

## Lampiran 5

## Prates Kelas Eksperimen

No	Interval	Titik Tengah (xi)	Batas Nyata	Frekuensi Absolut	Frekuensi Komulatif	Frekuensi Relatif (%)
1	48 - 52	50	47.5	2	2	6.67
2	53 - 57	55	52.5	5	7	16.67
3	58 - 62	60	57.5	13	20	43.33
4	63 - 67	65	62.5	6	26	20.00
5	68 - 72	70	67.5	2	28	6.67
6	73 - 77	75	72.5	2	30	6.67
Jumlah			30			100

Deskripsi Data:

64	50	64	54	58
74	62	55	58	52
71	58	73	61	69
58	55	62	63	56
63	59	62	61	65
61	62	64	58	62

Rentang nilai = nilai tertinggi - nilai terendah

$$= 74 - 50 = 24$$

Banyak kelas interval =  $1 + 3.3 (\log n)$ 

$$= 1 + 3.3 (\log 30)$$

$$= 1 + 3.3 (1.48)$$

$$= 1 + 4.88$$

$$= 5.88$$

$$= 6$$

$$\text{Panjang kelas} = \frac{24}{6} = 4 = 5$$

No	Interval	Tabulasi	Frekuensi (f <sub>i</sub> )	Titik Tengah (x <sub>i</sub> )	f <sub>i</sub> .x <sub>i</sub>	(x <sub>i</sub> - $\bar{x}$ )	(x <sub>i</sub> - $\bar{x}$ ) <sup>2</sup>	f <sub>i</sub> (x <sub>i</sub> - $\bar{x}$ ) <sup>2</sup>
1	48 - 52	II	2	50	100	-12.5	156.25	312.5
2	53 - 57	III	5	55	275	-7.5	56.25	281.25
3	58 - 62	III	13	60	780	-2.5	6.25	81.25
4	63 - 67	III	6	65	390	2.5	6.25	37.5
5	68 - 72	II	2	70	140	7.5	56.25	112.5
6	73 - 77	II	2	75	150	12.5	156.25	312.5
jumlah			30	375	1835		437.5	1137.5

$$\bar{x} = \frac{\sum xi}{n} = \frac{375}{6} = 62.5$$

diketahui:

kelas modus = kelas ketiga

$$b = 58 - 0.5 = 57.5$$

$$F = 7$$

$$P = 5$$

$$n = 30$$

$$b_1 = 13 - 5 = 8$$

$$f = 13$$

$$b_2 = 13 - 6 = 7$$

keterangan:

b = batas kelas modus yaitu kelas interval dengan frekuensi terbanyak

P = panjang kelas modus

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval terdekat sebelumnya

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval berikutnya

$$\begin{aligned}1. \text{ Mean} &= \frac{\sum f_i x_i}{n} \\&= \frac{1835}{30} \\&= 61.17\end{aligned}$$

$$2. \text{ Median} = b + p \left( \frac{\frac{1}{2}n - F}{f} \right) = 65.5 + 5 \left( \frac{\frac{1}{2} \cdot 30 - 12}{13} \right)$$

$$= 57.5 + 5 \left( \frac{15 - 7}{13} \right) = 57.5 + 5 \left( \frac{8}{13} \right)$$

$$= 57.5 + 3.7 = 61.2$$

$$3. \text{ Modus} = b + p \left( \frac{b_1}{b_1 + b_2} \right) = 57.5 + 5 \left( \frac{7}{7+8} \right)$$

$$= 57.5 + 5 \left( \frac{7}{15} \right)$$

$$= 57.5 + 2.8$$

$$= 60.3$$

$$4. \text{ Varians} = \frac{\sum f_i (x_i - x)^2}{n-1}$$

$$= \frac{1137.5}{29} = 39.22$$

$$\begin{aligned}5. \text{ Standar Deviasi (Sd)} &= \sqrt{\text{varians}} \\&= \sqrt{39.22} \\&= 6.26\end{aligned}$$

