

FLOWGORITHM Laboratory-1[Programming Structures]

NOTE: Laboratories in my course are called “Hands on workshops” in the syllabus.

Flowgorithm is a **free** Windows application that helps you create programs using simple flowcharts. It runs in Windows. Sorry there is no Mac version yet. You can download the application here:

<http://www.flowgorithm.org/index.htm>

Apple user can explore **Parallels Desktop** (or other apple emulator, see <https://iphonebyte.com/best-windows-emulator-mac/>) to run Windows applications on a Mac. Another emulator is **Wine** which is free.

Laboratory Problems.

Each problem illustrates a programming structure. Before starting, get into a HAPPY mood.



1. Construct a program by a flowchart that salutes the world: “**Hello World** program
2. Given the final score (e.g., **91%**) by the user, write a flowchart to assign the letter grade to a student (e.g., “**A**”). The standard grading curve applies (e.g., $90 < score \leq 80, grade = B$)
3. Write a flowchart for a program that computes the integer division of n [numerator] and d [denominator]. Integer Division (also called Long Division) is the process of division of two integers which produces a quotient and a remainder both integers.

PROBLEM #1 (illustrate the sequence structure & complies with tradition)

TUTORIAL TO CONSTRUCT HELLO WORLD PROGRAM (this tutorial is available directly from the flowgorithm webpage)

Tutorial

This short tutorial shows how to create the classic *Hello World* program.

Start ▶

Tutorial - 1 of 8

Using this short tutorial, you are going to create a very simple program called *Hello World*. It is a traditional beginner's program that displays "Hello, world!" on the screen.

When you start a new flowchart, you will see two rounded rectangles called "terminals". These symbols represent the beginning and end of your program.

Many flowcharts display the text "start" in the top terminal. Flowgorithm, however, uses the text "Main". Most programming languages start with "Main" and Flowgorithm attempts to be consistent.

Let's Begin ▶

Flowgorithm

Tutorial - 2 of 8

Everything in a flowchart is represented by a shape. You will add your own shapes between the Main and End terminals.

To add a shape, move your mouse pointer over a line. If you can add a shape, the line will turn orange.

Now, either double-click or right-click to add a shape.

Next ▶

Tutorial - 3 of 8

A pop-up menu will appear that shows all the shapes you can add.

In flowcharts, each action your computer can perform is represented by a different shape. For example, input and output shapes are represented with parallelograms (slanted rectangles).

You can also paste from the clipboard using this menu. In the picture, it is grayed-out, so there isn't anything to paste yet.

Next ▶

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The *Hello World* program needs an output shape. It will allow the program to display information on the screen.

Move the mouse over the green parallelogram with the text "Output". It will highlight in blue.

Click on the shape. It will be added to your flowchart.

Clipboard

Miscellaneous

Comment

Breakpoint

Statement

Input / Output

Variables

Control

Looping

Input

Output

Declare

Assign

If

Call

While

For

Do

Next ▶

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Now your flowchart contains an output shape.

Currently, it is displayed in gray. In Flowgorithm, any shape that is gray is "incomplete". This means that the shape needs some information before it can work.

You need to tell Flowgorithm what you want it to output. This can be anything from the result of a calculation to a text message.

Now, double-click or right-click on the output shape to edit it.

Next ▶

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A window will appear titled "Output Properties". Using this window, you can specify what will be displayed on the screen.

Output shapes are fairly simple. They will output the result of an expression. This can be something like a text message, a variable, or the result of a calculation.

In the box, type "Hello, world!". You have to add the double-quotes around the text. In computer programming, this is called a String.

Now, click on OK to continue. You might get an error window if you didn't type it in correctly. If that happens, just edit the shape again and fix it.

Output Properties

Output

An Output Statement evaluates an expression and then displays the result to the screen.

Enter an expression below:

"Hello, world!"

OK Cancel

Next ▶

Tutorial - 7 of 8

The Output shape will now appear in green.

