

PENGUJIAN KENORMALAN, KESERAGAMAN, KECUKUPAN DATA

❖ Stasiun 1 : Obras bahu

Tabel L.1.1

Data Mentah Stasiun 1

data ke-	obras bahu kiri (detik)	obras bahu kanan (detik)	total (detik)
1	23,60	12,48	36,08
2	20,94	12,58	33,52
3	22,32	12,30	34,62
4	21,26	13,65	34,91
5	20,61	15,27	35,88
6	22,55	12,01	34,56
7	20,84	12,95	33,79
8	22,69	10,82	33,51
9	20,44	14,51	34,95
10	22,35	12,81	35,16
11	20,49	16,25	36,74
12	22,15	14,46	36,61
13	22,76	12,17	34,93
14	21,74	12,08	33,82
15	23,49	12,34	35,83
16	22,10	11,66	33,76
17	22,06	11,34	33,40
18	22,15	12,86	35,01
19	20,77	14,05	34,82
20	22,04	13,12	35,16
21	21,89	12,83	34,72
22	21,10	13,29	34,39
23	21,56	13,97	35,53
24	21,79	13,16	34,95
25	22,71	13,78	36,49
26	22,43	14,34	36,77
27	21,75	14,90	36,65
28	22,30	13,88	36,18
29	22,68	13,40	36,08
30	21,00	12,26	33,26
31	21,17	15,57	36,74
32	23,08	11,82	34,90
33	22,63	12,98	35,61
34	21,16	14,55	35,71
35	21,32	14,87	36,19
36	21,76	12,41	34,17
		TOTAL	1265,40
		RATA-RATA	35,15

➤ Uji Kenormalan Data

Tabel L.1.2

Uji Kenormalan Data Stasiun 1

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig		
...	33,25	...	33,255	0	...	-1,780	0	0,038	0,038	1,351	8,641	9	0,015		
33,26	33,82	33,255	33,827	7	-1,780	-1,243	0,038	0,107	0,069	2,498					
33,83	34,39	33,827	34,398	2	-1,243	-0,706	0,107	0,240	0,133	4,793					
34,40	34,96	34,398	34,970	9	-0,706	-0,169	0,240	0,433	0,193	6,941	6,941	9	0,611		
34,97	35,54	34,970	35,542	4	-0,169	0,368	0,433	0,644	0,211	7,585	7,585	4	1,694		
35,55	36,11	35,542	36,113	6	0,368	0,905	0,644	0,817	0,174	6,254	6,254	6	0,010		
36,12	36,68	36,113	36,685	5	0,905	1,442	0,817	0,925	0,108	3,891	6,578	8	0,307		
36,69	37,25	36,685	37,257	3	1,442	1,979	0,925	0,976	0,051	1,827					
37,26	...	37,257	...	0	1,979	...	0,976	1	0,024	0,860					
				36											2,637

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{36,77 - 33,26}{6,14} \\
 &= 0,57
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,06
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 2,637
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi^2_{\alpha} = 5,991$$

$\chi^2 < \chi^2_{\alpha}$ ($2,637 < 5,991$) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.3

Uji Keseragaman Data Stasiun 1

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	36,08	33,52	34,62	34,91	35,88	34,56	34,93
2	33,79	33,51	34,95	35,16	36,74	36,61	35,13
3	34,93	33,82	35,83	33,76	33,40	35,01	34,46
4	34,82	35,16	34,72	34,39	35,53	34,95	34,93
5	36,49	36,77	36,65	36,18	36,08	33,26	35,91
6	36,74	34,90	35,61	35,71	36,19	34,17	35,55
						Total	210,90
						Rata-Rata	35,15

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{210,90}{6} = 35,15$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

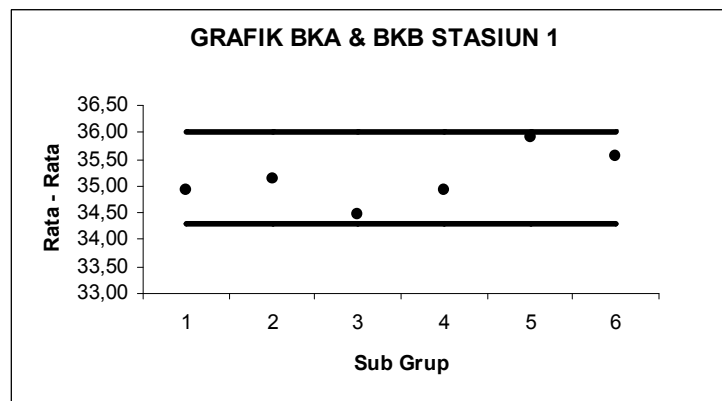
$$= 1,06$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,06}{\sqrt{6}} = 0,43$$

$$BKA = \bar{X} + c * \sigma_x = 36,01$$

$$BKB = \bar{X} - c * \sigma_x = 34,29$$



Gambar L.1.2

Grafik BKA dan BKB Stasiun 1

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 44518,47 - 1601237,16}}{1265,40} \right]^2 \\ &= 0,36 \end{aligned}$$

$N' < N$ ($0,36 < 36$) maka datanya cukup.