## Lampiran 6

## Postes Kelas Eksperimen

No	Interval	Titik Tengah (xi)	Batas Nyata	Frekuensi Absolut	Frekuensi Komulatif	Frekuensi Relatif (%)
1	55 - 60	57.5	54.5	1	1	3.33
2	61 - 66	63.5	60.5	2	3	6.67
3	67 - 72	69.5	66.5	11	14	36.67
4	73 - 78	75.5	72.5	12	26	40.00
5	79 - 84	81.5	78.5	1	27	3.33
6	85 - 90	87.5	84.5	3	30	10.00
Jumlah			30			100

## Deskripsi Data

86	65	78	70	75
82	87	71	71	58
77	68	89	72	78
70	68	76	75	68
77	71	75	73	75
70	73	63	70	73

$$\text{Rentang nilai} = \text{nilai tertinggi} - \text{nilai terendah}$$

$$= 89 - 58 = 31$$

$$\text{Banyak kelas interval} = 1 + 3.3 (\log n)$$

$$= 1 + 3.3 (\log 30)$$

$$= 1 + 3.3 (1.48)$$

$$= 1 + 4.88$$

$$= 5.88$$

$$= 6$$

$$\text{Panjang kelas} = \frac{31}{6} = 5.17 = 6$$

No	Interval	Tabulasi	Frekuensi (f <sub>i</sub> )	Titik Tengah (x <sub>i</sub> )	f <sub>i</sub> .x <sub>i</sub>	(x <sub>i</sub> - X̄)	(x <sub>i</sub> - X̄) <sup>2</sup>	f <sub>i</sub> (x <sub>i</sub> - X̄) <sup>2</sup>
1	55 - 60	I	1	57.5	57.5	-15	225	225
2	61 - 66	II	2	63.5	127	-9	81	162
3	67 - 72	III I	11	69.5	764.5	-3	9	99
4	73 - 78	IV II	12	75.5	906	3	9	108
5	79 - 84	I	1	81.5	81.5	9	81	81
6	85 - 90	III	3	87.5	262.5	15	225	675
Jumlah			30	435	2199		630	1350

$$\bar{x} = \frac{\sum xi}{n} = \frac{435}{6} = 72.5$$

diketahui:

kelas modus = kelas keempat

$$b = 73 - 0.5 = 72.5$$

$$F = 14$$

$$P = 6$$

$$n = 30$$

$$b_1 = 12 - 11 = 1$$

$$f = 12$$

$$b_2 = 12 - 1 = 3$$

keterangan:

b = batas kelas modus yaitu kelas interval dengan frekuensi terbanyak

P = panjang kelas modus

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval terdekat sebelumnya

b<sub>2</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval berikutnya

$$1. \text{ Mean} = \frac{\sum f_i x_i}{n} = \frac{2199}{30}$$

$$= 73.3$$

$$\begin{aligned} 2. \text{ Median} &= b + p \left( \frac{\frac{1}{2} n - F}{f} \right) = 72.5 + 6 \left( \frac{\frac{1}{2} \cdot 30 - 14}{12} \right) \\ &= 72.5 + 6 \left( \frac{15 - 14}{12} \right) = 72.5 + 6 \left( \frac{1}{12} \right) \\ &= 72.5 + 0.5 \\ &= 73 \end{aligned}$$

$$\begin{aligned} 3. \text{ Modus} &= b + p \left( \frac{b_1}{b_1 + b_2} \right) \\ &= 72.5 + 6 \left( \frac{1}{1+3} \right) \\ &= 72.5 + 1.5 = 74 \end{aligned}$$

$$4. \text{ Varians} = \frac{\sum f_i (x_i - x)^2}{n-1} = \frac{1350}{29}$$

$$= 46.55$$

$$5. \text{ Standar Deviasi (Sd)} = \sqrt{\text{varians}}$$

$$= \sqrt{46.55}$$

$$= 6.82$$

## Lampiran 7

## Prates Kelas Kontrol

No	Interval	Titik Tengah (xi)	Batas Nyata	Frekuensi Absolut	Frekuensi Komulatif	Frekuensi Relatif (%)
1	50 - 53	51.5	49.5	1	1	3.33
2	54 - 57	55.5	53.5	4	5	13.33
3	58 - 61	59.5	57.5	17	22	56.67
4	62 - 65	63.5	61.5	5	27	16.67
5	66 - 69	67.5	65.5	2	29	6.67
6	70 - 73	71.5	69.5	1	30	3.33
Jumlah			30		100	