Since all the shapes are in color (nothing is gray), your program is complete. Now it is time to run it.

On the main toolbar, you should see a green icon that looks like the Play Button you use when playing a DVD or watching a video on YouTube.

Click on this icon to run your program. You can also press F5 on your keyboard or select Run from the Program menu.

Next ▶

Tutorial - 8 of 8

A new window should appear called the "Console Screen". In computer programming, the console is used to display and input textual information.

The Console Screen in Flowgorithm was modeled after the texting windows you use on your phone. So, it is like you are texting Flowgorithm!

Anyway, you have finished your first computer program. Congratulations!

Back to Documentation

Console

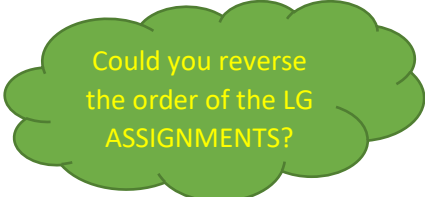
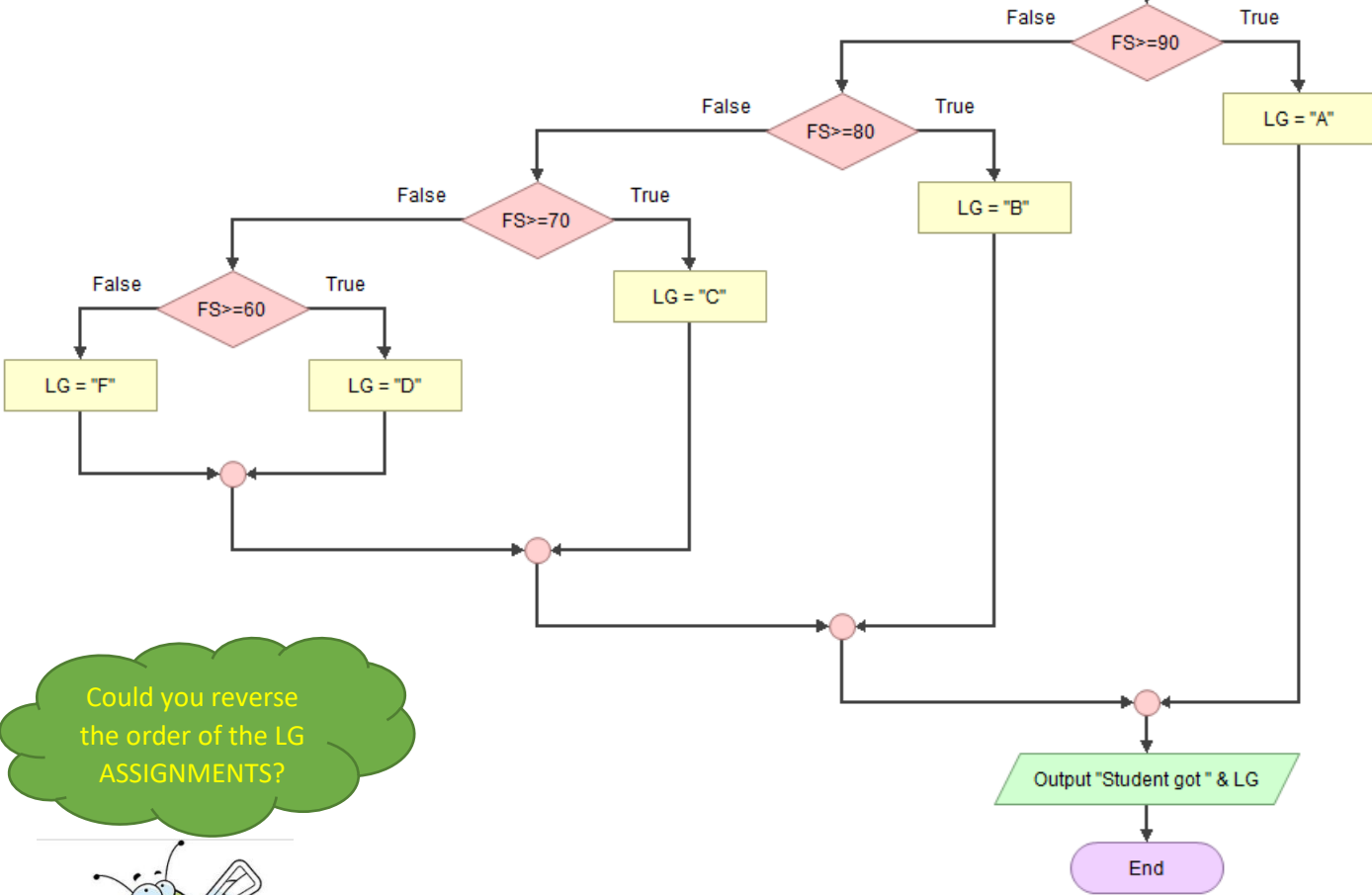
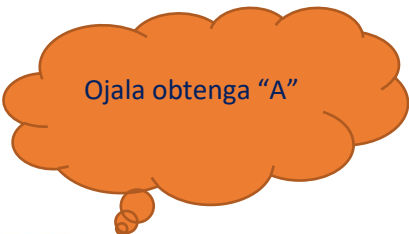
You have completed the Hello World tutorial !