❖ Stasiun 2 : Obras rip leher

Tabel L.1.4

Data Mentah Stasiun 2

data ke-	obras rip (detik)	obras rip leher (detik)	Total (detik)
1	12,93	55,97	68,90
2	11,39	55,91	67,30
3	13,69	55,09	68,78
4	13,00	55,97	68,97
5	12,92	56,65	69,57
6	11,64	56,44	68,08
7	13,41	54,75	68,16
8	11,59	54,62	66,21
9	11,88	56,59	68,47
10	12,36	56,13	68,49
11	12,81	56,75	69,56
12	11,87	55,40	67,27
13	11,84	56,75	68,59
14	12,05	56,09	68,14
15	11,95	56,94	68,89
16	12,50	56,07	68,57
17	11,38	56,29	67,67
18	12,26	56,50	68,76
19	12,77	56,40	69,17
20	13,19	58,09	71,28
21	11,44	55,41	66,85
22	13,75	57,34	71,09
23	12,80	56,37	69,17
24	13,03	54,06	67,09
25	12,22	56,75	68,97
26	12,35	55,81	68,16
27	13,97	55,09	69,06
28	12,86	56,68	69,54
29	13,23	56,47	69,70
30	11,16	56,25	67,41
31	12,37	56,12	68,49
32	12,74	54,57	67,31
33	12,91	56,40	69,31
34	12,87	56,90	69,77
35	12,42	56,28	68,70
36	12,13	54,25	66,38
		TOTAL	2467,83
		RATA-RATA	68,55

➤ Uji Kenormalan Data

Tabel L.1.5

Uji Kenormalan Data Stasiun 2

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig	
...	66,20	...	66,205	0	...	-2,073	0	0,019	0,019	0,686	9,709	9	0,052	
66,21	67,03	66,205	67,031	3	-2,073	-1,344	0,019	0,090	0,070	2,537				
67,04	67,85	67,031	67,856	6	-1,344	-0,614	0,090	0,270	0,180	6,486				
67,86	68,68	67,856	68,682	9	-0,614	0,116	0,270	0,546	0,277	9,955	9,955	9	0,092	
68,69	69,50	68,682	69,508	11	0,116	0,846	0,546	0,801	0,255	9,180	9,180	11	0,361	
69,51	70,33	69,508	70,334	5	0,846	1,576	0,801	0,942	0,141	5,085	7,156	7	0,003	
70,34	71,15	70,334	71,159	1	1,576	2,306	0,942	0,989	0,047	1,691				
71,16	71,98	71,159	71,985	1	2,306	3,036	0,989	0,999	0,009	0,337				
71,99	...	71,985	...	0	3,036	...	0,999	1	0,001	0,043				
				36										0,508

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{71,28 - 66,21}{6,14} \\
 &= 0,83
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,13
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 0,508
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 4 - 2 - 1 = 1$$

$$\alpha = 0,05$$

$$\chi^2_{\alpha} = 3,841$$

$\chi^2 < \chi^2_{\alpha}$ (0,508 < 3,841) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.6

Uji Keseragaman Data Stasiun 2

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	68,90	67,30	68,78	68,97	69,57	68,08	68,60
2	68,16	66,21	68,47	68,49	69,56	67,27	68,03
3	68,59	68,14	68,89	68,57	67,67	68,76	68,44
4	69,17	71,28	66,85	71,09	69,17	67,09	69,11
5	68,97	68,16	69,06	69,54	69,70	67,41	68,81
6	68,49	67,31	69,31	69,77	68,70	66,38	68,33
						Total	411,31
						Rata-Rata	68,55

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{411,31}{6} = 68,55$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

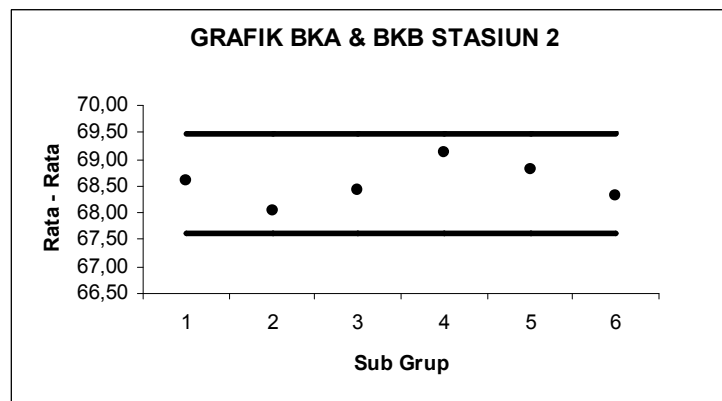
$$= 1,13$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,13}{\sqrt{6}} = 0,46$$

$$BKA = \bar{X} + c * \sigma_x = 69,47$$

$$BKB = \bar{X} - c * \sigma_x = 67,63$$



Gambar L.1.2

Grafik BKA dan BKB Stasiun 2

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 169216,60 - 6090184,91}}{2467,83} \right]^2 \\ &= 0,11 \end{aligned}$$

$N' < N$ ($0,11 < 36$) maka datanya cukup.

❖ Stasiun 3 : Obras tangan

Tabel L.1.7

Data Mentah Stasiun 3

data ke-	obras tangan kiri (detik)	obras tangan kanan (detik)	total (detik)
1	36,10	35,70	71,80
2	36,32	36,60	72,92
3	39,48	35,75	75,23
4	35,55	39,21	74,76
5	36,56	34,88	71,44
6	36,76	37,37	74,13
7	39,55	36,40	75,95
8	36,32	37,50	73,82
9	36,79	35,86	72,65
10	37,36	35,27	72,63
11	38,12	33,42	71,54
12	36,93	35,76	72,69
13	38,21	36,55	74,76
14	37,25	35,27	72,52
15	39,92	35,00	74,92
16	37,85	34,61	72,46
17	38,18	36,43	74,61
18	38,63	36,02	74,65
19	39,61	34,13	73,74
20	36,26	36,65	72,91
21	36,52	37,59	74,11
22	39,47	35,05	74,52
23	35,34	39,35	74,69
24	35,25	35,98	71,23
25	35,03	36,99	72,02
26	35,60	37,94	73,54
27	38,12	34,93	73,05
28	35,26	36,20	71,46
29	36,08	36,33	72,41
30	35,27	36,10	71,37
31	35,96	38,00	73,96
32	34,41	39,71	74,12
33	34,39	39,55	73,94
34	37,68	37,15	74,83
35	38,70	33,57	72,27
36	36,52	36,37	72,89
TOTAL			2640,54
RATA-RATA			73,35

