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Group Assignment iv.pdf  
PDF

Great — I see the full **Assignment IV** clearly.

Let's solve **everything step-by-step** with full workings, exactly how your lecturer expects in Business Statistics.

## QUESTION ONE

We have **grouped data** for two companies:

Class intervals (life in thousand hours):

Class (L)	A	B
17–19	10	3
19–21	16	40
21–23	20	12
23–25	8	3
25–27	6	2

We compute **midpoints** first:

Class	Midpoint (x)
17–19	18
19–21	20

Class	Midpoint (x)
21–23	22
23–25	24
25–27	26

### (i) Mean Life for A and B

#### Company A

$$\bar{x} = \frac{\sum fx}{\sum f}$$

Compute  $fx$ :

x	f(A)	f·x
18	10	180
20	16	320
22	20	440
24	8	192
26	6	156
<b>Totals</b>	<b>60</b>	<b>1288</b>

$$\bar{x}_A = \frac{1288}{60} = 21.47$$

#### Company B

x	f(B)	f·x
18	3	54
20	40	800
22	12	264
24	3	72
26	2	52
<b>Totals</b>	<b>60</b>	<b>1242</b>

$$\bar{x}_B = \frac{1242}{60} = 20.70$$

## (ii) Standard Deviation (Grouped Data)

Formula:

$$\sigma = \sqrt{\frac{\sum fx^2}{N} - \bar{x}^2}$$

Compute  $\sum fx^2$ :

Company A

x	f	fx <sup>2</sup>
18	10	3240
20	16	6400
22	20	9680
24	8	4608
26	6	4056



x	f	$fx^2$
Total	60	27984

$$\sigma_A = \sqrt{\frac{27984}{60} - (21.47)^2}$$

$$= \sqrt{466.4 - 461.7} = \sqrt{4.7} = 2.17$$

**Company B**

x	f	$fx^2$
18	3	972
20	40	16000
22	12	5808
24	3	1728
26	2	1352
Total	60	25860

$$\sigma_B = \sqrt{\frac{25860}{60} - (20.70)^2}$$

$$= \sqrt{431.0 - 428.5} = \sqrt{2.5} = 1.58$$

**(iii) Interquartile Range (IQR)**

Grouped data quartile formula:

$$Q_k = L + \frac{(k \frac{N}{4} - cf)}{f} \times h$$

Where:

L = lower class boundary

cf = cumulative frequency before class

f = class frequency

h = class width (=2)

Total N = 60

So:

- $Q_1$  position = 15
- $Q_3$  position = 45

## Company A

Cumulative frequencies:

Class	f	CF	Open square icon
17–19	10	10	
19–21	16	26	
21–23	20	46	
23–25	8	54	
25–27	6	60	

### Find Q1 for A

15 falls in 19–21 class:

L = 19, cf = 10, f = 16

$$Q_1 = 19 + \frac{(15 - 10)}{16} \cdot 2 = 19 + 0.625 = 19.63$$

### Find Q3 for A



45 falls in 21–23 class:

L = 21, cf = 26, f = 20

$$Q_3 = 21 + \frac{(45 - 26)}{20} \cdot 2 = 21 + 1.9 = 22.90$$

$$IQR_A = 22.90 - 19.63 = 3.27$$

### Company B

Cumulative frequencies:

Class	f	CF
17–19	3	3
19–21	40	43
21–23	12	55
23–25	3	58
25–27	2	60

### Q1 for B

15 falls in 19–21

L = 19, cf = 3, f = 40

$$Q_1 = 19 + \frac{(15 - 3)}{40} \cdot 2 = 19 + 0.6 = 19.60$$

### Q3 for B

45 falls in 21–23

L = 21, cf = 43, f = 12

$$Q_3 = 21 + \frac{(45 - 43)}{12} \cdot 2 = 21 + 0.33 = 21.33$$



$$IQR_B = 21.33 - 19.60 = 1.73$$


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#### (iv) Coefficient of Variation

$$CV = \frac{\sigma}{\bar{x}} \times 100$$

**Company A**

$$CV_A = \frac{2.17}{21.47} \times 100 = 10.1\%$$

**Company B**

$$CV_B = \frac{1.58}{20.70} \times 100 = 7.6\%$$


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#### (v) Mode (Grouped Data)

Modal class = highest frequency

- Company A → 21–23 (f=20)
- Company B → 19–21 (f=40)

Formula:

$$\text{Mode} = L + \frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)} \cdot h$$