This is the first program most programming students around the world perform by tradition, GREAT !

PROBLEM #2 (illustrate the use of selection structure—IF statements)

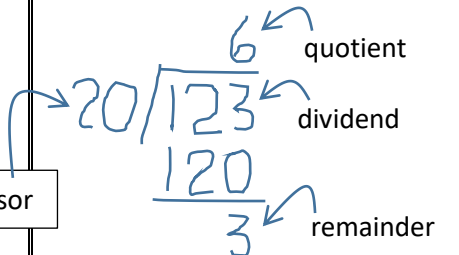
Given the final score, write a program to assign the letter grade to a student. The standard grading curve applies

<p>PSEUDOCODE (multialternative-IF)</p> <pre> INPUT score IF score >= 90 LG = "A" ELSEIF score >= 80 LG = "B" ELSEIF score >= 70 LG = "C" ELSEIF score >= 60 LG = "D" ELSE LG = "F" END PRINT "Student letter grade is", LG % Flowgorithm does not support the IF of multiple alternatives. Nested IF statements should be used instead % </pre>	<p>PSEUDOCODE (Nested IF/ELSE statements)</p> <pre> INPUT score IF score >= 90 LG = "A" ELSE IF score >= 80 LG = "B" ELSE IF score >= 70 LG = "C" ELSE IF score >= 60 LG = "D" ELSE LG = "F" END END END END PRINT "Student letter grade is", LG </pre>
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PROBLEM #3 (illustrates the use of Loops)

Integer Division (also called Long Division) is the division of an integer number by another, which produces a quotient and a remainder both integers. Procedure: You subtract repeatedly the divisor from the dividend until the current remainder is smaller than the divisor. Then the number of times you subtracted the divisor is the quotient, and the last remainder is the resulting remainder of the long division.

Example	Process:
	<pre> 123 % n=[numerator, dividend] - 20 ←1 % d=[denominator, divisor] 103 % r=[remainder], becomes new n in next iter. - 20 ←2 83 - 20 ←3 63 - 20 ←4 43 - 20 ←5 23 - 20 ←6 quotient 3 ← remainder is smaller than 20 </pre>

Quotient is the number of times you subtracted the divisor is equal or smaller than the remainder (i.e., until $n \leq d$), in the above example quotient = 6, and remainder = 3

PSEUDOCODE:

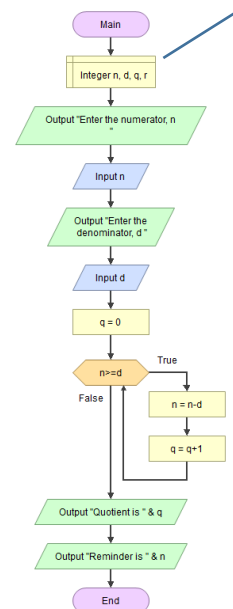
INPUT n % n = integer numerator
INPUT d % d =integer denominator

SET q=0 % q=quotient [a counter]
COMPUTE:
 WHILE n>=d
 n=n-d
 q=q+1
 END

PRINT "quotient is", q
PRINT "remainder is ", n



Why do I have to declare variables in flowgorithm?



