Instructor: Dr. Zehir Hatem
Academic year: 2026/2027

Python Programming
Series 1: Variables, Data Types, and Operators
Badji Mokhtar - Annaba University, Urban Planning Department

Exercise 1:

Statement.
Declare variables to store information about an urban area named **Annaba**:

- `city_name` (string): "Annaba"
- `total_population` (integer): 45000
- `total_area_km2` (float): 49.5
- `is_coastal` (boolean): True

1. Write a Python script that assigns these values.
2. Use the `type()` function to print the data type of each variable.
3. Calculate the **population density** (population divided by area) and store it in a variable named `population_density`. Print the result.

Solution.

```
city_name = "Annaba"
total_population = 45000
total_area_km2 = 49.5
is_coastal = True

print(type(city_name))
print(type(total_population))
print(type(total_area_km2))
print(type(is_coastal))

population_density = total_population / total_area_km2
print("Population density:", population_density)
```

Exercise 2:

Statement.
You are tasked with projecting the population growth of a district over the next 5 years.

1. Define a variable `current_population` equal to 15000.
2. Define an annual growth rate `growth_rate` equal to 0.03 (3%).
3. Calculate the projected population after 1 year, 2 years, and 5 years using the compound growth formula:

`current_population * (1 + growth_rate) ** years`

Solution.

```
current_population = 15000
growth_rate = 0.03

for years in (1, 2, 5):
    projected = current_population * (1 + growth_rate) ** years
    print("Population after", years, "year(s):", round(projected))
```

Exercise 3:

Statement.
A municipal zoning code classifies a zone as **High Density** if its population density exceeds 3000 people/km^2 **and** its total area is less than 20 km^2.

1. Using the density calculated in Exercise 1 (49.5 km^2, 45000 population), write a boolean expression that evaluates whether the district qualifies as high density.
2. Print a clear descriptive message displaying the evaluation result (e.g., Is High Density Zone: True/False).

Solution.

```
is_high_density = population_density > 3000 and total_area_km2 < 20
print("Is High Density Zone:", is_high_density)
```

Exercise 4:

Statement.
As an urban planner writing scripts, you will frequently encounter error messages. Identify the specific Python error type for each scenario:

1. What error occurs when you run `print(city_name ?`
2. What error occurs when you try to add a string and an integer, such as `total_population + " inhabitants"`?
3. What error occurs if you try to print a variable `district_code` before assigning any value to it?

Solution.

1. `SyntaxError`
2. `TypeError`
3. `NameError`

Exercise 5:

Statement.
You are designing a rectangular public square and a triangular park in an urban extension project.

1. Define variables `rectangle_length = 85.5` (in meters) and `rectangle_width = 40.0` (in meters). Calculate the surface area (length * width) and print the result in square meters (m^2).

2. Define variables `triangle_base = 50.0` (in meters) and `triangle_height = 30.0` (in meters). Calculate the surface area of the triangular park using the formula (base * height) / 2 and print the result in m^2.

3. Calculate the total combined surface area of both public spaces and print the final sum.

Solution.

```
rectangle_length = 85.5
rectangle_width = 40.0
rectangle_area = rectangle_length * rectangle_width
print("Rectangle area:", rectangle_area, "m²")

triangle_base = 50.0
triangle_height = 30.0
triangle_area = (triangle_base * triangle_height) / 2
print("Triangle area:", triangle_area, "m²")

total_area = rectangle_area + triangle_area
print("Total area:", total_area, "m²")
```