Introduction to Programming

Week 01
Algorithm

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Content

Algorithm is the core of an application.

Flowchart is a common way to describe an algorithm. (Another way is pseudo-code)

6 fundamental symbols:

- "Start": a rounded rectangle
- "Input": a parallelogram
- "Process": a rectangle
- "Output": a parallelogram
- "End": a rounded rectangle
- And a line with arrow to connect all above elements.

In this lab, we practice to draw several basic flowcharts.

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Basic flowchart understanding

How to write an algorithm: https://youtu.be/DDAqV2N1j_Y

How to create a compressed file: https://youtu.be/aFo9So11s4E

Submit to Moodle: https://youtu.be/2Hbm5Os10jw

Programming is the process to write a program / an application.

Specifically, programming includes 4 steps:

- Step1: Understanding your problem.

- Step 2: Designing an algorithm.

- Step 3: Writing source code.

- Step 4: Packaging source code files into an executable file, a website, an apk, or an ipa file.

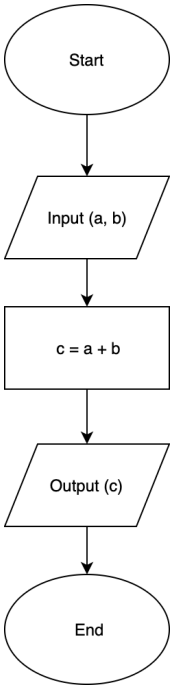
You may think step 3 is the most important step. But, actually, step 2 is the most one.

Without step 2, you don't know how to solve a problem manually. Then, you don't know to teach your computer how to solve it, by writing source code.

For example, do you know an algorithm to find the shortest path from 2 specific locations? If you don't, how can to implement a C++ / Python source code to find the shortest path?

There are 2 ways to express an algorithm: drawing a ***flowchart***, or writing a ***pseudo-code***.

Here is an example of a flowchart to solve a problem: compute the sum of 2 integers a, b.

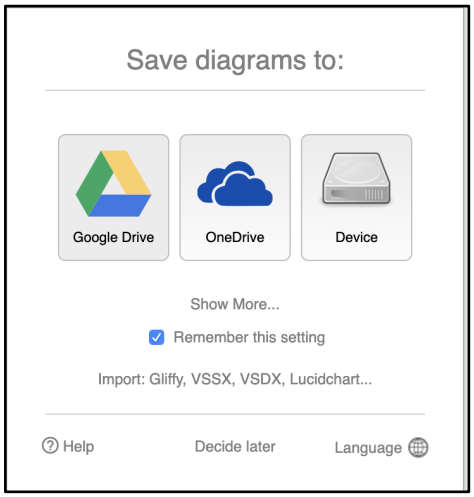

Start
Input (a, b)
c = a + b
Output (c)
End

3 Basic flowchart creation in draw.io

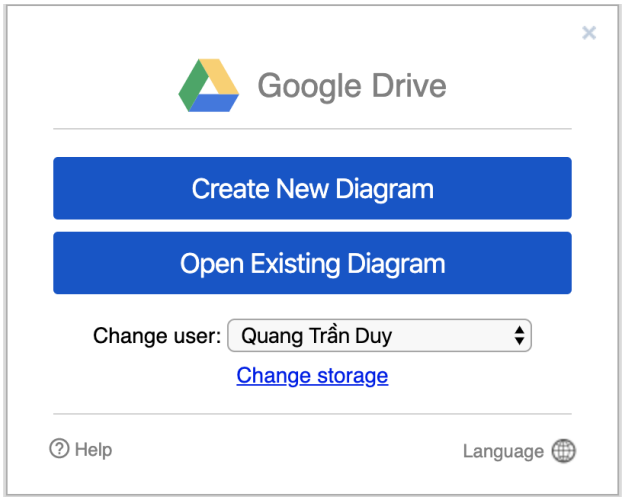
(Credit to Mr. Trần Duy Quang)