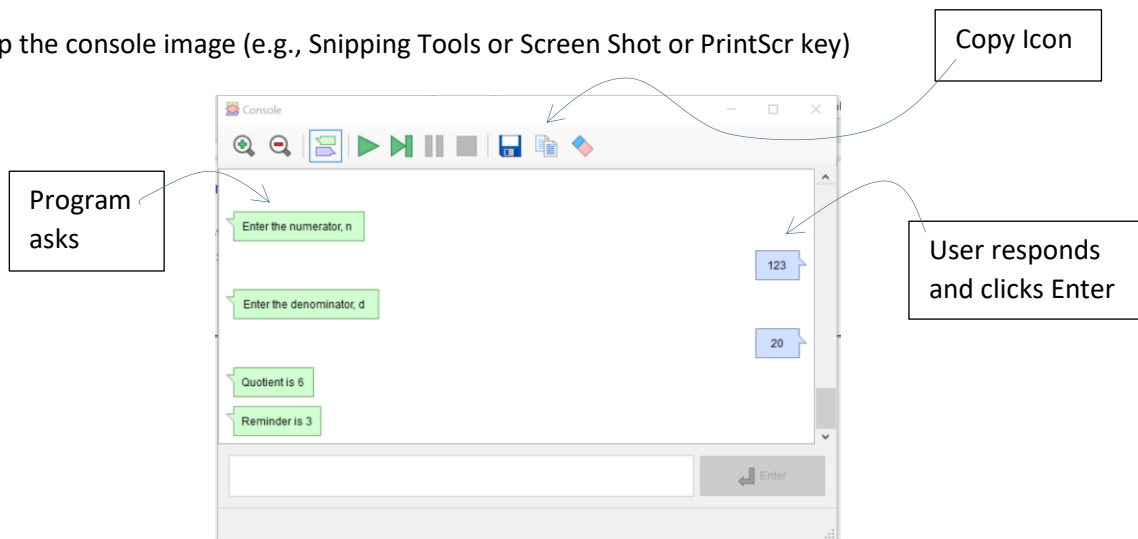
In the flowgorithm you can declare several variables in a single shape

OUTPUT (Copy icon in the console)

```

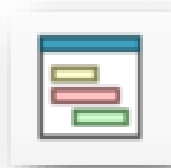
Enter the numerator, n
123
Enter the denominator, d
20
Quotient is 6
Remainder is 3
    
```

You can also trap the console image (e.g., Snipping Tools or Screen Shot or PrintScr key)

