

(17) STATISTIK – STATISTICS I, II, III

(a) MODE DATA TAK TERKUMPUL – Mode of a ungrounded data

Mode = Nilai data yang mempunyai frekuensi paling tinggi (the value of data with the highest frequency)

<p>Contoh 1 : 6, 7, 7, 11, 5, 6, 11, 13, 14, 11, 8 Susun \Rightarrow 5, 6, 6, 7, 7, 8, 11, 11, 11, 13, 14 mode = 11</p>	<p>Contoh 2 :</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Skor</td> <td>2</td> <td>4</td> <td>6</td> <td>8</td> <td>10</td> </tr> <tr> <td>Frekuensi</td> <td>3</td> <td>15</td> <td>7</td> <td>12</td> <td>9</td> </tr> </table> <p style="text-align: center;">mode = 4</p>	Skor	2	4	6	8	10	Frekuensi	3	15	7	12	9												
Skor	2	4	6	8	10																				
Frekuensi	3	15	7	12	9																				
<p>Contoh 3 :</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Skor</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Frekuensi</td> <td>1</td> <td>3</td> <td>7</td> <td>x</td> <td>5</td> </tr> </table> <p style="text-align: center;">mode = 2, nilai maksimum $x = ???$ $x < 7 \Rightarrow x = 6$</p>	Skor	0	1	2	3	4	Frekuensi	1	3	7	x	5	<p>Contoh 4 :</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td>Skor</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Frekuensi</td> <td>1</td> <td>7</td> <td>0</td> <td>x</td> <td>2</td> </tr> </table> <p style="text-align: center;">mode = 3, nilai minimum $x = ???$ $x > 7 \Rightarrow x = 8$</p>	Skor	0	1	2	3	4	Frekuensi	1	7	0	x	2
Skor	0	1	2	3	4																				
Frekuensi	1	3	7	x	5																				
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Frekuensi	1	7	0	x	2																				

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(b) MEDIAN DATA TAK TERKUMPUL – Median of a ungrounded data

Median = Nilai di tengah-tengah apabila set data dikumpul dalam susunan menaik (the middle value when a set of data is arranged in ascending order)

<p>Contoh 1 : 5, 3, 3, 5, 7, 7, 1 Susun semula \Rightarrow 1, 3, 3, 5, 5, 7, 7 median = 5</p>	<p>Contoh 2 : 24, 23, 12, 19, 16, 17 Susun semula \Rightarrow 12, 16, 17, 19, 23, 24 median = $\frac{17+19}{2} = 18$</p>												
<p>Contoh 3 :</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td>Jenis Buku</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Bilangan Pelajar</td> <td>3</td> <td>0</td> <td>1</td> <td>5</td> <td>6</td> </tr> </table> <p style="text-align: center;">\Rightarrow 1, 1, 1, 3, 4, 4, 4, 4, 4, 5, 5, 5, 5, 5, 5 median = 4</p>		Jenis Buku	1	2	3	4	5	Bilangan Pelajar	3	0	1	5	6
Jenis Buku	1	2	3	4	5								
Bilangan Pelajar	3	0	1	5	6								
<p>Contoh 4 :</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td>Saiz Kasut</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> <tr> <td>Bilangan Pelajar</td> <td>8</td> <td>14</td> <td>12</td> <td>x</td> <td>3</td> </tr> </table> <p style="text-align: center;">median = 3, range of $x = ???$</p>		Saiz Kasut	1	2	3	4	5	Bilangan Pelajar	8	14	12	x	3
Saiz Kasut	1	2	3	4	5								
Bilangan Pelajar	8	14	12	x	3								

8	14	11	x	3
8	14	11	x	3

$8 + 14 = 11 + x + 3$
 $22 = x + 14$
 $8 = x$

$8 + 14 + 11 = x + 3$
 $33 = x + 3$
 $30 = x$

$\therefore 8 \leq x \leq 30$

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(c) MIN DATA TAK TERKUMPUL – Mean of a ungrouped data

