

SD11 Q1 Assignments – Week 3-4

Version: September 2018

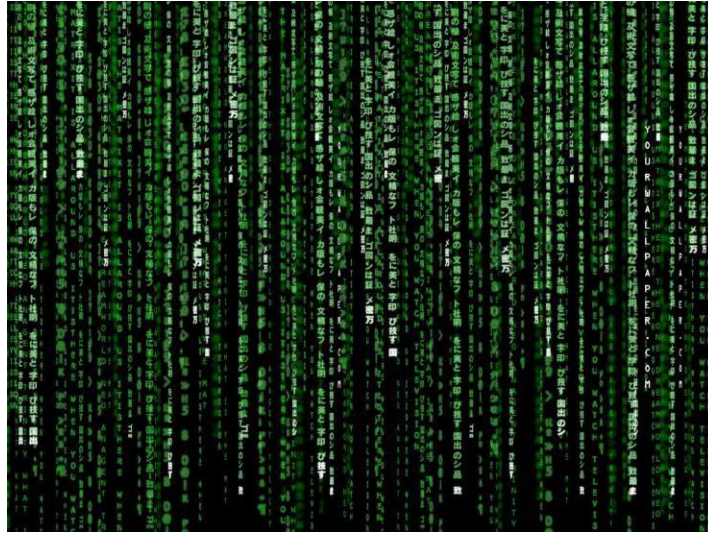


Table of Contents

Assignment 3-4.1: Odd or even	2
Assignment 3-4.2: Comparing three integers	2
Assignment 3-4.3: Duplicates (exercise 5.11.20 from the book)	2
Assignment 3-4.4: Arithmetic with 2 numbers	2
Assignment 3-4.5: Body fat of a person	3
Assignment 3-4.6: Body mass index	3
Assignment 3-4.7: Days of the month	3
Assignment 3-4.8: Wavelengths	4

Assignments must be finished before the week 5 practicum!

WEEK 3-4

Assignment 3-4.1: Odd or even

A program asks the user to enter one integer, and then determines and displays whether the number is odd or even. Use the remainder operator: an even number is dividable by 2, so any multiple of 2 leaves a remainder of 0 when divided by 2. First provide the flow chart of the program and then implement the code!

Assignment 3-4.2: Comparing three integers

A program asks the user to enter three integer values (e.g. 56, 30 and 45). Your program should compare these three integers, and display the value of the largest (e.g. "The maximum value is 56."). If all three numbers are equal, the program should display the message "All numbers are equal.". Again, first provide the flow chart of the program and then implement the code!

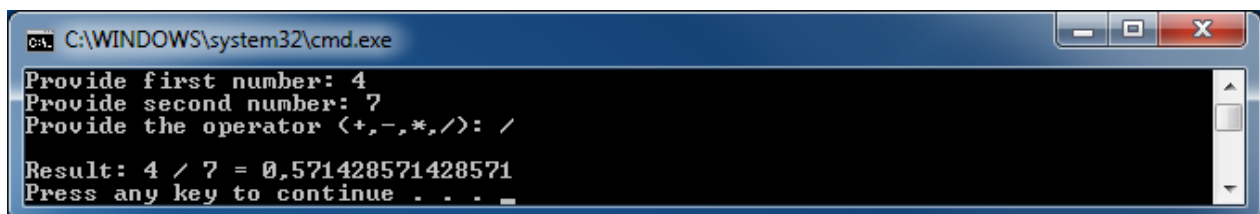
Assignment 3-4.3: Duplicates (Exercise 5.20 from the book)

A program requests three integer values from the user. It then displays one of two things: if any of the values entered are duplicates, it displays "DUPLICATES"; otherwise, it displays "ALL UNIQUE". First provide the flow chart of the program and then implement the code.

Assignment 3-4.4: Arithmetic with 2 numbers

The goal is to write a program that performs some arithmetic on any pair of numbers with the choice of adding, subtracting, multiplying and dividing the first number by the second one. First ask the user for two numbers and next ask for one of the operators +, -, * or /. Depending on the operator the user enters, compute and display the result of the operation.

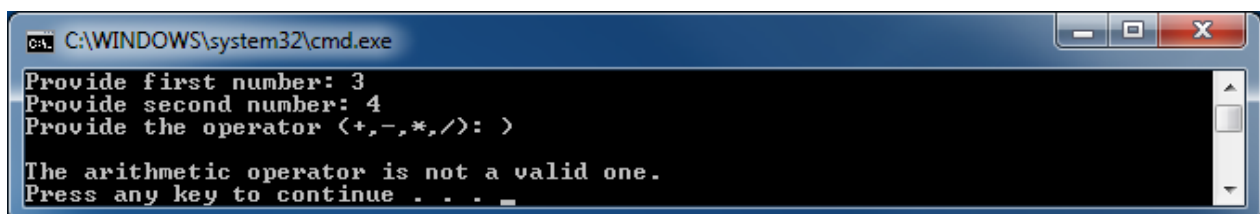
The output can be something like:



```

C:\WINDOWS\system32\cmd.exe
Provide first number: 4
Provide second number: 7
Provide the operator (+,-,*,/): /
Result: 4 / 7 = 0,571428571428571
Press any key to continue . . .
  
