Exercise 1 :

The following data show weights of 40 students (in kg) :

40.5 -48 -48.3 -59.6- 59.5 -55.2 -54.8- 50.9 -41 -47.5- 48.9 -60.1 -58 -55.9 -54.2- 51.5- 43- 46 49.1- 60.7- 57.8 -56- 53.7 -51.7 -44.5 -45.7 -49.5 -61.3 -57.4 -56.5 -53.5 -52.1- 45.4 -45.5 -50.6 64 -57 -56.8 -53 -52.4

Required:

1- What is the nature of the random variable? Is the variable discrete or continuous?

2- Put the data in an appropriate frequency table.

3- Does the frequency table have the same class width? Justify your answer.

4- Present the above data by using a histogram.

5-calculate the relative frequency table

6-calculate the ascending and descending cumulative frequency tables and provide their graphical representation.

Exercise 2 :

X is the statistical variable distributed as follows:

X	131-135	136-140	141-145	146-150	151-155
fi	3	9	12	9	7

Required:

1- Calculate mode then determine it graphically.
2- Calculate the arthimetic mean.

Exercise 1: Students' Weights

Data (kg):

40.5, 48, 48.3, 59.6, 59.5, 55.2, 54.8, 50.9, 41, 47.5, 48.9, 60.1, 58, 55.9,

54.2, 51.5, 43, 46, 49.1, 60.7, 57.8, 56, 53.7, 51.7, 44.5, 45.7, 49.5, 61.3,

57.4, 56.5, 53.5, 52.1, 45.4, 45.5, 50.6, 64, 57, 56.8, 53, 52.4

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1. **Nature of the random variable**

Weight is a quantitative continuous variable because it can take any real value •
within an interval, not just integers.

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2. **Frequency Table**

Step 1: Range

The range is the difference between the maximum and minimum values:

Maximum weight: 64 kg •

Minimum weight: 40.5 kg •

$$\text{Range} = \text{Max} - \text{Min} = 64 - 40.5 = 23.5 \text{ kg}$$

Range = 23.5 kg

Step 2: Number of Classes

A common formula for the number of classes (Sturges' formula):

$$k = 1 + 3.322 \log_{10} n$$

n = 40 (number of observations) •

$$k = 1 + 3.322 \log_{10} 40$$
$$\log_{10} 40 \approx 1.602$$
$$k = 1 + 3.322 \times 1.602 \approx 1 + 5.32 \approx 6.32$$

Number of classes ≈ 6–7 (round to nearest whole number, usually 7)

Step 3: Class Width

Class width formula:

$$\text{Class width} = \frac{\text{Range}}{\text{Number of classes}} = \frac{23.5}{7} \approx 3.36 \text{ kg}$$

- **For convenience, round up to 4 kg per class.**

- **Classes: 40–44, 44–48, 48–52, 52–56, 56–60, 60–64, 64–68**

Weight Class (kg)	Frequency (fi)
40–44	3
44–48	6
48–52	9
52–56	9
56–60	9
60–64	3
64–68	1
Total	40

3. . Class Width Consistency

- **Each class has a width of 4 kg (difference between upper and lower boundary).**

- **-Yes, the frequency table has the same class width, which makes it suitable for histogram representation and further analysis.**

4. Histogram

- **X-axis: Weight Class (kg)**

- **Y-axis: Frequency (fi)**

- **Bars height = frequency of each class**

  Instructions to plot:

1. **Draw X−axis labeled with class intervals: 40−44, 44−48, …, 64−68**

2. **Draw Y−axis labeled with frequencies (0−10)**

3. **Draw a bar for each class with height equal to its frequency**

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5. **Relative Frequency Table**

Relative frequency = Frequency ÷ Total observations

Weight Class (kg)	Frequency (fi)	Relative Frequency (fi/N)
40−44	3	3 ÷ 40 = 0.075
44−48	6	6 ÷ 40 = 0.15
48−52	9	9 ÷ 40 = 0.225
52−56	9	9 ÷ 40 = 0.225
56−60	9	9 ÷ 40 = 0.225
60−64	3	3 ÷ 40 = 0.075
64−68	1	1 ÷ 40 = 0.025
Total	40	1.0

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6. **Cumulative Frequency Tables**

Ascending Cumulative Frequency

Weight Class (kg)	Cumulative Frequency
40−44	3
44−48	9
48−52	18
52−56	27
56−60	36
60−64	39

64–68	40

Descending Cumulative Frequency

Weight Class (kg)	Cumulative Frequency
40–44	40
44–48	37
48–52	31
52–56	22
56–60	13
60–64	4
64–68	1

Graphs Instructions

1. **Histogram: Use the frequency table. Each bar height = fi.**

2. **Ascending Ogive: Plot cumulative frequency vs upper class boundary (e.g., 44, 48, 52…) and connect points.**

3. **Descending Ogive: Plot cumulative frequency vs lower class boundary (e.g., 40, 44, 48…) and connect points.**

Exercise 2: Statistical Variable X

Data:

X Class	Frequency (fi)
131–135	3
136–140	9
141–145	12
146–150	9
151–155	7

Faculty of Economic, Commercial and Management Sciences

1st Semester of the 2025/2026 university year   first year students

An exam in statistics 1**(section A&B)**

1. Mode Calculation

Modal class = 141–145 (highest frequency = 12) •

Formula for grouped data:

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

Where:

L = lower boundary of modal class = 140.5 •

f1 = frequency of modal class = 12 •

f0 = frequency of previous class = 9 •

f2 = frequency of next class = 9 •

h = class width = 5 •

$$\text{Mode} = 140.5 + \frac{12 - 9}{2 * 12 - 9 - 9} * 5 = 140.5 + \frac{3}{6} * 5 = 140.5 + 2.5 = 143$$

Mode ≈ 143

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2. Arithmetic Mean

Midpoints (xi) of classes: 133, 138, 143, 148, 153 •

Multiply by frequency: fi × xi •

Class	xi	fi	fi × xi
131–135	133	3	399
136–140	138	9	1242
141–145	143	12	1716
146–150	148	9	1332
151–155	153	7	1071

Sum fi × xi = 399 + 1242 + 1716 + 1332 + 1071 = 5760 •

Sum fi = 3 + 9 + 12 + 9 + 7 = 40 •

$$\textbf{Mean} = \frac{\sum fi \cdot xi}{\sum fi} = \frac{5760}{40} = 144$$

Arithmetic Mean $= 144$