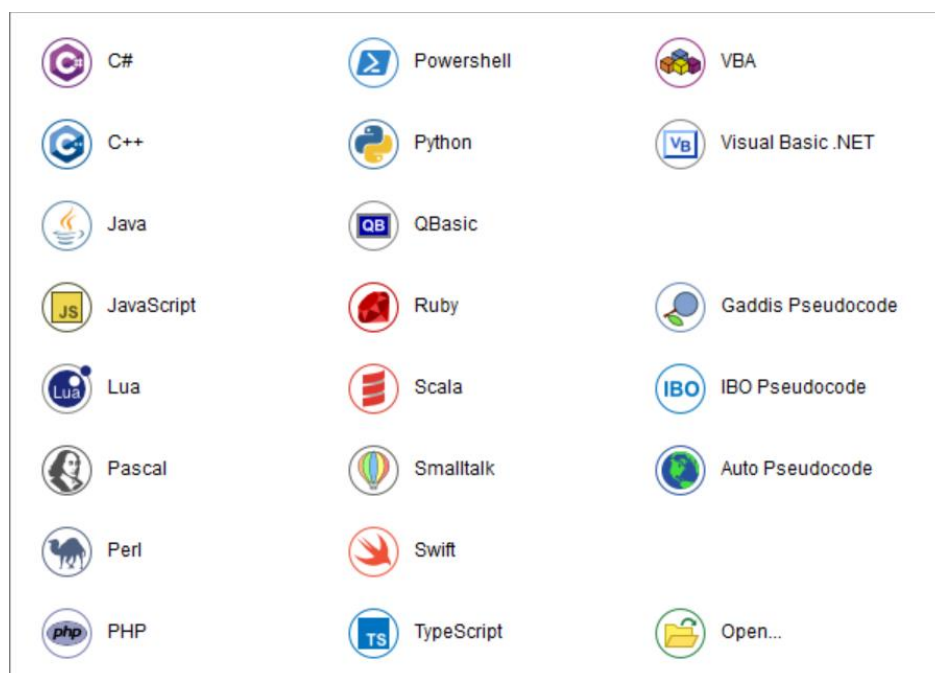


PROBLEM#4

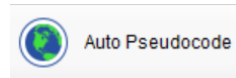
Flowgorithm's Source Code Viewer allows flowcharts to be converted to several real-world programming languages. This generated source code, is created by using program templates. While in the Flowgorithm editor choose the option:



Clicking on the above Icon opens the Source Code Viewer and you can translate your flowchart to different languages.



For example, if you choose:

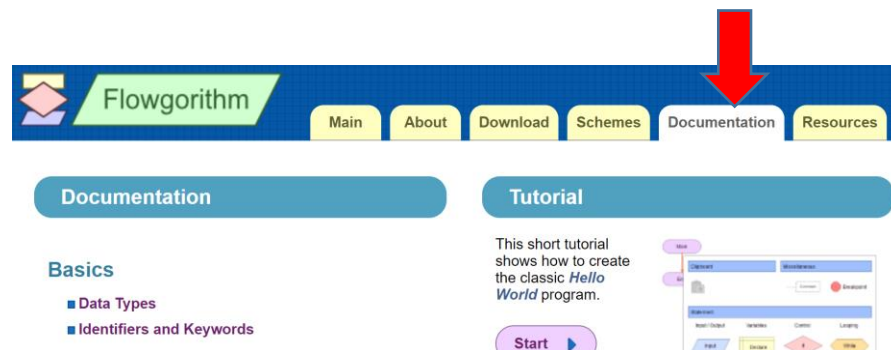


will yield the second column in the table below:

Flowchart Graphical Editor	Source Code Viewer

PROBLEM#5

- (A) What and how many library function (called intrinsic functions) are supported by flowgorithm?
- (B) What and how many Data Types are supported by flowgorithm?



QUIZ

- (1) What is variable declaration? What is it for?
- (2) What type of data does flowgorithm support? Where do you find this information?
- (3) How do you implement the multi-alternatives-IF in flowgorithm?
- (4) How do you export the flowchart as an image and paste it into a word document?
- (5) How do you export the output of a given program?
- (6) You discovered your running program has something wrong (e.g., infinite loop), how do you stop it in flowgorithm?
- (7) What is a counter?
- (8) Is it possible to run more than one program at a time? Should you?

BIG NOTE: **Python** do have the multi-alternative if structure, as seen below:

```
score=float(input("Enter the final score="))
```

```
if score>=90:
```

```
    LG="A"
```

```
elif score>=80:
```

```
    LG="B"
```

```
elif score>=70:
```

```
    LG="C"
```

```
elif score>=60:
```

```
    LG="D"
```

```
else:
```

```
    LG="F"
```

```
print("Student letter grade is", LG)
```