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.

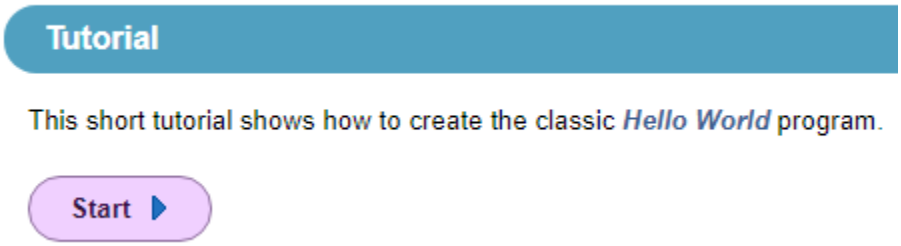
Laboratory Problems.

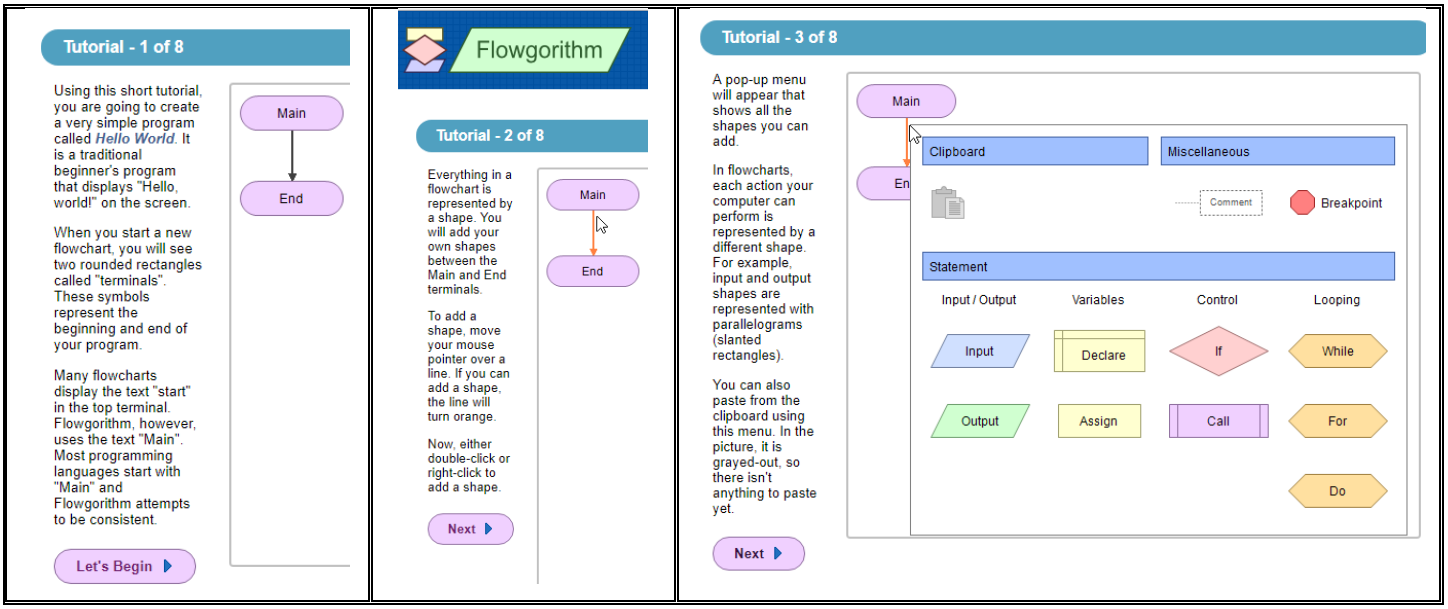
Each problem illustrates a programming structure. Before starting, get into a HAPPY mood.

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 reminder 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)





Flowgorithm

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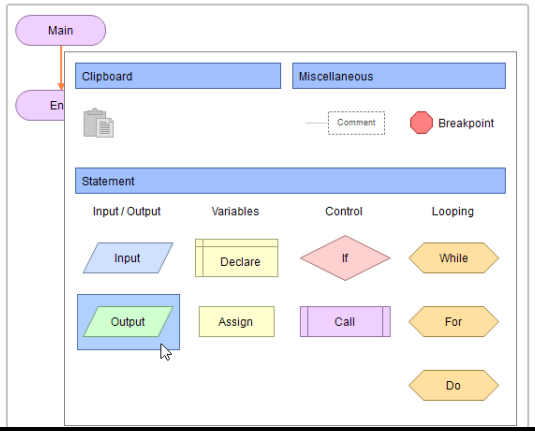
The *Hello World* program needs an output shape. It will allow the program to display information on the screen.