➤ Uji Kenormalan Data

Tabel L.1.8

Uji Kenormalan Data Stasiun 3

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig	
...	71,22	...	71,225	0	...	-1,664	0	0,048	0,048	1,731	5,194	6	0,125	
71,23	71,99	71,225	71,994	6	-1,664	-1,061	0,048	0,144	0,096	3,462				
72,00	72,76	71,994	72,762	8	-1,061	-0,459	0,144	0,323	0,179	6,438	6,438	8	0,379	
72,77	73,53	72,762	73,531	4	-0,459	0,143	0,323	0,557	0,234	8,419	8,419	4	2,319	
73,54	74,29	73,531	74,300	8	0,143	0,746	0,557	0,772	0,215	7,743	7,743	8	0,009	
74,30	75,06	74,300	75,069	8	0,746	1,348	0,772	0,911	0,139	5,008	8,207	10	0,392	
75,07	75,83	75,069	75,837	1	1,348	1,950	0,911	0,974	0,063	2,278				
75,84	76,60	75,837	76,606	1	1,950	2,552	0,974	0,995	0,020	0,728				
76,61	...	76,606	...	0	2,552	...	0,995	1	0,005	0,193				
				36									3,224	

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{75,95 - 71,23}{6,14} \\
 &= 0,77
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,28
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 3,224
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi_a^2 = 5,991$$

$\chi^2 < \chi_a^2$ (3,224 < 5,991) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.9

Uji Keseragaman Data Stasiun 3

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	71,80	72,92	75,23	74,76	71,44	74,13	73,38
2	75,95	73,82	72,65	72,63	71,54	72,69	73,21
3	74,76	72,52	74,92	72,46	74,61	74,65	73,99
4	73,74	72,91	74,11	74,52	74,69	71,23	73,53
5	72,02	73,54	73,05	71,46	72,41	71,37	72,31
6	73,96	74,12	73,94	74,83	72,27	72,89	73,67
						Total	440,09
						Rata-Rata	73,35

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{440,09}{6} = 73,35$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

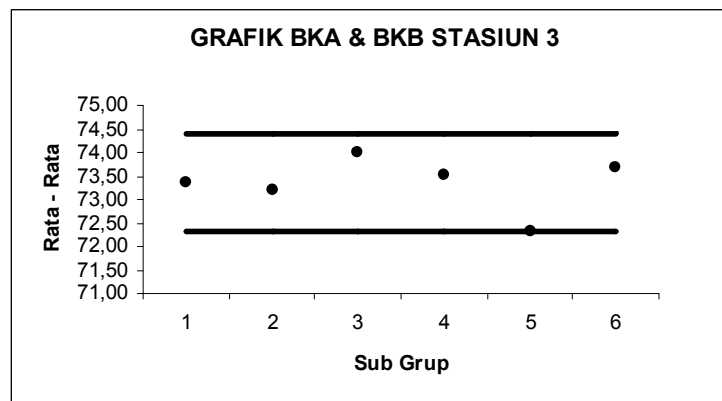
$$= 1,28$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,28}{\sqrt{6}} = 0,52$$

$$BKA = \bar{X} + c * \sigma_x = 74,39$$

$$BKB = \bar{X} - c * \sigma_x = 72,31$$



Gambar L.1.3

Grafik BKA dan BKB Stasiun 3

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 193736,22 - 6972451,49}}{2640,54} \right]^2 \\ &= 0,12 \end{aligned}$$

$N' < N$ ($0,12 < 36$) maka datanya cukup.

❖ Stasiun 4 : Obras jadi

Tabel L.1.10

Data Mentah Stasiun 4

data ke-	obras bagian kiri (detik)	obras bagian kanan (detik)	total (detik)
1	28,90	26,57	55,47
2	28,77	27,17	55,94
3	30,90	24,75	55,65
4	29,15	25,85	55,00
5	27,83	27,21	55,04
6	27,48	29,61	57,09
7	29,87	27,69	57,56
8	30,95	25,24	56,19
9	30,47	26,25	56,72
10	30,15	25,41	55,56
11	28,12	27,60	55,72
12	30,76	25,80	56,56
13	29,20	26,28	55,48
14	30,24	26,76	57,00
15	28,83	28,04	56,87
16	28,91	27,74	56,65
17	27,76	29,98	57,74
18	28,58	27,38	55,96
19	28,95	27,79	56,74
20	29,80	27,55	57,35
21	28,73	26,76	55,49
22	30,61	26,99	57,60
23	29,65	26,11	55,76
24	28,61	27,26	55,87
25	30,17	25,82	55,99
26	27,72	28,73	56,45
27	28,37	29,39	57,76
28	30,71	24,35	55,06
29	29,18	25,92	55,10
30	27,54	27,80	55,34
31	30,71	24,86	55,57
32	27,40	29,34	56,74
33	29,53	27,28	56,81
34	30,19	26,35	56,54
35	30,08	27,61	57,69
36	30,06	25,65	55,71
TOTAL			2025,77
RATA-RATA			56,27