Using draw.io to create flowchart

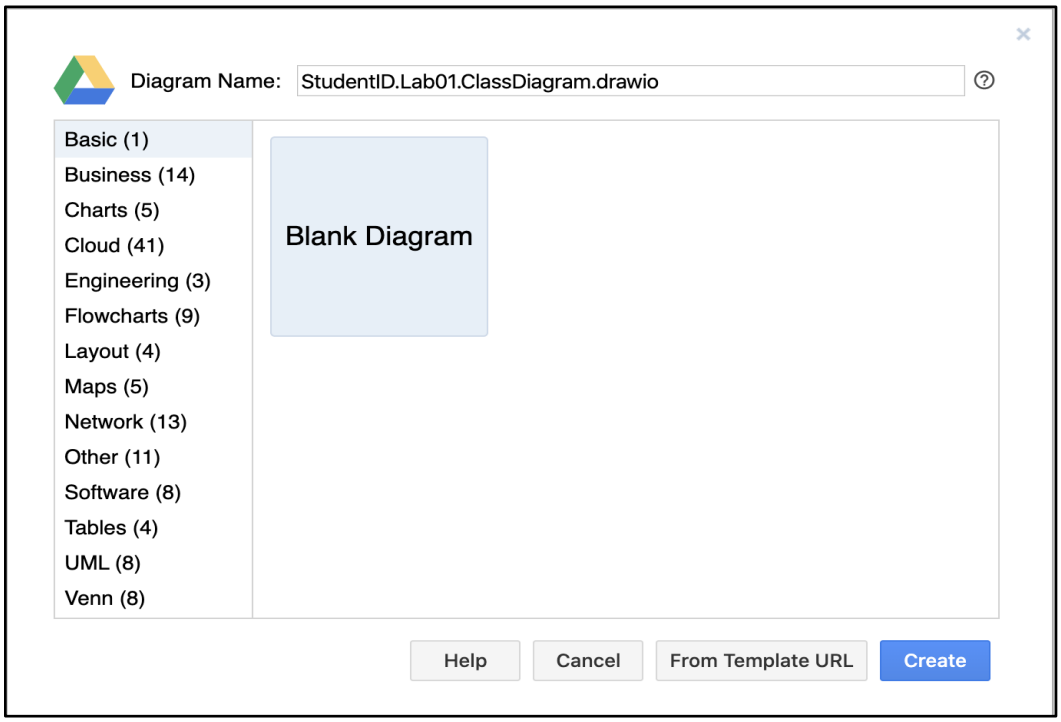
- **Step 01**: Access http://draw.io, choose to save your flowcharts using Google Drive (recommended).



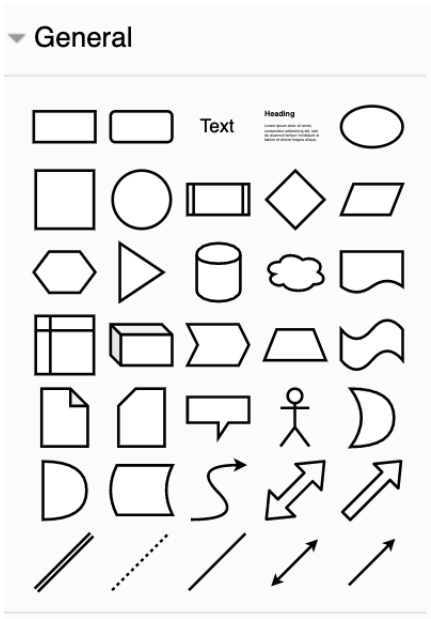
- **Step 02**: Choose **Create new diagram** to create a blank diagram.