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.

Next



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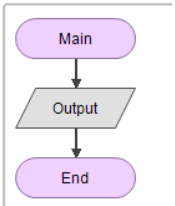
Now your flowchart contains an output shape.

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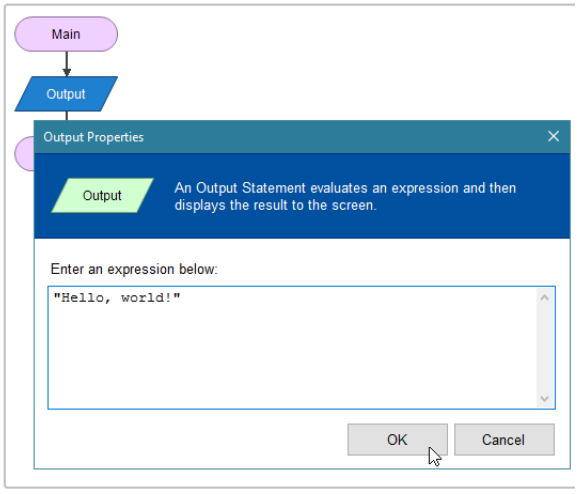
A window will appear titled "Output Properties". Using this window, you can specify what will be displayed on the screen.

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.

Next



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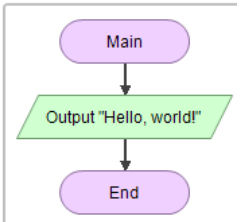
The Output shape will now appear in green.

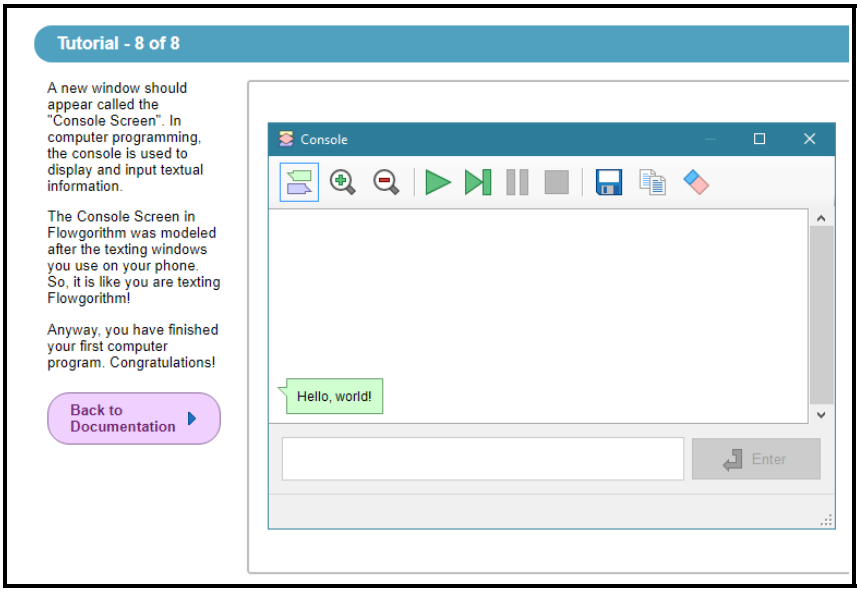
Since all the shapes are in color (nothing is gray), your program is complete. Now it is time to run it.

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





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)