➤ Uji Kenormalan Data

Tabel L.1.11

Uji Kenormalan Data Stasiun 4

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig) ² /eig
...	54,99	...	54,995	0	...	-1,503	0	0,066	0,066	2,390	5,942	5	0,149
55,00	55,44	54,995	55,445	5	-1,503	-0,974	0,066	0,165	0,099	3,552			
55,45	55,89	55,445	55,894	10	-0,974	-0,444	0,165	0,328	0,163	5,879	5,879	10	2,889
55,90	56,34	55,894	56,344	4	-0,444	0,085	0,328	0,534	0,205	7,398	7,398	4	1,561
56,35	56,79	56,344	56,793	7	0,085	0,614	0,534	0,731	0,197	7,080	7,080	7	0,001
56,80	57,24	56,793	57,243	4	0,614	1,144	0,731	0,874	0,143	5,153	9,701	10	0,009
57,25	57,69	57,243	57,692	4	1,144	1,673	0,874	0,953	0,079	2,852			
57,70	58,14	57,692	58,142	2	1,673	2,203	0,953	0,986	0,033	1,200			
58,15	...	58,142	...	0	2,203	...	0,986	1	0,014	0,497			
				36									4,609

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{57,76 - 55,00}{6,14} \\
 &= 0,45
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 0,85
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 4,609
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi^2_{\alpha} = 5,991$$

$\chi^2 < \chi^2_{\alpha}$ (4,609 < 5,991) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.12

Uji Keseragaman Data Stasiun 4

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	55,47	55,94	55,65	55,00	55,04	57,09	55,70
2	57,56	56,19	56,72	55,56	55,72	56,56	56,39
3	55,48	57,00	56,87	56,65	57,74	55,96	56,62
4	56,74	57,35	55,49	57,60	55,76	55,87	56,47
5	55,99	56,45	57,76	55,06	55,10	55,34	55,95
6	55,57	56,74	56,81	56,54	57,69	55,71	56,51
Total							337,63
Rata-Rata							56,27

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{337,63}{6} = 56,27$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

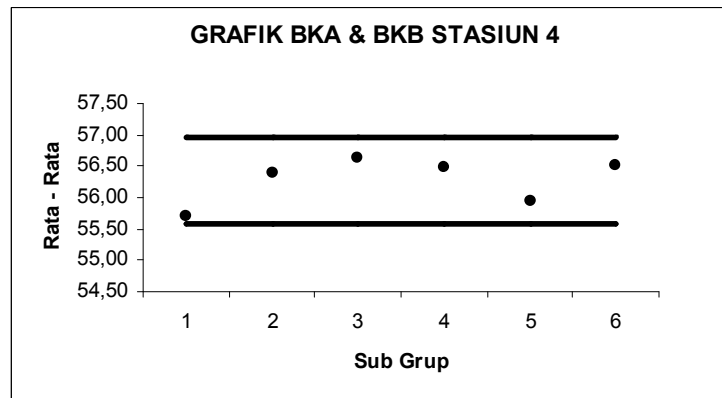
$$= 0,85$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{0,85}{\sqrt{6}} = 0,35$$

$$BKA = \bar{X} + c * \sigma_x = 56,97$$

$$BKB = \bar{X} - c * \sigma_x = 55,57$$



Gambar L.1.4

Grafik BKA dan BKB Stasiun 4

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 114018,12 - 4103744,09}}{2025,77} \right]^2 \\ &= 0,09 \end{aligned}$$

$N' < N (0,09 < 36)$ maka datanya cukup.

❖ Stasiun 5 : Overdeck tangan dan bawah

Tabel L.1.13

Data Mentah Stasiun 5

data ke-	overdeck bawah (detik)	overdeck tangan kiri (detik)	overdeck tangan kanan (detik)	total (detik)
1	47,92	27,55	27,27	102,74
2	46,20	28,02	26,89	101,11
3	48,10	27,46	26,25	101,81
4	44,20	27,73	26,08	98,01
5	49,97	27,76	24,88	102,61
6	44,66	27,72	25,75	98,13
7	49,67	26,51	25,07	101,25
8	48,89	25,88	25,68	100,45
9	49,66	28,77	24,16	102,59
10	45,20	28,62	25,62	99,44
11	43,69	27,62	25,00	96,31
12	43,46	27,06	25,96	96,48
13	46,87	26,46	25,97	99,30
14	47,39	27,15	25,87	100,41
15	46,50	26,79	24,19	97,48
16	44,63	26,88	26,68	98,19
17	46,72	26,14	25,90	98,76
18	44,69	26,39	26,07	97,15
19	46,34	26,16	24,47	96,97
20	49,19	27,69	27,84	104,72
21	46,23	26,26	24,65	97,14
22	46,43	26,45	25,91	98,79
23	45,07	27,36	26,50	98,93
24	47,37	25,36	26,41	99,14
25	47,71	27,97	24,88	100,56
26	47,73	26,88	26,91	101,52
27	49,28	28,09	25,06	102,43
28	48,24	28,42	27,84	104,50
29	43,97	28,87	25,34	98,18
30	48,53	27,27	26,56	102,36
31	48,63	26,45	27,66	102,74
32	48,68	26,50	26,97	102,15
33	44,47	29,61	26,32	100,40
34	44,09	27,12	26,28	97,49
35	45,88	27,53	26,59	100,00
36	46,79	27,82	25,44	100,05
			TOTAL	3600,29
			RATA-RATA	100,01