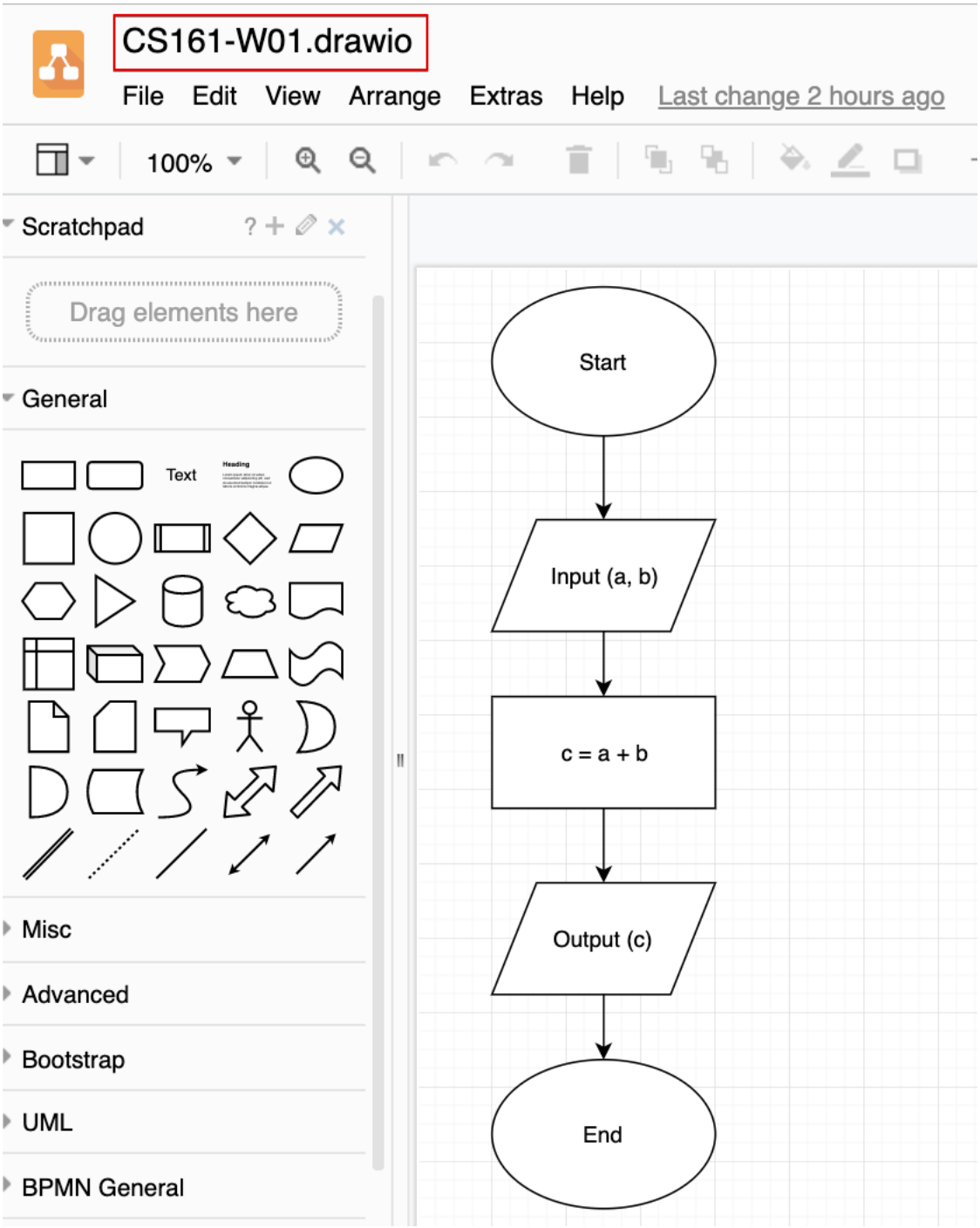
- Step 03: Create a Blank diagram, name it in the following format:



- Step 04: On the left panel, expand the Flowchart node for all the shapes needed for creating a flowchart



- Step 05: Create your first flow charts



- Step 6: To submit your work. Firstly, drag and select your diagram. Secondly, choose menu File – Export as – PNG. Thirdly, Zoom: 200%, Selection Only. Export. Finally, choose your local device and download.