```

Or (in case the arithmetic operator that the user provided is not valid):



```

C:\WINDOWS\system32\cmd.exe
Provide first number: 3
Provide second number: 4
Provide the operator (+,-,*,/): >
The arithmetic operator is not a valid one.
Press any key to continue . . .
  
```

Provide the flow chart and the implementation of this program.

Optional: Change the program in such a way that the user can provide expressions like "8 * 3" or "6 / 5" on one line instead of asking for each part of the input separately.

Assignment 3-4.5: Body mass index

Body mass index (BMI) is calculated based on the following formula:

$$BMI = \frac{weight}{height^2}$$

Design and write a program that asks the user to enter the weight and height. Your program should calculate and display the BMI. Also show the following explanation so that the user can evaluate his/her BMI:

Underweight: less than 18.5
 Normal: between 18.5 and 24.9
 Overweight: between 25 and 29.9
 Obese: 30 or greater

If the BMI value indicates the person is obese, issue the following warning “Your BMI is extremely high. Please contact your doctor because your health is in danger!”.

Assignment 3-4.6: Body fat of a person

Another way to determine how healthy someone is, is by measuring his/her body fat percentage. The formulas to determine the body fat for female and male are as follows:

Body fat formula for women:

A1 = (body weight x 0.732) + 8.987
 A2 = wrist measurement (at fullest point) / 3.140
 A3 = waist measurement (at naval) x 0.157
 A4 = hip measurement (at fullest point) x 0.249
 A5 = forearm measurement (at fullest point) x 0.434
 B = A1 + A2 – A3 – A4 + A5
 Body fat = body weight – B
 Body fat percentage = body fat x 100 / body weight

Body fat formula for men:

A1 = (body weight x 1.082) + 94.42
 A2 = waist measurement x 4.15
 B = A1 – A2
 Body fat = body weight – B
 Body fat percentage = body fat x 100 / body weight

Note: weights in pounds, measurements in inches.

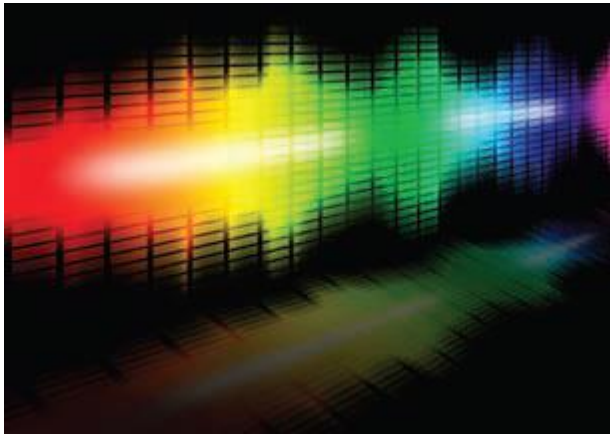
Assignments:

- a) Design and write a program to calculate the body fat of a person.
- b) Extend the program such that two arbitrary persons can compare their body fat such that the program determines who has the least body fat.

Assignment 3-4.7: Days of the month

Design and implement a program that asks the user to enter a month (1 for January, 2 for February, and so on) and then prints the number of days in the month. For February, print “28 or 29 days”. Do not use a separate if/else branch for each month!

Assignment 3-4.8: Wavelengths



Design and write a program that prompts the user for a wavelength value and prints a description of the corresponding part of the electromagnetic spectrum, as given in the table below.

Type	Wavelength (m)	Frequency (Hz)
Radio Waves	$> 10^{-1}$	$< 3 \times 10^9$
Microwave	10^{-3} to 10^{-1}	3×10^9 to 3×10^{11}
Infrared	7×10^{-7} to 10^{-3}	3×10^{11} to 4×10^{14}
Visible light	4×10^{-7} to 7×10^{-7}	4×10^{14} to 7.5×10^{14}
Ultraviolet	10^{-8} to 4×10^{-7}	7.5×10^{14} to 3×10^{16}
X-rays	10^{-11} to 10^{-8}	3×10^{16} to 3×10^{19}
Gamma rays	$< 10^{-11}$	$> 3 \times 10^{19}$

Hint: you can make use of scientific notation also in C++, saving you a lot of counting and typing zeroes for this exercise. Have a look at Chapter 3 from the book to figure out how to do this!