log } 6 + \text{Log } 6 + \text{Log } 7 + \text{Log } 10 + \text{Log } 12)$$

$$= \frac{1}{7} (0.4771 + 0.699 + 0.7782 + 0.7782 + 0.8451 + 1 + 1.0729)$$

$$= 0.8081$$

$$\text{G.M.} = 6.43$$

$$\bar{x} = \frac{1}{7} (3 + 5 + 6 + 6 + 7 + 10 + 12) = 7$$

$$\text{G.M.}$$

$$\bar{x}$$

$$.$$

$$(\quad)$$

$$x_1, x_2, \dots, x_k$$

$$k$$

$$:$$

$$f_1, f_2, \dots, f_k$$

$$\text{G.M.} = \sqrt[n]{x_1^{f_1} x_2^{f_2} \dots x_n^{f_n}}$$

$$n = \sum_{i=1}^k f_i :$$

$$-$$

$$x_1, x_2, \dots, x_n$$

$$H$$

$$.$$

$$:$$

$$H = \frac{1}{\frac{1}{n} \sum_{i=1}^n \frac{1}{x_i}} = \frac{n}{\sum_{i=1}^n \frac{1}{x_i}}$$

$$:$$

$$\frac{1}{H} = \frac{1}{n} \sum_{i=1}^n \frac{1}{x_i}$$

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3,5,6,6,7,10,12

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$$\frac{1}{H}=\frac{1}{7}(\frac{1}{3}+\frac{1}{5}+\frac{1}{6}+\frac{1}{6}+\frac{1}{10}+\frac{1}{12})$$

$$\frac{1}{H}=\frac{1}{7}(\frac{140+84+70+70+60+42+35}{420})$$

$$\frac{1}{H}=\frac{501}{2940}\Rightarrow H=5.87$$

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$$f_1,f_2,...,f_k\qquad x_1,x_2,...,x_k\qquad k$$

:

$$\frac{1}{H}=\frac{1}{n}\sum_{i=1}^n\frac{f_i}{x_i}=\frac{1}{n}(\frac{f_1}{x_1}+\frac{f_2}{x_2}+...+\frac{f_k}{x_k})$$

$$n=\sum_{i=1}^kf_i\quad:$$

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$$Q_1\qquad Q_3\quad Q_2\quad Q_1$$

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$$Q_3\quad (\quad)$$

$$Q_2$$

$$D_9\quad \ldots\quad D_2\quad D_1$$

$$D_2$$

$$D_1$$

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$$P_1\qquad P_{99}\quad \ldots\quad P_2\quad P_1$$

$$P_2$$

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$$\frac{2n}{4} \qquad \frac{n}{4} \qquad \frac{n}{2} \qquad ()$$

$$\frac{2n}{100} \qquad \frac{n}{100} \qquad \frac{n}{2}$$

$$:$$

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< 4.5	0
< 6.5	2
D ₂	
< 8.5	7
< 10.5	15
P ₉₀	
< 12.5	19
< 14.5	20

: D₂

$$D_2 = A + \frac{(\frac{2n}{10} - f_1)}{f_2 - f_1} L$$

f_2 f_1 n A

: L

$$D_2 = 6.5 + \frac{4-2}{7-2}.2 = 7.3$$

: P₉₀

$$P_{90} = A' + \frac{(\frac{90n}{100} - f_1')}{f_2' - f_1'} L$$

$$P_{90} = 10.5 + \frac{18-15}{19-15}.2 = 12$$

:

 $y \quad x$

x	1	2	4	-2	5
y	-1	1	5	-7	7

:

$$\text{i) } \sum x, \sum y, \sum xy, \sum x^2, \sum y^2, \sum x^3, \sum y^3, \sum xy^2$$

$$\text{ii) } (\sum x)^2, ((\sum x) + 2)^2, \sum (x - 3y)^2, \sum x(x + 4)$$

:

$$\text{(i) } \sum \left(\frac{y}{x} \right) = \frac{\sum y}{\sum x}, \quad \text{ii) } \sum xy = \sum x \sum y$$

$$\text{(iii) } \sum (x - c)(x + c) = \sum x^2 - nc^2, \quad \text{(iv) } (\sum x)^2 = \sum x^2$$

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6,6,9,8,6,10,9,9,8,7,8,6,7,8,8,11,10,11,8,8

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2	8
3	10
5	20
7	20
8	6
9	6

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	40-49	50-59	60-69	70-79	80-89	90-99
	6	10	17	17	6	4

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	20-29	30-39	40-49	50-59	60-69	70-79
	9	12	15	8	4	2

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0, 2, 4, 6

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