Deskripsi Data :

60	66	60	61	59
59	60	65	71	57
58	52	61	65	61
56	59	60	55	64
60	61	66	60	56
64	61	59	58	65

Rentang nilai = nilai tertinggi – nilai terendah

$$= 71 - 52 = 19$$

Banyak kelas interval =  $1 + 3.3 (\log n)$ 

$$= 1 + 3.3 (\log 30)$$

$$= 1 + 3.3 (1.48)$$

$$= 1 + 4.88$$

$$= 5.88$$

$$= 6$$

$$\text{Panjang kelas} = \frac{19}{6} = 3.2 = 4$$

No	Interval	Tabulasi	Frekuensi (f <sub>i</sub> )	Titik Tengah (x <sub>i</sub> )	f <sub>i</sub> .x <sub>i</sub>	(x <sub>i</sub> - $\bar{x}$ )	(x <sub>i</sub> - $\bar{x}$ ) <sup>2</sup>	f <sub>i</sub> (x <sub>i</sub> - $\bar{x}$ ) <sup>2</sup>
1	50 - 53	I	1	51.5	51.5	-10	100	100
2	54 - 57	III	4	55.5	222	-6	36	144
3	58 - 61	IIII IIIII II	17	59.5	1011.5	-2	4	68
4	62 - 65	IIII	5	63.5	317.5	2	4	20
5	66 - 69	II	2	67.5	135	6	36	72
6	70 - 73	I	1	71.5	71.5	10	100	100
jumlah			30	369	1809		280	504

$$\bar{x} = \frac{\sum xi}{n} = \frac{369}{6} = 61.5$$

diketahui:

kelas modus = kelas kelima

$$b = 58 - 0.5 = 57.5$$

$$F = 5$$

$$P = 4$$

$$n = 30$$

$$b_1 = 17 - 4 = 13$$

$$f = 17$$

$$b_2 = 17 - 5 = 12$$

keterangan:

b = batas kelas modus yaitu kelas interval dengan frekuensi terbanyak

P = panjang kelas modus

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval terdekat sebelumnya

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval berikutnya

$$1. \text{ Mean} = \frac{\sum f_i \cdot x_i}{n} = \frac{1809}{30} = 60.3$$

$$\begin{aligned} 2. \text{ Median} &= b + p \left( \frac{\frac{1}{2}n - F}{f} \right) = 57.5 + 4 \left( \frac{\frac{1}{2} \cdot 30 - 15}{17} \right) \\ &= 57.5 + 4 \left( \frac{15 - 10}{10} \right) = 65.5 + 4 \left( \frac{1}{2} \right) \\ &= 57.5 + 2 = 59.5 \end{aligned}$$

$$\begin{aligned} 3. \text{ Modus} &= b + p \left( \frac{b_1}{b_1 + b_2} \right) = 57.5 + 4 \left( \frac{3}{7} \right) \\ &= 57.5 + 1.7 = 59.2 \end{aligned}$$

$$4. \text{ Varians} = \frac{\sum f_i (x_i - x)^2}{n-1} = \frac{504}{29} = 17.38$$

$$5. \text{ Standar Deviasi (Sd)} = \sqrt{\text{varians}} = \sqrt{17.38} = 4.17$$

## Lampiran 8

## Postes Kelas Kontrol

No	Interval	Titik Tengah ( $x_i$ )	Batas Nyata	Frekuensi Absolut	Frekuensi Komulatif	Frekuensi Relatif (%)
1	57 - 60	58.5	56.5	3	3	10.00
2	61 - 64	62.5	60.5	8	11	26.67
3	65 - 68	66.5	64.5	10	21	33.33
4	69 - 72	70.5	68.5	7	28	23.33
5	73 - 76	74.5	72.5	1	29	3.33
6	77 - 80	78.5	76.5	1	30	3.33
Jumlah				30		100

Deskripsi Data :

62	68	64	73	59
66	68	70	78	68
65	60	63	67	63
67	62	69	66	65
63	70	72	72	63
69	69	60	64	68

