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

Exercise Sheet 3 - SOLUTIONS
Conditional Statements

Content Table

Exercise 1

Write a program that asks the user's age and then classifies the age according to the following scheme:

```
Error < 0 <= Baby < 1 <= Child < 13 <= Teenager < 18 <=
Adult < 60 <= Senior < 120 <= Error
```

SOLUTION

```
clear;
age = input('Introduce the age: ');

if(age < 0)
   disp('Error');
elseif(age <=1)
   disp('Baby');
elseif(age <=13)
   disp('Child');
elseif(age <=18)
   disp('Teenager');
elseif(age <=60)
   disp('Adult');
elseif(age <=120)
   disp('Senior');
else
   disp('Error');
end
```

Exercise 2

Write a program that simulates a calculator. The program will ask the user to choose an operation: addition (number 1), subtraction (number 2), multiplication (number 3) or division (number 4). Then, it will ask the user to introduce 2 values and display the result of the selected operation.

Example of execution:

```
Operations:
1. Addition
2. Subtraction
3. Multiplication
4. Division
Choose an operation: 1
Introduce a number: 3
Introduce another number: 5
3 + 5 = 8
```

SOLUTION

```
clear;
disp('Operations: ');
disp('1. Addition');
disp('2. Subtraction');
disp('3. Multiplication');
disp('4. Division');
option = input('Choose an operation: ');
num1 = input('Introduce a number: ');
num2 = input('Introduce another number: ');
if(option==1)
    fprintf('%d + %d = %d',num1,num2,num1+num2);
elseif(option==2)
    fprintf('%d - %d = %d',num1,num2,num1-num2);
elseif(option==3)
    fprintf('%d * %d = %d',num1,num2,num1*num2);
elseif(option==4)
    fprintf('%d / %d = %d',num1,num2,num1/num2);
else
    disp('Operation not valid');
end
```

Exercise 3

Write a program that receives 5 numbers. Then, it asks the user if he/she wants to display these numbers in the order they were introduced or in reverse order, and displays them.

Example of execution:

```
Introduce number 1 of 5: 4
Introduce number 2 of 5: 2
Introduce number 3 of 5: 8
Introduce number 4 of 5: 6
Introduce number 5 of 5: 1
Do you want to print them in reverse order? (y/n): y
1 6 8 2 4
```

SOLUTION

```
clear;
num1 = input('Introduce number 1 of 5: ');
num2 = input('Introduce number 2 of 5: ');
num3 = input('Introduce number 3 of 5: ');
num4 = input('Introduce number 4 of 5: ');
num5 = input('Introduce number 5 of 5: ');
reverse = input('Do you want to print them in reverse order? (y/n):
','s');
if(reverse == 'y')
    fprintf('%d %d %d %d %d',num5,num4,num3,num2,num1);
else
    fprintf('%d %d %d %d %d',num1,num2,num3,num4,num5);
end
```

Exercise 4

Write a program that asks the user to introduce the coordinates of two points and indicates which one is closer to the axes center (0, 0), or if the two of them are at the same distance.

Example of execution:

```
Introduce x1: 2
Introduce y1: 2
Introduce x2: 3
Introduce y2: 4
The first point is closer
```

Note: to calculate the square root of a number you can use the MATLAB function **sqrt**. Type *help sqrt* in the command line for more information

SOLUTION

```
clear;
x1 = input('Introduce x1: ');
y1 = input('Introduce y1: ');
x2 = input('Introduce x2: ');
y2 = input('Introduce y2: ');

distance1 = sqrt(x1^2+y1^2);
distance2 = sqrt(x2^2+y2^2);

if(distance1 == distance2)
   disp('Same distance');
elseif(distance1 < distance2)
   disp('The first point is closer');
else
   disp('The second point is closer');
end
```

Exercise 5

Modify the ATM program we did in the previous class so that it now informs the user if the quantity is valid or invalid (smaller than 20, not multiple of 10 or greater than 600). In the latter case it also describes the reason why the quantity is invalid.