$\text{Mean} = \frac{\text{Jumlah kesemua data}}{\text{Bil Data}}$ $\text{mean} = \frac{\text{sum of all the values of data}}{\text{the number of data}}$	$\text{Mean} = \frac{\text{jumlah (nilai} \times \text{frekuensi)}}{\text{jumlah frekuensi}}$ $\text{mean} = \frac{\text{sum of (value} \times \text{frequency)}}{\text{total frequency}}$										
<p>Contoh 1 :</p> <p>68, 62, 84, 75, 78, 89</p> $\text{mean} = \frac{68 + 62 + 84 + 75 + 78 + 79}{6}$ $= 76$	<p>Contoh 2 :</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Mark</td> <td style="padding: 2px;">74</td> <td style="padding: 2px;">78</td> <td style="padding: 2px;">82</td> <td style="padding: 2px;">86</td> </tr> <tr> <td style="padding: 2px;">Frequency</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> </tr> </table> $\text{mean} = \frac{74(5) + 78(10) + 82(2) + 86(3)}{5 + 10 + 2 + 3}$ $= 78.6$	Mark	74	78	82	86	Frequency	5	10	2	3
Mark	74	78	82	86							
Frequency	5	10	2	3							

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(d) UKURAN SERAKAN ~ JARAK, KUANTIL BAWAH (PERTAMA) (Q₁), KUANTIL ATAS (KETIGA) (Q₃), INTERKUANTIL (tengah/median)
Measure of Dispersion ~ range, first / lower quartile (Q₁), third / upper quartile (Q₃), interquartile range

<ul style="list-style-type: none"> • JARAK (range) = (terbesar – terkecil) nilai data • Q₁ = Nilai tengah antara nilai awal dan median (the value that divides the values of data that are less than median into 2 equal parts) • Q₃ = Nilai tengah antara nilai akhir dan median (the value that divides the values of data that are greater than median into 2 equal parts) • Jarak Interkuartil (Interquartile range) = Q₃ - Q₁ 	
<p>Example 1 :</p> <p>5, 30, 45, 29, 25, 6, 21, 8, 28, 4</p> <p style="text-align: center;"> \downarrow Q₁ \downarrow Q₃ \Rightarrow 4, 5, 6, 8, 21, 25, 28, 29, 30, 45 </p> <p>∴ jarak = 45 - 4 = 41</p> <p>∴ Q₁ = 6</p> <p>∴ Q₃ = 29</p> <p>∴ Jarak Interkuartil = 29 - 6 = 23</p>	<p>Example 2 :</p> <p>8, 12, 6, 10, 6, 7, 13, 3, 8, 10, 13, 19</p> <p style="text-align: center;"> \downarrow Q₁ \downarrow Q₃ \Rightarrow 3, 6, 6, 7, 8, 8, 10, 10, 12, 13, 13, 19 </p> <p>∴ jarak = 19 - 3 = 16</p> <p>∴ Q₁ = $\frac{6+7}{2} = 6.5$</p> <p>∴ Q₃ = $\frac{12+13}{2} = 12.5$</p> <p>∴ Jarak Interkuartil = 12.5 - 6.5 = 6</p>

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(e) PENYELESAIAN MASALAH – Solve problem involving ungrouped data

<p>Contoh 1 :</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Score</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">x</td> <td style="padding: 2px;">12</td> <td style="padding: 2px;">14</td> </tr> <tr> <td style="padding: 2px;">Frequency</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">1</td> </tr> </table> <p style="text-align: center; margin-left: 100px;"> \downarrow Q₁ \downarrow Q₃ \Rightarrow 1, 3, 6, 6, x, x, x, 12, 14 </p>	Score	1	3	6	x	12	14	Frequency	1	1	2	3	1	1	<p>\Rightarrow third quartile = 11, x = ???</p> $\therefore \frac{x+12}{2} = 11$ $x + 12 = 22$ $x = 22 - 12$ $x = 10$
Score	1	3	6	x	12	14									
Frequency	1	1	2	3	1	1									
<p>Contoh 2 :</p> <div style="text-align: center; border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;">3, 3, 6, x, x, 3</div> <p>mode = 3, median = 4. Dua data baru, 4 dan 7 dimasukkan kedalam set, min = ???</p> <p style="margin-left: 50px;"> \downarrow 3, 3, 3, x, x, 6 </p>															
<table style="width: 100%; border: none;"> <tr> <td style="width: 40%; border: none;"> $\frac{3+x}{2} = 4$ $3 + x = 8$ $x = 8 - 3$ $x = 5$ </td> <td style="width: 60%; border: none;"> $\text{min} = \frac{3+3+3+5+5+6+4+7}{8}$ $= 4.5$ </td> </tr> </table>		$\frac{3+x}{2} = 4$ $3 + x = 8$ $x = 8 - 3$ $x = 5$	$\text{min} = \frac{3+3+3+5+5+6+4+7}{8}$ $= 4.5$												
$\frac{3+x}{2} = 4$ $3 + x = 8$ $x = 8 - 3$ $x = 5$	$\text{min} = \frac{3+3+3+5+5+6+4+7}{8}$ $= 4.5$														