Rentang nilai = nilai tertinggi – nilai terendah

$$= 78 - 59 = 19$$

Banyak kelas interval =  $1 + 3.3 (\log n)$ 

$$= 1 + 3.3 (\log 30)$$

$$= 1 + 3.3 (1.48)$$

$$= 1 + 4.88$$

$$= 5.88$$

$$= 6$$

$$\text{Panjang kelas} = \frac{19}{6} = 3.17 = 4$$

No	Interval	Tabulasi	Frekuensi (f <sub>i</sub> )	Titik Tengah (x <sub>i</sub> )	f <sub>i</sub> .x <sub>i</sub>	(x <sub>i</sub> - X̄)	(x <sub>i</sub> - X̄) <sup>2</sup>	f <sub>i</sub> (x <sub>i</sub> - X̄) <sup>2</sup>
1	57 - 60	I	3	58.5	175.5	-10	100	300
2	61 - 64	II	8	62.5	500	-6	36	288
3	65 - 68	III III I	10	66.5	665	-2	4	40
4	69 - 72	III III II	7	70.5	493.5	2	4	28
5	73 - 76	I	1	74.5	74.5	6	36	36
6	77 - 80	III	1	78.5	78.5	10	100	100
jumlah			30	411	1987		280	792

$$\bar{X} = \frac{\sum xi}{n} = \frac{411}{6} = 68.5$$

diketahui:

kelas modus = kelas ketiga

$$b = 65 - 0.5 = 64.5$$

$$F = 11$$

$$P = 4$$

$$n = 30$$

$$b_1 = 10 - 8 = 2$$

$$f = 10$$

$$b_2 = 10 - 7 = 3$$

keterangan:

b = batas kelas modus yaitu kelas interval dengan frekuensi terbanyak

P = panjang kelas modus

b<sub>1</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval terdekat sebelumnya

b<sub>2</sub> = frekuensi kelas modus dikurangi frekuensi kelas interval berikutnya

$$1. \text{ Mean} = \frac{\sum f_i \cdot x_i}{n} = \frac{1987}{30} = 66.23$$

$$\begin{aligned} 2. \text{ Median} &= b + p \left( \frac{\frac{1}{2}n - F}{f} \right) = 64.5 + 4 \left( \frac{\frac{1}{2} \cdot 30 - 11}{10} \right) \\ &= 64.5 + 4 \left( \frac{15 - 11}{10} \right) = 64.5 + 4 \left( \frac{4}{10} \right) \\ &= 64.5 + 1.6 = 66.1 \end{aligned}$$

$$\begin{aligned} 3. \text{ Modus} &= b + p \left( \frac{b_1}{b_1 + b_2} \right) = 64.5 + 4 \left( \frac{2}{2+3} \right) \\ &= 64.5 + 4 \left( \frac{2}{5} \right) \\ &= 64.5 + 1.6 = 66.1 \end{aligned}$$

$$4. \text{ Varians} = \frac{\sum f_i (x_i - x)^2}{n-1} = \frac{792}{29} = 25.14$$

$$5. \text{ Standar Deviasi (Sd)} = \sqrt{\text{varians}} = \sqrt{25.14} = 5.01$$

