

Computer Programming
Bachelor in Biomedical Engineering
Bachelor in Applied Mathematics and Computing
Course 2020/ 2021

Exercise Sheet 2 - SOLUTIONS
MATLAB Syntax (screen output)

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1. Exercises: SCREEN OUTPUT

Exercise 1

Write a program that asks the user to introduce two numbers and produces the following output

```
Introduce a number: 3
Introduce another number: 12
If we subtract 3 from 12 we obtain 9, and if
we divide 12 by 3 we obtain 4
```

SOLUTION

```
clear;
number1 = input('Introduce a number: ');
number2 = input('Introduce another number: ');
rdo1 = number2 - number1;
rdo2 = number2 / number1;
fprintf('If we subtract %d from %d we obtain %d, and if we divide %d
by %d we obtain %d', number1, number2, rdo1, number2, number1, rdo2);
```

Exercise 2

Write a program that reads the length and width of a rectangle and displays its area and its perimeter.

Example of execution:

```
Introduce the width of the rectangle: 5
Introduce the length of the rectangle: 3
The area is 15
The perimeter is 16
```

SOLUTION

```
clear;
w = input('Introduce the width of the rectangle: ');
v = input('Introduce the length of the rectangle: ');
fprintf('\n\nThe area is %d', w*v);
fprintf('\n\nThe perimeter is %d', 2*w+2*v);
```

Exercise 3

Write a program that reads the radius of a circle and calculates its area and its perimeter.

Example of execution:

```
Introduce the radius of the circle: 4
The area is 5.026560e+01
The perimeter is 2.513280e+01
```

SOLUTION

```
clear;
r = input('Introduce the radius of the circle: ');
fprintf('\nThe area is %d',3.1416*(r^2));
fprintf('\nThe perimeter is %d',2*3.1416*r);
```

Exercise 4

Write a program that reads a number of seconds and transforms it into hours, minutes and seconds.

Example of execution:

```
Introduce a number: 5
5 seconds equals to 0 hours, 0 minutes and 5 seconds
```

Another example of execution:

```
Introduce a number: 65
65 seconds equals to 0 hours, 1 minutes and 5 seconds
```

Another example of execution:

```
Introduce a number: 3805
3805 seconds equals to 1 hours, 3 minutes and 25 seconds
```

Tip: The function *floor* can help you solve this problem. Type *help floor* in the command window to know more about this function.

SOLUTION

```
clear;
number = input('Introduce a number: ');
minutes = floor(number/60);
seconds = number - minutes*60;
hours = floor(minutes/60);
```

```
minutes = minutes - hours*60;
fprintf ('%d seconds equals to %d hours, %d minutes and %d
seconds', number, hours, minutes, seconds);
```

Exercise 5

Write a program that exchanges the values of two variables.

Example of execution:

```
Introduce the value of a: 5
Introduce the value of b: 1
```

```
The value of a is now 1
The value of b is now 5
```

SOLUTION

```
clear;
a = input('Introduce the value of a: ');
b = input('Introduce the value of b: ');
c = a;
a = b;
b = c;
fprintf('\nThe value of a is now %d',a);
fprintf('\nThe value of b is now %d',b);
```

Exercise 6

Write a program that estimates the age of a person. The program will ask the user the current year and the year when he/she was born, and print his/her estimated age.

The output of the execution may look like this:

```
Introduce the current year: 2016
Introduce the year when you were born: 1996
You are 19 or 20 years old...
```

SOLUTION

```
clear;
year = input('Introduce the current year: ');
born = input('Introduce the year when you were born: ');
age1 = year-born;
age2 = age1-1;
fprintf('\n You are %d or %d years old.', age1, age2);
```

Exercise 7

Create a program that asks the user to introduce a quantity in Euros and displays the number of notes of 50, 20 and 10 Euros on screen.

The output of the execution may look like this:

```
Introduce a quantity: 140
You have 2 notes of 50
You have 2 notes of 20
You have 0 notes of 10
```

```
clear;
quantity = input('Introduce a quantity: ');
q50 = floor(quantity/50);
q20rem = quantity - (q50*50);
q20 = floor(q20rem/20);
q10rem = q20rem - (q20*20);
q10 = q10rem/10;
fprintf('\nYou have %d notes of 50 \nYou have %d notes of 20 \nYou
have %d notes of 10\n', q50, q20, q10);
```

or

```
clear;
quantity = input('Introduce a quantity: ');
q50 = floor(quantity/50);
q20rem = rem(quantity,50);
q20 = floor(q20rem/20);
q10rem = rem(q20rem,20);
q10 = q10rem/10;
fprintf('\nYou have %d notes of 50 \nYou have %d notes of 20 \nYou
have %d notes of 10\n', q50, q20, q10);
```

Exercise 8

Write a program whose execution generates the following output:

```
Introduce current date
Introduce the number of the day (1-31): 3
Introduce the number of the month (1-12): 2
Introduce the year: 2002
Now introduce the date you were born
Introduce the day of the month you were born (1-31): 4
Introduce the number of the month you were born (1-12): 4
Introduce the year you were born: 2000
You've been alive:
1 whole years
21 whole months
and about 658 and 680 days
```

Solve the problem considering that:

- The minimum days (e.g. 658) are calculated as if all the months have 30 days and the maximum days (e.g. 680) as if all the months have 31 days
- Solve the problem considering ONLY the case in which the current year and the year the user is born are different
- A 'whole year' means that the user was alive all 12 months of the corresponding year. The same logic applies to a 'whole month'.