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- (f) Selang kelas, had yang lebih rendah / atas, sempadan bawah / atas, saiz selang kelas, titik tengah
Class interval, lower / upper limit, lower / upper boundary, size of class interval, midpoint

Contoh :

Selang Kelas	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45
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- had atas = 16, sempadan atas = 20
 - had bawah = 15.5, sempadan bawah = 20.5
 - saiz selang kelas = 5
 - titik tengah = $\frac{\text{sempadan bawah} + \text{sempadan atas}}{2}$
- $$= \text{sempadan atas} - \text{sempadan bawah} = \frac{\text{lower boundary} + \text{upper boundary}}{2}$$
- $$= \text{titiktengah}_2 - \text{titiktengah}_1 = 18$$

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- (g) JADUAL FREKUENSI, KUMULATIF FREKUENSI, MODAL KELAS, MIN, SELANG KELAS,
Frequency table, Cumulative Frequency, Modal class, Mean, Range

Contoh :

Demam, x	11 – 15	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45
Frekuensi, f	1	3	6	10	11	7	2
Kumulatif F.	1	4	10	20	31	38	40

- modal kelas = selang kelas dengan nilai f tertinggi = 31 – 35

$$\text{min} = \frac{\sum fx}{\sum f} = \frac{\text{sum of (midpoint} \times \text{frequency)}}{\text{sum of frequency}}$$

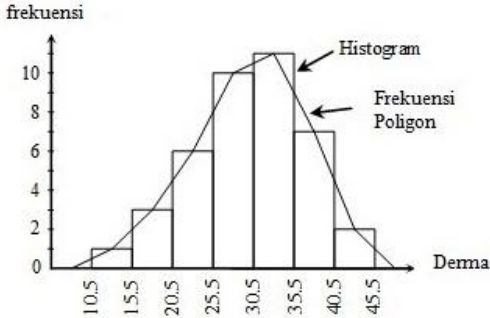
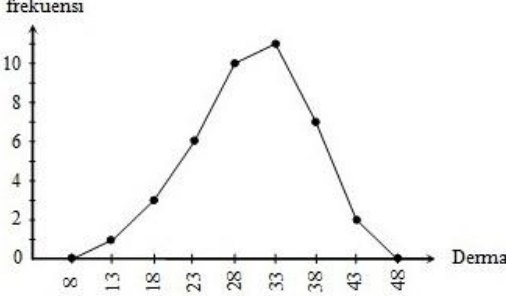
$$= \frac{\text{jum (titiktengah} \times \text{frekuensi)}}{\text{jum frekuensi}}$$

$$= \frac{13(1) + 18(3) + 23(6) + 28(10) + 33(11) + 38(7) + 43(2)}{40} = 30$$

- Jarak (range) = titik tengah (tertinggi – terendah) kelas = 43 – 13 = 30

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- (h) Histogram, poligon kekerapan, ogif, kuartil pertama, ketiga kuartil, pelbagai interquartile
Histogram, frequency polygons, ogive, first quartile, third quartile, interquartile range

<p>Histogram</p> <ul style="list-style-type: none"> • sempadan atas / sempadan bawah (lower / upper boundary). • Frekuensi kekerapan (frequency) <p>** Poligon Frekuensi boleh dibina dari histogram</p> <p>maksud poligon – bentuk geometri dari garis lurus dan bercantum garisnya (contoh segitiga, segiempat)</p>	<p>Contoh : [berdasarkan frekuensi (g)]</p> 
<p>Frekuensi Poligon</p> <ul style="list-style-type: none"> • Titik Tengah (midpoint) • Frekuensi (frequency) <p>** the frequency polygon should add a class with zero frequency before the first class and after the last class</p>	<p>Example : [berdasarkan frekuensi (g)]</p> 
<p>OGIF (Ogive)</p> <ul style="list-style-type: none"> • sempadan atas (upper boundary) • frekuensi bertambah / kumulatif frekuensi <p>** Mesti ada kelas 0 (cth 10.5)</p>	<p>contoh : [berdasarkan frekuensi (g)]</p> 