07JCJXX Computer Sciences, A.A. 2020/2021

Lab Exercises3

Exercise Objectives:

- Solve problems that involve logical choices
- Write statements using Boolean expressions

Technical Content

- Use of conditional statement **if elif** and **else**
- Use of logical and relational expressions
- Comparison of integers, floating point numbers and strings
- Use of nested instructions

To solve during lab session:

Exercise 1. Write a program that reads three numbers and displays the message "increasing" if they are in ascending order, "decreasing" if they are in descending order and "neither" if they are neither in ascending nor descending order. In this Exercise increasing strictly means increasing, i.e. each value must be greater than the previous one (the same meaning has the term decreasing): the sequence 3 4 4, therefore, should not be considered increasing. [P3.5]

Exercise 2. Write a program that translates a letter grade into the corresponding numerical grade. The marks in letters are A, B, C, D and F, possibly followed by a + or - sign. Their numerical values are, in order, 4, 3, 2, 1 and 0. The grades F + and F– do not exist. A + sign increases the numerical grade by 0.3, while a - sign decreases it by the same amount. The A+ grade is however equal to 4.0.
Enter a letter grade: B–
The numeric value is 2.7. [P3.12]

Exercise 3. Write a program that reads a string and displays the appropriate messages, after checking whether:

a. contains only letters
b. contains only uppercase letters
c. contains only lowercase letters
d. contains only digits
e. it contains only letters and numbers
f. starts with a capital letter
g. ends with a period [P3.17]

Exercise 4. The following algorithm identifies the season (Spring, Summer, Fall or Winter) to which a date belongs, given the month and day.

If month is 1, 2 or 3, season = "Winter"
Otherwise if month is 4, 5 or 6, season = "Spring"
Otherwise if month is 7, 8 or 9, season = " Summer "
Otherwise if month is 10, 11 or 12, season = "Fall"
If month is divisible by 3 and day >= 21
    If season is "Winter", season = "Spring"
    Otherwise if season is "Spring", season = "Summer"
    Otherwise if season is " Summer ", season = "Fall"
    Otherwise season = "Winter"

Write a schedule that asks the user for a month and a day and then displays the season determined by this algorithm. [P3.20]

Exercise 5. One year of 366 days is called a leap year and serves to keep the calendar synchronized with the Sun, as the Earth rotates around once every 365.25 days. In reality, this number is not exact and for all dates after 1582 the Gregorian correction applies: usually years divisible by 4, such as 1996, are leap years, but years divisible by 100, such as 1900, are not; as an exception to the exception, years divisible by 400, such as 2000, are leap years. Write a program that asks the user for a year and determines if it is a leap year, using a single if statement (with the appropriate Boolean operators). [P3.27]

To be solved at home

Exercise 6. Considering the numerical values of the grades explained in Exercise 2, create a program that translates a number between 0 and 4 into the nearest literal grade. For example, the number 2.8 (which could be the average of several grades) must be translated as B–. Solve the tie cases in favor of the best grade: for example, 2.85 must be translated as B. [P3.13]

Exercise 7. Write a program that calculates taxes according to this pattern. [P3.25]

For "unmarried" marital status and taxable income higher than	**but not higher than**	**taxes are**	**of the sum greater than**
$ 0	$ 8000	10%	$ 0
$ 8000	$ 32,000	$ 800 + 15%	$ 8000
$ 32,000		$ 4400 + 25%	$ 32,000
By "married" marital status and taxable income higher than	**but not higher than**	**taxes are**	**of the sum greater than**
$ 0	$ 16,000	10%	$ 0
$ 16,000	$ 64,000	$ 1600 + 15%	$ 16,000
$ 64,000		$ 8800 + 25%	$ 64,000

Exercise 8. Write a unit conversion program that asks the user from which unit (choosing from: ml, l, g, kg, mm, cm, m, km) and to which unit (choosing from: fl . oz , gal , oz , lb, in, ft , mi) wants to make a conversion, rejecting incompatible conversions (such as, for example, gal → km). Then ask the value to be converted and finally visualize the result [P3.26]:

```
Convert from? gal
Convert to? ml
Value? 2.5
2.5 gal = 9463.5 ml
```

Exercise 9. A supermarket rewards its customers with shopping vouchers whose amount depends on the amount of money spent on *groceries* . For example, if you spend $50, you get a shopping voucher equal to eight percent of that amount. The following table shows the percentage used to calculate the voucher for different amounts. Write a program that calculates and displays the value of the shopping voucher delivered to the customer, based on the amount of money they spent on the purchase of food products. [P3.40]

Money spent	**Percentage of the voucher**
Less than $10	No coupons
From $10 to $ 60	8%
More than $60 to $150	10%
More than $150 to $210	12%
More than $210	14%