Examples of execution:

```
Introduce a quantity: 35
Error. Quantity is not valid
The quantity is not a multiple of 10


Introduce a quantity: 10
Error. Quantity is not valid
```

The quantity is smaller than 20

SOLUTION

```
clear;
quantity = input('Introduce a quantity: ');
remainder10 = rem(quantity, 10);
if((quantity < 20) || (quantity > 600) || (remainder10 ~= 0))
    disp('Error. Quantity is not valid');
     if(quantity < 20)
        disp('The quantity is smaller than 20');
     elseif(quantity > 600)
        disp('The quantity is greater than 600');
     else
        disp('The quantity is not a multiple of 10');
     end
else
    disp('The quantity is valid');
end
```

Exercise 6

Write a program that determines the minimum or the maximum number between 5 numbers inserted by the user. Then the program provides the user with three options:
1) Determine the minimum number
2) Determine the maximum number
3) Determine the minimum and maximum number
Use a vector to store the user's input.

Use the MATLAB functions **min** and **max** to obtain the results.

Type *help min* or *help max* in the command line for more information.

Example of execution:

Insert element 1: 3
Insert element 2: 4
Insert element 3: 6
Insert element 4: 7
Insert element 5: 3
Operations:
1 -Obtain the minimum
2 -Obtain the maximum
3 -Obtain the minimum and maximum
Which operation do you want to perform? 2
The maximum number is 7

SOLUTION

```
clear;
vect = zeros(1,5);
vect(1) = input('Insert element 1: ');
vect(2) = input('Insert element 2: ');
vect(3) = input('Insert element 3: ');
vect(4) = input('Insert element 4: ');
vect(5) = input('Insert element 5: ');
disp('Operations: ');
disp('1 -Obtain the minimun');
disp('2 -Obtain the maximun');
disp('3 -Obtain the minimum and maximum');
operation = input('Which operation do you want to perform? ');
if(operation == 1)
    fprintf('The minimum number is %d\n', min(vect));
elseif(operation == 2)
    fprintf('The maximum number is %d\n', max(vect));
elseif(operation == 3)
    fprintf('The minimun and maximun numbers are %d and %d\n',
min(vect),max(vect));
else
    disp('Wrong operation number');
end
```

Exercise 7

Write a program to convert a letter grade ‘A’, ‘B’, ‘C’, ‘D’ or ‘F’ to a numerical grade. The letter grades ‘A’, ‘B’, ‘C’, and ‘D’ correspond to 90, 80, 70, and 60 respectively, and a letter ‘F’ corresponds to 40. The program asks the user to introduce a letter grade, and whether it is necessary to add any positive or negative extra marks. Positive marks increase the base grade with 0.5 point each, and negative marks decrease the grade with 0.5. Note that no student should score higher than 100 or lower than 0.

Example of execution:

Introduce the letter grade: B
Introduce the number of positive extra marks: 2
Introduce the number of negative extra marks: 0
Your numerical grade is 81.00

SOLUTION

```
clear;
letter = input('Introduce the letter grade: ', 's');
positives = input('Introduce the number of positive extra marks: ');
negatives = input('Introduce the number of negative extra marks: ');

if(letter == 'A')
    basescore = 90;
elseif(letter == 'B')
    basescore = 80;
elseif(letter == 'C')
    basescore = 70;
elseif(letter == 'D')
    basescore = 60;
```

```
elseif(letter == 'F')
    basescore = 40;
end

score = basescore + (positives * 0.5) - (negatives * 0.5);
if(score > 100)
    score = 100;
elseif(score < 0)
    score = 0;
end
fprintf('Your numerical grade is %.2f\n ', score);
```

SOLUTION using 'switch'

```
clear;
letter = input('Introduce the letter grade: ', 's');
positives = input('Introduce the number of positive extra marks: ');
negatives = input('Introduce the number of negative extra marks: ');

switch (letter)
    case 'A'
        basescore = 90;
    case 'B'
        basescore = 80;
    case 'C'
        basescore = 70;
    case 'D'
        basescore = 60;
    case 'F'
        basescore = 40;
end

score = basescore + (positives * 0.5) - (negatives * 0.5);
if(score > 100)
    score = 100;
elseif(score < 0)
    score = 0;
end
fprintf('Your numerical grade is %.2f\n ', score);
```

Exercise 8

Write a program that asks the user to introduce two numbers and determines whether one of these numbers can be divided by the other.