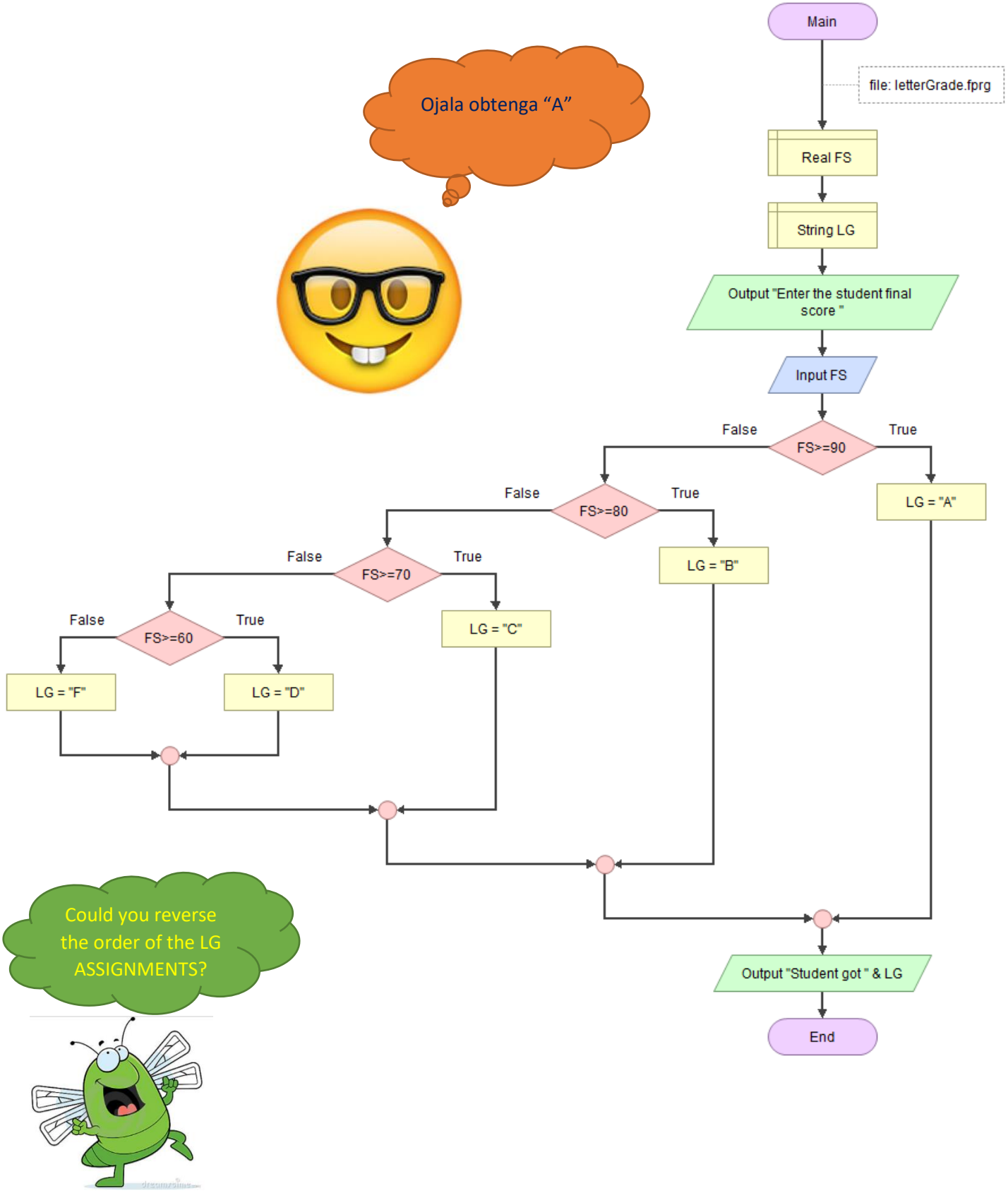
Given the final score, write a program to assign the letter grade to a student. The standard grading curve applies

PSEUDOCODE (multialternative-IF)

```
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 %
```

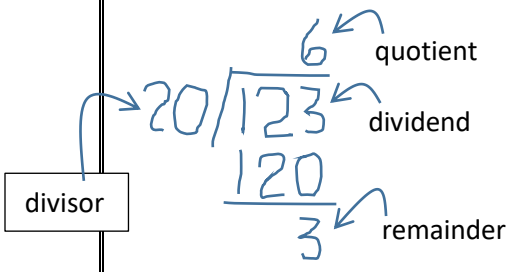
PSEUDOCODE (Nested IF/ELSE statements)

```
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
```


Ojala obtenga “A”
Main
file: letterGrade.fprg
Real FS
String LG
Output "Enter the student final score "
Input FS
False
FS>=90
True
LG = "A"
False
FS>=80
True
LG = "B"
False
FS>=70
True
LG = "C"
False
FS>=60
True
LG = "F"
LG = "D"
Output "Student got " & LG
End
Could you reverse the order of the LG ASSIGNMENTS?

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 reminder both integers. Procedure: You subtract repeatedly the divisor from the dividend until the current reminder is smaller than the divisor. Then the number of times you subtracted the divisor is the quotient, and the last reminder is the resulting reminder of the long division.