**Company A**

L = 21

f<sub>1</sub> = 20

f<sub>0</sub> = 16

f<sub>2</sub> = 8

h = 2

$$Mode_A = 21 + \frac{(20 - 16)}{(40 - 24)} \cdot 2$$



$$= 21 + \frac{4}{16} \cdot 2 = 21 + 0.5 = 21.50$$

### Company B

L = 19

f1 = 40

f0 = 3

f2 = 12

h = 2

$$\begin{aligned} Mode_B &= 19 + \frac{(40 - 3)}{(80 - 15)} \cdot 2 \\ &= 19 + \frac{37}{65} \cdot 2 = 19 + 1.14 = 20.14 \end{aligned}$$

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## QUESTION TWO

Raw data (n=18):

63, 229, 165, 77, 19, 71, 67, 59, 66, 102,  
81, 72, 50, 55, 74, 61, 82, 48, 70, 86

We sort it:

19, 48, 50, 55, 59, 61, 63, 66, 67, 70,  
71, 72, 74, 77, 81, 82, 86, 102, 165, 229

(N = 20)



### (i) Median

Even case:

$$Median = \frac{10th + 11th}{2}$$

10th = 70

11th = 71

$$\text{Median} = \frac{70 + 71}{2} = 70.5$$

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## (ii) Quartiles

$$Q_1 = \text{median of lower 10} = \frac{5\text{th} + 6\text{th}}{2} = \frac{59 + 61}{2} = 60$$

$$Q_3 = \text{median of upper 10} = \frac{15\text{th} + 16\text{th}}{2} = \frac{81 + 82}{2} = 81.5$$

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## (iii) Outliers

Use IQR rule:

$$IQR = Q_3 - Q_1 = 81.5 - 60 = 21.5$$

Lower fence:

$$LF = Q_1 - 1.5(IQR) = 60 - 32.25 = 27.75$$

Upper fence:

$$UF = Q_3 + 1.5(IQR) = 81.5 + 32.25 = 113.75$$

Any value <27.75 or >113.75 is an outlier.

Outliers = 165, 229

(also 19 < 27.75 → also an outlier)

So: 19, 165, 229

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## (iv) Box Plot

(I can generate a plotted image if you want — just say "plot it.")

Summary:

- Min: 19
  - Q1: 60
  - Median: 70.5
  - Q3: 81.5
  - Max (non-outlier): 102
  - Outliers: 19, 165, 229
- 

## (v) Mean

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

Sum the values:

$$\begin{aligned}\text{Total} &= 63+229+165+77+19+71+67+59+66+102+81+72+50+55+74+61+82+48+70+86 \\ &= 1667\end{aligned}$$

$$\bar{x} = \frac{1667}{20} = 83.35$$

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DONE!



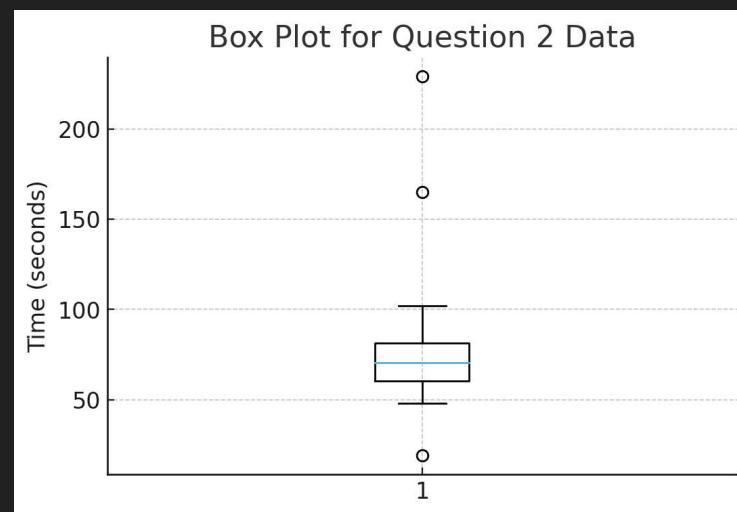
If you want, I can also prepare:

- ✓ A clean, exam-ready PDF
- ✓ A summarized page for quick revision
- ✓ Graphs/plots for Q2

Just tell me "format it nicely" or "create the PDF".



Graphs/plots for Q2



Your box plot for Question 2 is ready!

It clearly shows the median, quartiles, whiskers, and the outliers (19, 165, 229).

Here is the downloadable file:

👉 [Click to download Q2\\_boxplot.png](#)

If you want:

- A histogram
- A stem-and-leaf plot
- A frequency table