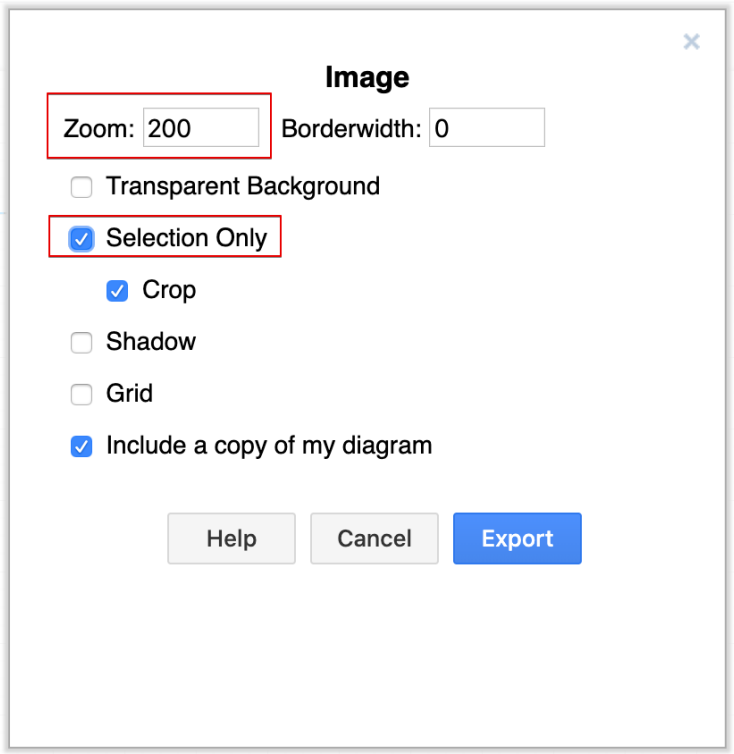
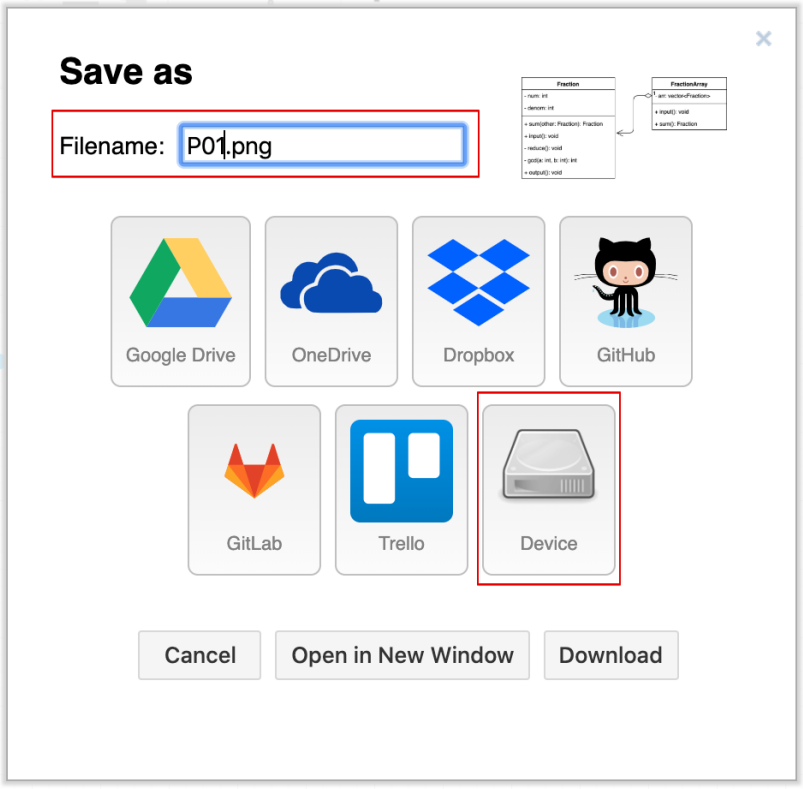


Image
Zoom: 200
Borderwidth: 0
Transparent Background
Selection Only
Crop
Shadow
Grid
Include a copy of my diagram
Help
Cancel
Export


Save as
Filename: P01.png
Google Drive
OneDrive
Dropbox
GitHub
GitLab
Trello
Device
Cancel
Open in New Window
Download

4 Assignments

A: YY: 02 => P01, P13.