➤ Uji Kenormalan Data

Tabel L.1.14

Uji Kenormalan Data Stasiun 5

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig	
...	96,30	...	96,305	0	...	-1,632	0	0,051	0,051	1,849	5,470	7	0,428	
96,31	97,67	96,305	97,675	7	-1,632	-1,028	0,051	0,152	0,101	3,620				
97,68	99,04	97,675	99,044	7	-1,028	-0,425	0,152	0,336	0,184	6,610	6,610	7	0,023	
99,05	100,41	99,044	100,414	7	-0,425	0,179	0,336	0,571	0,235	8,476	8,476	7	0,257	
100,42	101,78	100,414	101,784	5	0,179	0,782	0,571	0,783	0,212	7,633	7,633	5	0,908	
101,79	103,15	101,784	103,154	8	0,782	1,386	0,783	0,917	0,134	4,828	7,811	10	0,614	
103,16	104,52	103,154	104,523	1	1,386	1,990	0,917	0,977	0,060	2,144				
104,53	105,89	104,523	105,893	1	1,990	2,593	0,977	0,995	0,019	0,668				
105,90	...	105,893	...	0	2,593	...	0,995	1	0,005	0,171				
				36								2,230		

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{104,72 - 96,31}{6,14} \\
 &= 1,37
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 2,27
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 2,230
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi^2_{\alpha} = 5,991$$

$\chi^2 < \chi^2_{\alpha}$ ($2,230 < 5,991$) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.15

Uji Keseragaman Data Stasiun 5

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	102,74	101,11	101,81	98,01	102,61	98,13	100,74
2	101,25	100,45	102,59	99,44	96,31	96,48	99,42
3	99,30	100,41	97,48	98,19	98,76	97,15	98,55
4	96,97	104,72	97,14	98,79	98,93	99,14	99,28
5	100,56	101,52	102,43	104,50	98,18	102,36	101,59
6	102,74	102,15	100,40	97,49	100,00	100,05	100,02
Total							599,59
Rata-Rata							99,93

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{599,59}{6} = 99,93$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

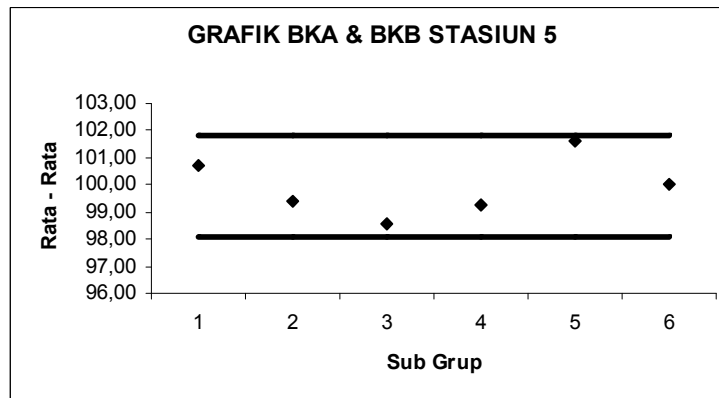
$$= 2,27$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{2,27}{\sqrt{6}} = 0,93$$

$$BKA = \bar{X} + c * \sigma_x = 101,79$$

$$BKB = \bar{X} - c * \sigma_x = 98,07$$



Gambar L.1.5

Grafik BKA dan BKB Stasiun 5

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 360238,26 - 12962088,08}}{3600,29} \right]^2 \\ &= 0,20 \end{aligned}$$

$N' < N$ ($0,20 < 36$) maka datanya cukup.

❖ Stasiun 6 : Stik leher

Tabel L.1.16

Data Mentah Stasiun 6

data ke-	lapis leher (detik)	stik leher (detik)	Total (detik)
1	68,13	67,95	136,08
2	68,23	66,39	134,62
3	69,50	64,95	134,45
4	67,52	66,40	133,92
5	67,65	66,00	133,65
6	67,93	67,39	135,32
7	68,30	65,16	133,46
8	67,41	66,68	134,09
9	66,64	66,37	133,01
10	69,92	66,92	136,84
11	66,57	66,56	133,13
12	67,83	67,36	135,19
13	69,36	65,86	135,22
14	66,34	66,74	133,08
15	68,41	65,22	133,63
16	69,32	64,91	134,23
17	65,49	67,63	133,12
18	69,82	66,72	136,54
19	67,23	66,34	133,57
20	68,09	65,10	133,19
21	65,95	69,66	135,61
22	65,48	67,76	133,24
23	68,54	65,91	134,45
24	66,42	68,77	135,19
25	67,90	66,96	134,86
26	66,15	70,66	136,81
27	65,52	70,97	136,49
28	66,10	66,93	133,03
29	67,65	67,17	134,82
30	68,34	66,11	134,45
31	67,59	68,37	135,96
32	66,37	68,05	134,42
33	66,52	68,91	135,43
34	67,35	67,25	134,60
35	66,48	70,24	136,72
36	66,11	69,04	135,15
TOTAL			4847,57
RATA-RATA			134,65

➤ Uji Kenormalan Data

Tabel L.1.17

Uji Kenormalan Data Stasiun 6

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig	
...	133,00	...	133,005	0	...	-1,380	0	0,084	0,084	3,019	7,036	9	0,548	
133,01	133,62	133,005	133,629	9	-1,380	-0,858	0,084	0,195	0,112	4,018				
133,63	134,25	133,629	134,253	5	-0,858	-0,336	0,195	0,368	0,173	6,223	6,223	5	0,240	
134,26	134,87	134,253	134,876	8	-0,336	0,185	0,368	0,574	0,205	7,387	7,387	8	0,051	
134,88	135,50	134,876	135,500	6	0,185	0,707	0,574	0,760	0,187	6,721	6,721	6	0,077	
135,51	136,12	135,500	136,124	3	0,707	1,229	0,760	0,890	0,130	4,687	8,632	8	0,046	
136,13	136,74	136,124	136,748	3	1,229	1,750	0,890	0,960	0,070	2,505				
136,75	137,37	136,748	137,371	2	1,750	2,272	0,960	0,988	0,028	1,026				
137,38	...	137,371	...	0	2,272	...	0,988	1	0,012	0,416				
				36									0,963	