Examples of execution:

```
Introduce a number: 3
Introduce another number: 12
12 can be divided by 3
Introduce a number: 12
Introduce another number: 3
12 can be divided by 3
Introduce a number: 3
```

```
Introduce another number: 3
3 can be divided by 3
```

SOLUTION

```
clear;
num1 = input('Introduce a number: ');
num2 = input('Introduce another number: ');
if(num1 > num2 && (rem(num1,num2) == 0))
    fprintf('%d can be divided by %d\n',num1,num2);
elseif(num2 > num1 && (rem(num2,num1) == 0))
    fprintf('%d can be divided by % d\n',num2,num1);
elseif(num2 == num1)
    fprintf('%d can be divided by %d\n',num1,num2);
else
    disp('No division possible');
end
```

Exercise 9

Write a program that, given a year introduced by the user, figures out whether the year is a leap year. Note: Leap years are multiples of 4, but each 400 years it is necessary to discount 3 leap years. To do this, years that are multiples of 100 are not leap years with the exception of the ones that are multiples of 400.

SOLUTION

```
clear;
year = input('Introduce a year: ');
if((rem(year,4) == 0) && (rem(year,100) ~= 0) || (rem(year,400) == 0))
    disp('This is a leap year');
else
    disp('This is not leap year');
end
```

Exercise 10

An insurance company needs to know which group of drivers will be given a discount. The discount will be applied whenever one of the following possibilities applies:

- The driver is a woman over 27, and no accidents have been reported in the last year.
- The driver is a man over 27, and no accidents have been reported in the last two years.
- The driver is a not over 27, and no accidents have been reported in the last five years.

Write a program that asks the user to introduce all the necessary data from the driver and identifies if he/she is eligible for a discount.

Example of execution:

Introduce the sex of the driver (f/m): m
Introduce the age of the driver: 30
Introduce the number of reports in the last year: 0
Introduce the number of reports in the last two years: 2
Introduce the number of reports in the last five years: 4
You do not have a discount

SOLUTION

```
clear;
gender = input('Introduce the sex of the driver (f/m): ','s');
age = input('Introduce the age of the driver: ');
rep1 = input('Introduce the number of reports in the last year: ');
rep2 = input('Introduce the number of reports in the last two years:
');
rep5 = input('Introduce the number of reports in the last five years:
');

if(((age >= 27) && (gender == 'f') && (rep1 == 0)) || ((age >= 27) &&
(gender == 'm') && (rep2 == 0)) || ((age < 27)  && (rep5 == 0)))
   disp('You have a discount');
else
   disp('You do not have a discount');
end
```

Exercise 11

Write a program that asks the user to introduce a day, month, and year and tells the user whether the date is correct or not. For this program, leap years are not considered (February will always have 28 days). Years before 0 will also be considered wrong.

Examples of execution:

Introduce the day: 23
Introduce the month: 3
Introduce the year: 2018
The date is correct

Introduce the day: 31
Introduce the month: 6
Introduce the year: 2019
Wrong date

SOLUTION

```
clear;
day = input('Introduce the day: ');
month = input('Introduce the month: ');
year = input('Introduce the year: ');

if(day <= 0) || (day > 31) || (month <= 0) || (month > 12) || (year <
0)
    disp('Wrong date');
elseif(day > 28) && (month == 2)
    disp('Wrong date');
elseif(day > 30) && ((month == 4) || (month == 6) || (month == 9) ||
(month == 11))
    disp('Wrong date');
else
    disp('The date is correct')
end
```

Exercise 12

Write a program that asks the user to introduce three numbers and indicates if they are all equal or if not, which one is the smallest number. Do not use vectors in this solution.

SOLUTION

```
clear;
varNumber1 = input('Introduce a number: ');
varNumber2 = input('Introduce another number: ');
varNumber3 = input('Introduce one more number: ');
if((varNumber1 == varNumber2) && (varNumber2 == varNumber3))
    disp('All numbers are equal');
elseif(varNumber1 > varNumber2)
    if(varNumber2 > varNumber3)
        fprintf('The smallest number is %d\n', varNumber3);
    else
        fprintf('The smallest number is %d\n', varNumber2);
    end
else
    if(varNumber1 > varNumber3)
        fprintf('The smallest number is %d\n', varNumber3);
    else
        fprintf('The smallest number is %d\n', varNumber1);
    end
end
```