H: YY: 10 => P01, P05, P06, P10, P13, P16, P17, P23, P24, P25.

Flowchart: 5 problems.

Pseudo-code: 5 problems.

P01 – SUM OF 2 NUMBERS

Write a program that allows user to enter 2 integer numbers. Compute the sum of them and output to the console.

Input

3 5

Output

3 + 5 = 8

P05 – DIVISION OF 2 NUMBERS

Write a program that allows user to enter 2 integer numbers a, b. Divide a by b and output the result to the console.

Input:

9 2

Output:

9 / 2 = 4.50

P06 – SIN OF AN ANGLE

Write a program that allows user to a angle (in degree). Use the built-in sin function to find the sin of this angle.

Input

30.0

Output

0.50

P10 – ELECTRICITY

Write a program that allows user to enter 2 electricity indices of last month and this month in a household. How many electricity power in KWh that the household consumed?

Input

1000 1211

Output

211

P13 – TRIANGLE

Write a program that allows user to enter 3 edges of a valid triangle. Compute the perimeter and area of the triangle.

Input

3.00 4.00 5.00

Output

12.00 6.00

P16 – VEHICLE PLATE NUMBER

Write a program that allows user to compute the lucky number of a vehicle plate number. Assuming that a vehicle plate number has 5 digit.

Input

12345

Output

5

Explanation

(1 + 2 + 3 + 4 + 5) % 10 = 15 % 10 = 5

P17 – CASH CHANGE

Write a program that allows user to enter an amount of money. Which money sheets are received.

Assuming that we have the following sheets: 500.000, 200.000, 100.000, 50.000, 20.000, 10.000, 5.000, 2.000 and 1.000.

Prefer a bigger-value sheet rather than a smaller-value ones.

Input

2361000

Output

500000: 4

200000: 1

100000: 1

50000: 1

20000: 0

10000: 1

5000: 0

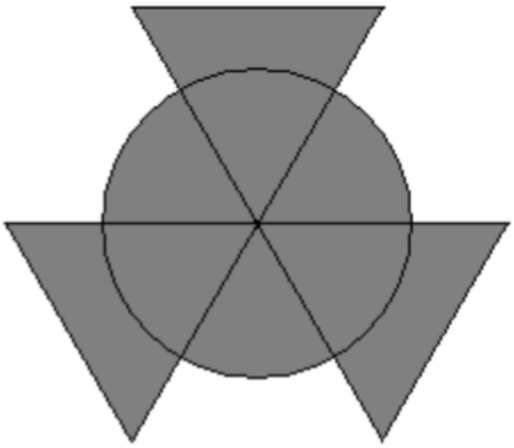
2000: 0

1000: 1

P23 – AREA OF SHAPE

Write a program that allows user to enter an edge of the equilateral triangle and the radius of the circle.

Compute the area of the following gray shape. Assuming that PI = 3.14.



P24 – REFUND DISCOUNT

A shopping promotion states that the customer will be refunded X = 40% of transaction amount, maximum Y = 100.000. How much should the client pay to get the maximum discount?

Input

40

100000

Output

250000

P25 – PACE AND SPEED

On 2019-10-12, Eliud Kipchoge, finished his marathon of 42.195km on 1 hours, 59 minutes and 40.2 seconds, a world record at this time.

Write a program that allows user to enter to the length in km and the time. Compute the athlete space and speed.