## Lampiran 9

Perhitungan Persyaratan Analisis Uji Liliefors  
Data Hasil Postes Kelas Kontrol

No	No Sampel	Nilai Sampel (xi)	(Zi)	(Fzi)	(Szi)	(Fzi-Szi)
1	5	59	-1.48	0.0694	0.0333	0.0361
2	12	60	-1.28	0.1003	0.0667	0.0336
3	28	60	-1.28	0.1003	0.1000	0.0003
4	1	62	-0.88	0.1894	0.1333	0.0561
5	17	62	-0.88	0.1894	0.1667	0.0227
6	13	63	-0.68	0.2483	0.2000	0.0483
7	15	63	-0.68	0.2483	0.2333	0.0150
8	21	63	-0.68	0.2483	0.2667	0.0184
9	25	63	-0.68	0.2483	0.3000	0.0517
10	3	64	-0.49	0.3121	0.3333	0.0212
11	29	64	-0.49	0.3121	0.3667	0.0546
12	11	65	-0.29	0.3859	0.4000	0.0141
13	20	65	-0.29	0.3859	0.4333	0.0474
14	19	66	-0.29	0.3859	0.4667	0.0808
15	6	66	-0.29	0.3859	0.5000	<b>0.1141</b>
16	14	67	0.11	0.5438	0.5333	0.0105
17	16	67	0.11	0.5438	0.5667	0.0229
18	2	68	0.31	0.6217	0.6000	0.0217
19	7	68	0.31	0.6217	0.6333	0.0116
20	10	68	0.31	0.6217	0.6667	0.0450
21	30	68	0.31	0.6217	0.7000	0.0783
22	18	69	0.51	0.6950	0.7333	0.0383
23	27	69	0.51	0.6950	0.7667	0.0717
24	26	69	0.51	0.6950	0.8000	0.1050
25	8	70	0.71	0.7611	0.8333	0.0722
26	22	70	0.71	0.7611	0.8667	0.1056
27	24	72	1.11	0.8665	0.9000	0.0335
28	23	72	1.11	0.8665	0.9333	0.0668
29	4	73	1.31	0.9049	0.9667	0.0618
30	9	78	2.31	0.9896	1.0000	0.0104

$$\begin{array}{ll} S_d = 5.01 & n = 30 \\ \bar{x} = 66.43 & L_t = 0.161 \\ \alpha = 0.05 & L_0 = 0.1141 \end{array}$$

Kesimpulan: Data berdistribusi normal, karena  $L_0 < L_t$ , yaitu  $0.1141 < 0.161$

## Lampiran 10

### Perhitungan Persyaratan Analisis Uji Liliefors Data Hasil Postes Kelas Eksperimen

No	No Sampel	Nilai Sampel (xi)	(Zi)	(Fzi)	(Szi)	(Fzi-Szi)
1	10	58	-2.27	0.0116	0.0333	0.0217
2	28	63	-1.54	0.0618	0.0667	0.0049
3	2	65	-1.24	0.1075	0.1000	0.0075
4	17	68	-0.80	0.2119	0.1333	0.0786
5	12	68	-0.80	0.2119	0.1667	0.0452
6	20	68	-0.80	0.2119	0.2000	0.0119
7	4	70	-0.51	0.3050	0.2333	0.0717
8	16	70	-0.51	0.3050	0.2667	0.0383
9	26	70	-0.51	0.3050	0.3000	0.0050
10	29	70	-0.51	0.3050	0.3333	0.0283
11	8	71	-0.36	0.3594	0.3667	0.0073
12	9	71	-0.36	0.3594	0.4000	0.0406
13	22	71	-0.36	0.3594	0.4333	0.0739
14	14	72	-0.22	0.4129	0.4667	0.0538
15	24	73	-0.07	0.4721	0.5000	0.0279
16	27	73	-0.07	0.4721	0.5333	0.0612
17	30	73	-0.07	0.4721	0.5667	0.0946
18	23	75	0.22	0.5871	0.6000	0.0129
19	19	75	0.22	0.5871	0.6333	0.0462
20	25	75	0.22	0.5871	0.6667	0.0796
21	5	75	0.22	0.5871	0.7000	0.1129
22	18	76	0.37	0.6443	0.7333	0.0890
23	11	77	0.52	0.6985	0.7667	0.0682
24	21	77	0.52	0.6985	0.8000	0.1015
25	3	78	0.66	0.7454	0.8333	0.0879
26	15	78	0.66	0.7454	0.8667	<b>0.1213</b>
27	6	82	1.25	0.8944	0.9000	0.0056
28	1	86	1.84	0.9671	0.9333	0.0338
29	7	87	1.98	0.9761	0.9667	0.0094
30	13	89	2.28	0.9887	1.0000	0.0113

$$\begin{array}{ll} S_d = 6.82 & n = 30 \\ \bar{x} = 73,47 & Lt = 0.161 \\ \alpha = 0.05 & L_0 = 0.1213 \end{array}$$

Kesimpulan: Data berdistribusi normal, karena  $L_0 < Lt$ , yaitu  $0.1213 < 0.161$