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{136,84 - 133,01}{6,14} \\
 &= 0,62
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,20
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 0,963
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi^2_{\alpha} = 5,991$$

$\chi^2 < \chi^2_{\alpha}$ (0,963 < 5,991) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.18

Uji Keseragaman Data Stasiun 6

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	136,08	134,62	134,45	133,92	133,65	135,32	134,67
2	133,46	134,09	133,01	136,84	133,13	135,19	134,29
3	135,22	133,08	133,63	134,23	133,12	136,54	134,30
4	133,57	133,19	135,61	133,24	134,45	135,19	134,21
5	134,86	136,81	136,49	133,03	134,82	134,45	135,08
6	135,96	134,42	135,43	134,60	136,72	135,15	135,38
						Total	807,93
						Rata-Rata	134,65

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{807,93}{6} = 134,65$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

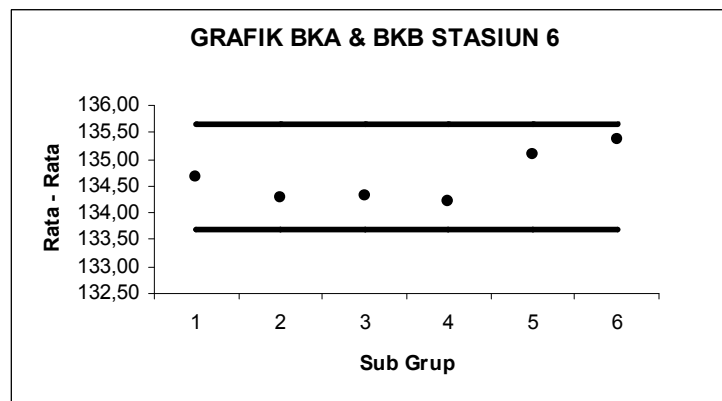
$$= 1,20$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,20}{\sqrt{6}} = 0,49$$

$$BKA = \bar{X} + c * \sigma_x = 135,63$$

$$BKB = \bar{X} - c * \sigma_x = 133,67$$



Gambar L.1.6

Grafik BKA dan BKB Stasiun 6

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 652798,24 - 23498934,90}}{4847,57} \right]^2 \\ &= 0,03 \end{aligned}$$

$N' < N (0,03 < 36)$ maka datanya cukup.

❖ Stasiun 7 : Jahit pasang *merk* dan *size*

Tabel L.1.19

Data Mentah Stasiun 7

data ke-	pasang <i>merk</i> dan <i>size</i> bagian kanan(detik)	bagian kiri (detik)	Total (detik)
1	44,31	20,59	64,90
2	45,79	18,92	64,71
3	43,34	20,22	63,56
4	43,20	20,43	63,63
5	46,53	19,45	65,98
6	46,12	18,97	65,09
7	46,13	20,72	66,85
8	46,25	17,66	63,91
9	45,50	19,54	65,04
10	43,45	20,16	63,61
11	46,76	18,51	65,27
12	43,59	19,69	63,28
13	45,22	19,73	64,95
14	46,78	20,05	66,83
15	44,45	20,56	65,01
16	43,72	19,10	62,82
17	45,22	20,51	65,73
18	44,68	21,08	65,76
19	45,60	19,52	65,12
20	46,63	20,32	66,95
21	44,72	18,35	63,07
22	45,84	18,68	64,52
23	44,96	20,02	64,98
24	44,92	19,32	64,24
25	44,75	19,64	64,39
26	46,94	19,56	66,50
27	45,20	18,39	63,59
28	43,81	20,25	64,06
29	43,45	20,43	63,88
30	45,87	19,85	65,72
31	46,95	19,26	66,21
32	46,44	19,52	65,96
33	44,89	18,21	63,10
34	44,93	19,24	64,17
35	43,76	19,62	63,38
36	44,59	19,16	63,75
		TOTAL	2330,52
		RATA-RATA	64,74

➤ Uji Kenormalan Data

Tabel L.1.20

Uji Kenormalan Data Stasiun 7

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig		
...	62,81	...	62,815	0	...	-1,644	0	0,050	0,050	1,801	5,133	5	0,003		
62,82	63,48	62,815	63,488	5	-1,644	-1,069	0,050	0,143	0,093	3,331					
63,49	64,16	63,488	64,160	8	-1,069	-0,493	0,143	0,311	0,168	6,061	6,061	8	0,621		
64,17	64,83	64,160	64,833	5	-0,493	0,082	0,311	0,533	0,222	7,988	7,988	5	1,118		
64,84	65,50	64,833	65,506	8	0,082	0,658	0,533	0,745	0,212	7,628	7,628	8	0,018		
65,51	66,17	65,506	66,178	5	0,658	1,234	0,745	0,891	0,147	5,278	9,190	10	0,071		
66,18	66,85	66,178	66,851	4	1,234	1,809	0,891	0,965	0,073	2,645					
66,86	67,52	66,851	67,523	1	1,809	2,385	0,965	0,991	0,027	0,960					
67,53	...	67,523	...	0	2,385	...	0,991	1	0,009	0,308					
				36											1,831

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{66,95 - 62,82}{6,14} \\
 &= 0,67
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,17
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 1,831
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi_a^2 = 5,991$$

$\chi^2 < \chi_a^2$ ($1,831 < 5,991$) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.21

Uji Keseragaman Data Stasiun 7

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	64,90	64,71	63,56	63,63	65,98	65,09	64,65
2	66,85	63,91	65,04	63,61	65,27	63,28	64,66
3	64,95	66,83	65,01	62,82	65,73	65,76	65,18
4	65,12	66,95	63,07	64,52	64,98	64,24	64,81
5	64,39	66,50	63,59	64,06	63,88	65,72	64,69
6	66,21	65,96	63,10	64,17	63,38	63,75	64,43
Total							388,42
Rata-Rata							64,74