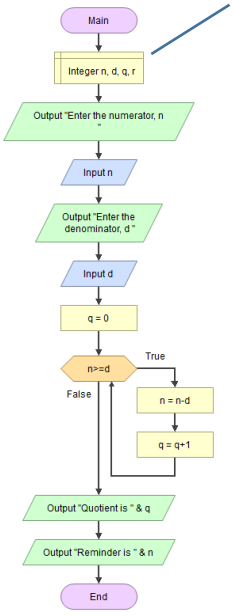
Example	Process:
	123 % n=[numerator, dividend] - 20 ←1 % d=[denominator, divisor] 103 % r=[reminder], becomes new n in next iter. - 20 ←2 83 - 20 ←3 63 - 20 ←4 43 - 20 ←5 23 - 20 ←6 quotient 3 ← reminder is smaller than 20

Quotient is the number of times you subtracted the divisor is equal or smaller than the reminder (i.e., until n<=d), in the above example quotient = 6, and reminder = 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 “reminder is “, n
```

Why do I have to declare variables in flowgorithm?

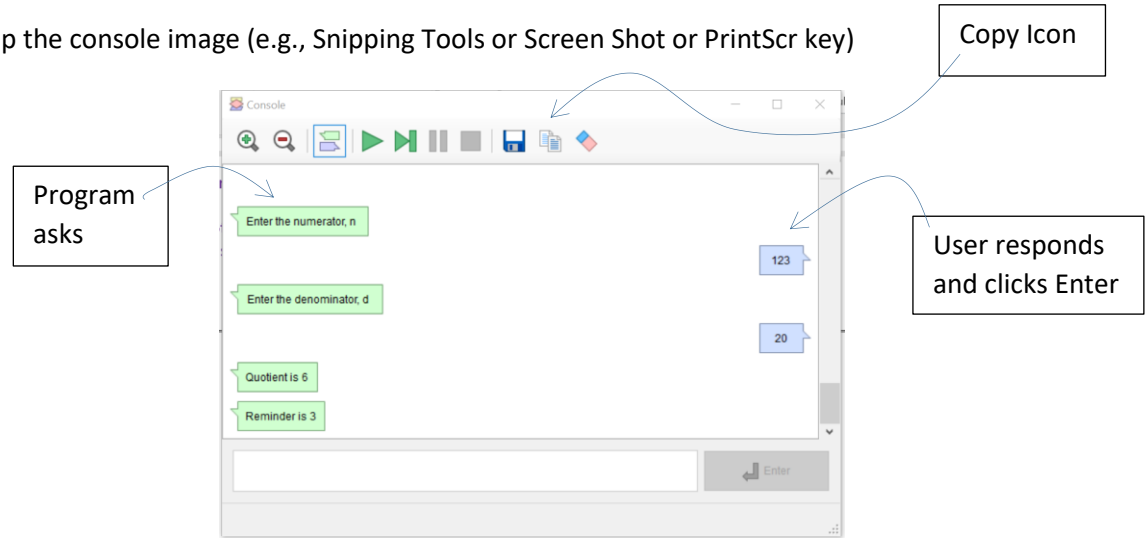


In the flowgorithm you can declare several variables in a single shape

OUTPUT (Copy icon in the console)

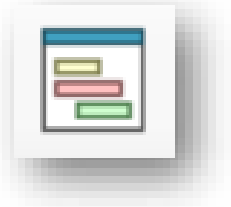