**Lampiran 11:****Uji Homogenitas (Uji Bartlett)****Tabel Uji**

Sampel ke-	dk	1/dk	Si <sup>2</sup>	Log Si <sup>2</sup>	(dk) (Log Si <sup>2</sup> )
1 (eksperimen)	29	0,034	45.55	1.658	48.082
2 (kontrol)	29	0,034	25.14	1,400	40.600
$\Sigma$	58	0,068	70.69	3.058	88.682

**Varians Gabungan**

$$\begin{aligned}
 S^2 &= \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 - 1) + (n_2 - 1)} \\
 &= \frac{(30 - 1)45.55 + (30 - 1)25.14}{29 + 29} \\
 &= \frac{1320.95 + 729.06}{58} \\
 &= \frac{2050.01}{34}
 \end{aligned}$$

$$S^2 = 35.345$$

$$\text{Log } S^2 = \text{Log } 35.345$$

$$= 1.548$$

$$\beta = (\text{Log } Si^2) (\sum n-1)$$

$$= (1.548) (58)$$

$$= 89.784$$

$$\chi^2 = (\ln 10) \left[ \beta - \sum (dk) (\log S_i^2) \right]$$

$$= (2,3026) [89.784 - 88.682]$$

$$= (2,3026) (1.102)$$

$$= 2.527$$

$\chi^2$  hitung = 2.527 <  $\chi^2$  tabel = 43.773, jadi datanya homogen

**Lampiran 12:**

**PENGUJIAN HIPOTESIS**  
**Uji-t**

Kelas Eksperimen

No. Sampel	Prates	Postes	x	$x^2$
1	64	86	22	484
2	50	65	15	225
3	64	78	14	196
4	54	70	16	256
5	58	75	17	289
6	74	82	8	64
7	62	87	25	625
8	55	71	16	256
9	58	71	13	169
10	52	58	6	36
11	71	77	6	36
12	58	68	10	100
13	73	89	16	256
14	61	72	11	121
15	69	78	9	81
16	58	70	12	144
17	55	68	13	169
18	62	76	14	196
19	63	75	12	144
20	56	68	12	144
21	63	77	14	196
22	59	71	12	144
23	62	75	13	169
24	61	73	12	144
25	65	75	10	100
26	61	70	9	81
27	62	73	11	121
28	64	63	-1	1
29	58	70	12	144
30	62	73	11	121
$\Sigma$	1834	2204	370	5212
Mean	61.13	73.47	12.33	173.73

## Kelas Kontrol

No. Sampel	Prates	Postes	y	$y^2$
1	60	62	2	4
2	66	68	2	4
3	60	64	4	16
4	61	73	12	144
5	59	59	0	0
6	59	66	7	49
7	60	68	8	64
8	65	70	5	25
9	71	78	7	49
10	57	68	11	121
11	58	65	7	49
12	52	60	8	64
13	61	63	2	4
14	65	67	2	4
15	61	63	2	4
16	56	67	11	121
17	59	62	3	9
18	60	69	9	81
19	55	66	11	121
20	64	65	1	1
21	60	63	3	9
22	61	70	9	81
23	66	72	6	36
24	60	72	12	144
25	56	63	7	49
26	64	69	5	25
27	61	69	8	64
28	59	60	1	1
29	58	64	6	36
30	65	68	3	9
$\Sigma$	1819	1993	174	1388
Mean	60.63	66.43	5.80	46.27

$$S_{\bar{x}-\bar{y}} = \sqrt{\frac{(\sum x^2 + \sum y^2)(\frac{1}{n_x} + \frac{1}{n_y})}{n_x + n_y - 2}}$$

$$= \sqrt{\frac{5212 + 1388(\frac{1}{30} + \frac{1}{30})}{30 + 30 - 2}}$$

$$= \sqrt{\frac{6600(0,0667)}{58}}$$

$$= \sqrt{7,59}$$

$$= 2.75$$

$$t = \frac{(\bar{x} - \bar{y})}{S_{\bar{x}-\bar{y}}}$$

$$= \frac{12.33 - 5.80}{2.75}$$

$$= \frac{6.53}{2.75}$$

$$= 2.375$$

Kesimpulan:

$t$  hitung = 2.375 >  $t$  tabel = 1.671, jadi, H1 diterima