MOHAMED KHIDER UNIVERSITY – BISKRA

Faculty of Exact Sciences
Department of Mathematics

First Year (L1) – Mathematics
Module: Descriptive Statistics

TD SERIES 2
POSITION PARAMETERS

Mode – Mean – Median – Quartiles – Deciles – Percentiles

Exercise 1 – Nominal Qualitative Variable

A survey of 100 students gives:

Transport	Bus	Car	Tram	Walk
Frequency	35	25	20	20

1. Identify the type of variable.
2. Compute relative frequencies.
3. Determine the mode.
4. Can the median be calculated? Justify.
5. Can deciles be calculated? Justify.

Exercise 2 – Ordinal Qualitative Variable

Satisfaction level:
Very Low $<$ Low $<$ Medium $<$ High $<$ Very High

Level	VL	L	M	H	VH
Frequency	10	30	40	25	15

1. Compute cumulative frequencies.
2. Determine the median category.
3. Determine Q_1 and Q_3.
4. Determine D_2 and D_8.
5. Determine P_{30} and P_{75}.
6. Interpret D_8.
7. Is the arithmetic mean meaningful? Explain.

Exercise 3 – Quantitative Discrete Variable

Number of children per family ($N = 60$):

x_i	0	1	2	3	4	5
n_i	6	12	18	10	8	6

1. Compute the arithmetic mean.
2. Determine the mode.
3. Compute the median.
4. Compute Q_1 and Q_3.
5. Compute D_3 and D_7.
6. Compute P_{90}.

Exercise 4 – Grouped Continuous Data

Salaries (thousand DA), $N = 120$:

Class	[20,30[	[30,40[	[40,50[	[50,60[	[60,70[
Frequency	12	28	36	26	18

1. Determine class midpoints.
2. Compute the approximate mean.
3. Determine the modal class.
4. Compute the grouped mode.
5. Compute the grouped median.
6. Compute Q_1 and Q_3.
7. Compute D_4 and D_9.
8. Compute P_{95}.
9. Interpret D_9 economically.

Exercise 5 – Graphical Mode (Histogram)

Heights (cm), $N = 100$:

Class	[150,160[	[160,170[	[170,180[	[180,190[
Frequency	10	35	40	15

1. Draw the histogram.

2. Identify the modal class.
3. Construct the mode triangle.
4. Estimate the mode graphically.
5. Verify using the grouped mode formula.

Exercise 6 – Graphical Median (Ogive)

Class	[0,10[	[10,20[	[20,30[	[30,40[	[40,50[
Frequency	8	12	20	15	5

1. Compute cumulative frequencies.
2. Draw the ogive.
3. Determine the median graphically.
4. Verify using interpolation.
5. Determine Q_1 and Q_3 graphically.

Exercise 7 – Unequal Class Widths

Age distribution ($N = 80$):

Class	[0,10[	[10,20[	[20,40[	[40,60[	[60,80[
Frequency	6	14	28	20	12

1. Determine class widths.
2. Identify the modal class.
3. Compute the grouped median.
4. Compute Q_1 and Q_3.
5. Compute D_6.
6. Compute P_{85}.

Exercise 8 – Statistical Table Construction (Sturges Rule)

Marks of 40 students:
8, 12, 15, 9, 10, 11, 14, 7, 13, 16, 10, 12, 9, 8, 17, 18, 6, 14, 11, 13, 12, 15, 10, 9, 7, 16, 14, 13, 12, 11, 10, 8, 9, 15, 17, 6, 14, 12, 13, 11

1. Compute the range.

2. Determine number of classes using Sturges rule:

$$k = 1 + 3.3 \log_{10}(N)$$

3. Determine class width.

4. Construct the grouped table.

5. Compute mean, median, mode, Q_1, Q_3, D_7, P_{90}.

Exercise 9 – Statistical Table Construction (Yule Rule)

Weights (kg) of 50 individuals:
52, 60, 75, 68, 70, 82, 90, 55, 63, 77, 72, 85, 58, 66, 74, 69, 88, 92, 61, 73, 78, 84, 67, 59, 71, 80, 76, 83, 62, 65, 79, 87, 91, 54, 57, 64, 68, 70, 74, 81, 86, 89, 53, 56, 60, 72, 75, 77, 82, 90

1. Compute the range.

2. Determine number of classes using Yule rule:

$$k \approx 2\sqrt{N}$$

3. Construct the grouped table.

4. Compute mean, median, mode, Q_1, Q_3, D_4, D_8, P_{95}.

5. Draw the histogram.

Exercise 10 – Special Means

A) Weighted Mean
TD = 15 (20%)
TP = 12 (30%)
Final Exam = 8 (50%)

1. Compute the weighted mean.

B) Geometric Mean
Growth rates: +10%, +5%, -3%

1. Compute the average annual growth rate.

2. Explain why the geometric mean is used.

C) Harmonic Mean
100 km at 50 km/h
100 km at 100 km/h

1. Compute total time.

2. Compute average speed.

3. Explain why harmonic mean is appropriate.

END OF TD SERIES 2