Enter the numerator, n
123
Enter the denominator, d
20
Quotient is 6
Reminder is 3

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

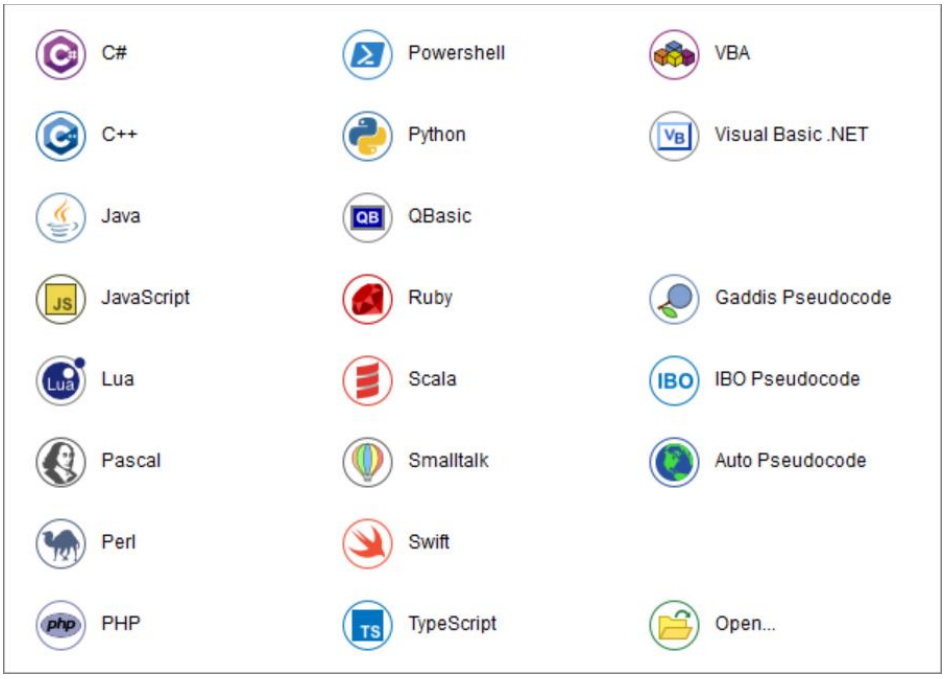


PROBLEM#4

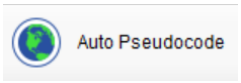
Flowgorithm's Source Code Viewer allows flowcharts to be converted to several real-world programming languages. This generated source code, is created by using program templates. While in the Flowgorithm editor choose the option:



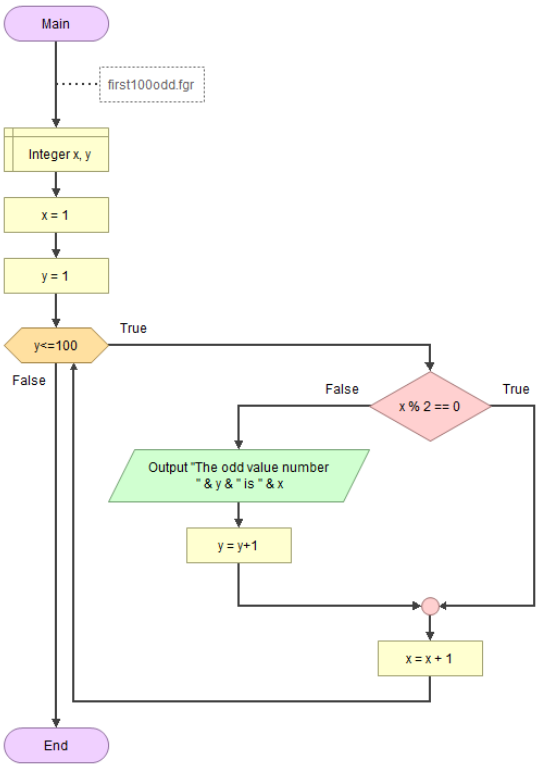
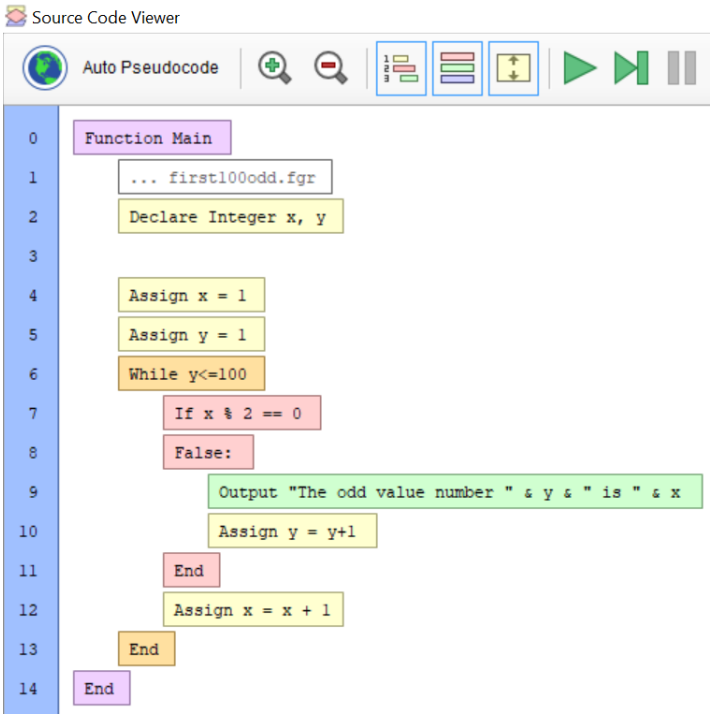
Clicking on the above Icon opens the Source Code Viewer and you can translate your flowchart to different languages.



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)
```