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{388,42}{6} = 64,74$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

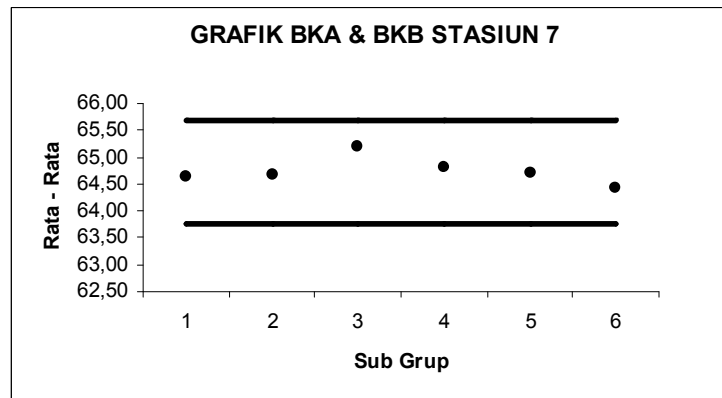
$$= 1,17$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,17}{\sqrt{6}} = 0,48$$

$$BKA = \bar{X} + c * \sigma_x = 65,70$$

$$BKB = \bar{X} - c * \sigma_x = 63,78$$



Gambar L.1.7

Grafik BKA dan BKB Stasiun 7

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 150917,89 - 5431323,47}}{2330,52} \right]^2 \\ &= 0,13 \end{aligned}$$

$N' < N$ ($0,13 < 36$) maka datanya cukup.

❖ Stasiun 8 : *Steam*

Tabel L.1.22

Data Mentah Stasiun 8

data ke-	steam (detik)	lipat baju (detik)	total (detik)
1	32,07	16,94	49,01
2	33,22	18,63	51,85
3	29,24	17,45	46,69
4	29,53	17,10	46,63
5	31,89	17,68	49,57
6	32,41	19,09	51,50
7	31,68	18,75	50,43
8	32,67	16,25	48,92
9	29,92	16,82	46,74
10	29,36	17,12	46,48
11	29,43	19,53	48,96
12	31,49	18,95	50,44
13	30,85	16,19	47,04
14	31,37	17,13	48,50
15	30,04	17,64	47,68
16	33,15	18,61	51,76
17	33,81	16,29	50,10
18	32,94	17,01	49,95
19	30,36	19,27	49,63
20	29,45	18,88	48,33
21	29,24	16,54	45,78
22	32,76	19,09	51,85
23	30,58	19,76	50,34
24	33,49	16,42	49,91
25	32,57	18,35	50,92
26	30,20	17,31	47,51
27	29,73	19,03	48,76
28	29,28	18,39	47,67
29	32,19	16,42	48,61
30	31,40	17,36	48,76
31	29,08	19,84	48,92
32	33,95	16,43	50,38
33	33,74	16,75	50,49
34	30,18	18,18	48,36
35	29,52	19,62	49,14
36	32,16	16,11	48,27
		TOTAL	1765,88
		RATA-RATA	49,05

➤ Uji Kenormalan Data

Tabel L.1.23

Uji Kenormalan Data Stasiun 8

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig		
...	45,77	...	45,775	0	...	-2,025	0	0,021	0,021	0,772	7,594	9	0,260		
45,78	46,76	45,775	46,764	5	-2,025	-1,414	0,021	0,079	0,057	2,061					
46,77	47,75	46,764	47,752	4	-1,414	-0,803	0,079	0,211	0,132	4,761					
47,76	48,74	47,752	48,741	5	-0,803	-0,192	0,211	0,424	0,213	7,660	7,660	5	0,924		
48,75	49,72	48,741	49,729	9	-0,192	0,418	0,424	0,662	0,238	8,584	8,584	9	0,020		
49,73	50,71	49,729	50,718	8	0,418	1,029	0,662	0,848	0,186	6,701	6,701	8	0,252		
50,72	51,70	50,718	51,707	2	1,029	1,640	0,848	0,949	0,101	3,643	5,461	5	0,039		
51,71	52,69	51,707	52,695	3	1,640	2,251	0,949	0,988	0,038	1,379					
52,70	...	52,695	...	0	2,251	...	0,988	1	0,012	0,439					
				36											1,495

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{51,85 - 45,78}{6,14} \\
 &= 0,99
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 1,62
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 1,495
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi_a^2 = 5,991$$

$\chi^2 < \chi_a^2$ (1,495 < 5,991) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.24

Uji Keseragaman Data Stasiun 8

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	49,01	51,85	46,69	46,63	49,57	51,5	49,21
2	50,43	48,92	46,74	46,48	48,96	50,44	48,66
3	47,04	48,5	47,68	51,76	50,1	49,95	49,17
4	49,63	48,33	45,78	51,85	50,34	49,91	49,31
5	50,92	47,51	48,76	47,67	48,61	48,76	48,71
6	48,92	50,38	50,49	48,36	49,14	48,27	49,26
						Total	294,31
						Rata-Rata	49,05

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{294,31}{6} = 49,05$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$$