SOLUTION

```
clear;
disp('Introduce current date');
currentDay = input('Introduce the number of the day (1-31): ');
currentMonth = input('Introduce the number of the month (1-12): ');
currentYear = input('Introduce the year: ');
disp('Now introduce the date you were born');
bornDay = input('Introduce the day of the month you were born (1-31): ');
bornMonth = input('Introduce the number of the month you were born (1-12): ');
bornYear = input('Introduce the year you were born: ');

years = currentYear - bornYear - 1;
months = (years * 12) + (currentMonth - 1) + (12 - bornMonth);
mindays = months*30 + (currentDay - 1) + (30 - bornDay);
maxdays = months*31 + (currentDay - 1) + (31 - bornDay);

fprintf('You've been alive: \n %d \t whole years \n %d \t whole months \n and about %d and %d days', years, months, mindays, maxdays);
```

Exercise 9

Write a program that asks the user to introduce 3 characters and stores them in a vector. Then it prints all the characters on screen one after the other.

The output of the execution may look like this:

```
Introduce a character: d
Introduce another character: o
Introduce another character: g
You have introduced the word: dog
```

SOLUTION

```
clear;
c(1) = input('Introduce a character: ','s');
c(2) = input('Introduce a character: ','s');
c(3) = input('Introduce a character: ','s');
fprintf('\n You have introduced the word: %c%c%c', c(1), c(2), c(3));
```

Exercise 10

Write a program that asks the user to introduce 4 numbers and puts them in a matrix of 2 rows and 2 columns. Next, it shows the average value on screen.

SOLUTION

```
clear;
matnum = zeros(2,2);
matnum(1,1) = input('Introduce a number: ');
matnum(1,2) = input('Introduce a number: ');
matnum(2,1) = input('Introduce a number: ');
matnum(2,2) = input('Introduce a number: ');
average = (matnum(1,1)+ matnum(1,2) + matnum(2,1) + matnum(2,2))/4;
fprintf('The average value is %.2f', average);
```

or

```
average = mean2(matnum);
```

Exercise 11

Modify the previous program so that it also displays all the numbers in reverse order on screen (starting from the last number introduced and ending with the first one).

SOLUTION

```
clear;
matnum = zeros(2,2);
matnum(1,1) = input('Introduce a number: ');
matnum(1,2) = input('Introduce a number: ');
matnum(2,1) = input('Introduce a number: ');
matnum(2,2) = input('Introduce a number: ');
average = (matnum(1,1)+ matnum(1,2) + matnum(2,1) + matnum(2,2))/4;
fprintf('You introduced the numbers %d, %d, %d and %d', matnum(2,2),
matnum(2,1), matnum(1,2), matnum(1,1));
fprintf('\nThe average value is %.2f', average);
```

Exercise 12 – extra exercise

Write a program that asks the user to introduce the following information about three students: NIA, age and number of courses enrolled. The program should organize the information in different rows of a matrix (one row per student). Next, it asks to introduce a number from 1 to 3, and prints the information of the correspondent student on screen.

Example of an execution:

```
Introduce the NIA of the first student: 10006667
Introduce his/her age: 20
```

Introduce the number of courses: 8
Introduce the NIA of the second student: 10008887
Introduce his/her age: 22
Introduce the number of courses: 12
Introduce the NIA of the third student: 10009977
Introduce his/her age: 19
Introduce the number of courses: 6

From which student do you want to print the data (1-3)? 3
The age of student 10009977 is 19, and he/she is currently
enrolled in 6 courses

SOLUTION

```
clear;
data = zeros(3,3);
data(1,1) = input('Introduce the NIA of the first student: ');
data(1,2) = input('Introduce the age: ');
data(1,3) = input('Introduce the number of courses: ');
data(2,1) = input('Introduce the NIA of the second student: ');
data(2,2) = input('Introduce the age: ');
data(2,3) = input('Introduce the number of courses: ');
data(3,1) = input('Introduce the NIA of the third student: ');
data(3,2) = input('Introduce the age: ');
data(3,3) = input('Introduce the number of courses: ');
num = input('From which student do you want to print the data (1-3)?');
fprintf('\n The age of student %d is %d, and he/she is currently
enrolled in %d courses', data(num,1), data(num,2), data(num,3));
```

or

```
fprintf('\n The age of student %d is %d, and he/she is currently
enrolled in %d courses', data(num,:));
```