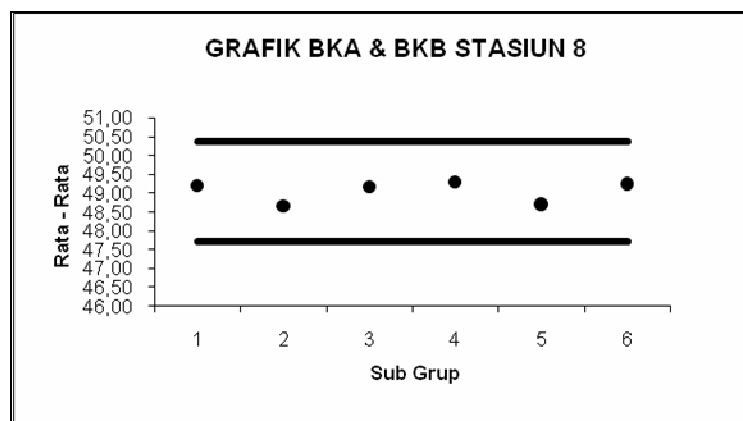
$$= 1,62$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{1,62}{\sqrt{6}} = 0,66$$

$$BKA = \bar{X} + c * \sigma_x = 50,37$$

$$BKB = \bar{X} - c * \sigma_x = 47,73$$



Gambar L.1.8

Grafik BKA dan BKB Stasiun 8

➤ Uji Kecukupan Data

$$\begin{aligned} N' &= \left[\frac{c / \alpha * \sqrt{N * \sum x_i^2 - (\sum x_i)^2}}{\sum x_i} \right]^2 \\ &= \left[\frac{2 / 0,1 * \sqrt{36 * 86712,04 - 3118332,17}}{1765,88} \right]^2 \\ &= 0,42 \end{aligned}$$

$N' < N$ ($0,42 < 36$) maka datanya cukup.

❖ Stasiun 9 : *Packing*

Tabel L.1.25

Data Mentah Stasiun 9

data ke-	<i>packing</i> (detik)
1	13,80
2	13,13
3	12,59
4	12,89
5	13,06
6	14,75
7	12,95
8	14,23
9	13,91
10	12,34
11	12,15
12	13,42
13	14,60
14	13,29
15	12,48
16	12,25
17	12,27
18	14,55
19	13,19
20	13,53
21	12,86
22	13,04
23	14,23
24	12,42
25	13,43
26	12,61
27	13,98
28	14,01
29	14,32
30	12,80
31	13,36
32	14,28
33	12,44
34	12,06
35	13,84
36	13,04
TOTAL	478,10
RATA-RATA	13,28

➤ Uji Kenormalan Data

Tabel L.1.26

Uji Kenormalan Data Stasiun 9

Interval Kelas		Batas Kelas		oi	z1	z2	P(z1)	P(z2)	P(z2)-P(z1)	ei	eig	oig	(oig-eig)2/eig		
...	12,05	...	12,055	0	...	-1,578	0	0,057	0,057	2,063	5,593	8	1,036		
12,06	12,49	12,055	12,493	8	-1,578	-1,014	0,057	0,155	0,098	3,530					
12,50	12,93	12,493	12,931	5	-1,014	-0,450	0,155	0,326	0,171	6,160	6,160	5	0,218		
12,94	13,36	12,931	13,369	8	-0,450	0,114	0,326	0,545	0,219	7,885	7,885	8	0,002		
13,37	13,80	13,369	13,807	4	0,114	0,678	0,545	0,751	0,206	7,405	7,405	4	1,566		
13,81	14,24	13,807	14,246	6	0,678	1,242	0,751	0,893	0,142	5,102	8,957	11	0,466		
14,25	14,68	14,246	14,684	4	1,242	1,806	0,893	0,965	0,072	2,579					
14,69	15,12	14,684	15,122	1	1,806	2,370	0,965	0,991	0,027	0,956					
15,13	...	15,122	...	0	2,370	...	0,991	1	0,009	0,320					
				36									3,288		

$$\begin{aligned}
 k &= 3,3 \log n + 1 \\
 &= 3,3 \log 36 + 1 \\
 &= 6,14 \approx 7
 \end{aligned}$$

$$\begin{aligned}
 c &= \frac{\text{data max} - \text{data min}}{k} \\
 &= \frac{14,75 - 12,06}{6,14} \\
 &= 0,44
 \end{aligned}$$

$$\begin{aligned}
 S &= \sqrt{\frac{\sum (X_i - \bar{X})^2}{N - 1}} \\
 &= 0,78
 \end{aligned}$$

$$\begin{aligned}
 \chi^2 &= \sum \frac{(oi - ei)^2}{ei} \\
 &= 3,288
 \end{aligned}$$

$$V = k - r - 1$$

$$V = 5 - 2 - 1 = 2$$

$$\alpha = 0,05$$

$$\chi_a^2 = 5,991$$

$\chi^2 < \chi_a^2$ (3,288 < 5,991) maka data mengikuti distribusi normal.

➤ Uji Keseragaman Data

Tabel L.1.27

Uji Keseragaman Data Stasiun 9

Sub Group	Waktu Penyelesaian ke-						Rata-Rata (detik)
	1	2	3	4	5	6	
1	13,80	13,13	12,59	12,89	13,06	14,75	13,37
2	12,95	14,23	13,91	12,34	12,15	13,42	13,17
3	14,60	13,29	12,48	12,25	12,27	14,55	13,24
4	13,19	13,53	12,86	13,04	14,23	12,42	13,21
5	13,43	12,61	13,98	14,01	14,32	12,80	13,53
6	13,36	14,28	12,44	12,06	13,84	13,04	13,17
						Total	79,68
						Rata-Rata	13,28

$$\bar{x} = \frac{\sum x}{k}$$

$$= \frac{79,68}{6} = 13,28$$

$$\sigma = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N - 1}}$$

$$= 0,78$$

$$\sigma_x = \frac{\sigma}{\sqrt{n}}$$

$$= \frac{0,78}{\sqrt{6}} = 0,32$$

$$BKA = \bar{X} + c * \sigma_x = 13,92$$

$$BKB = \bar{X} - c * \sigma_x = 12,64$$

DATA PENULIS

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