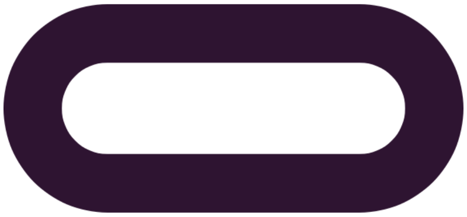
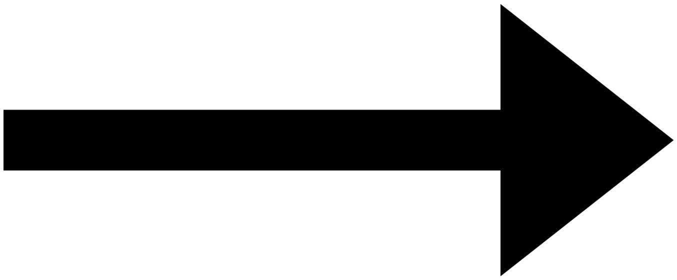
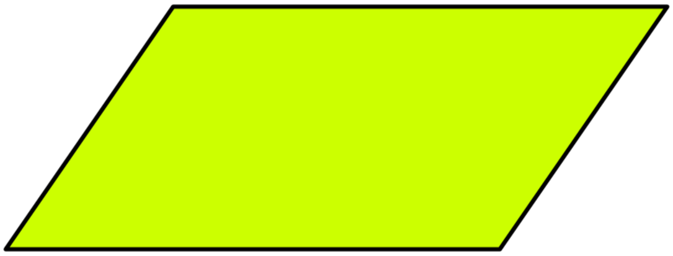
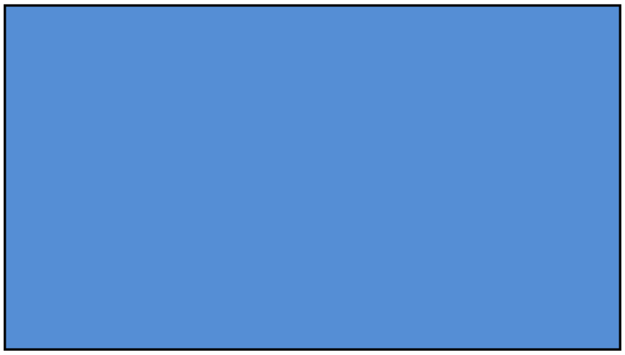
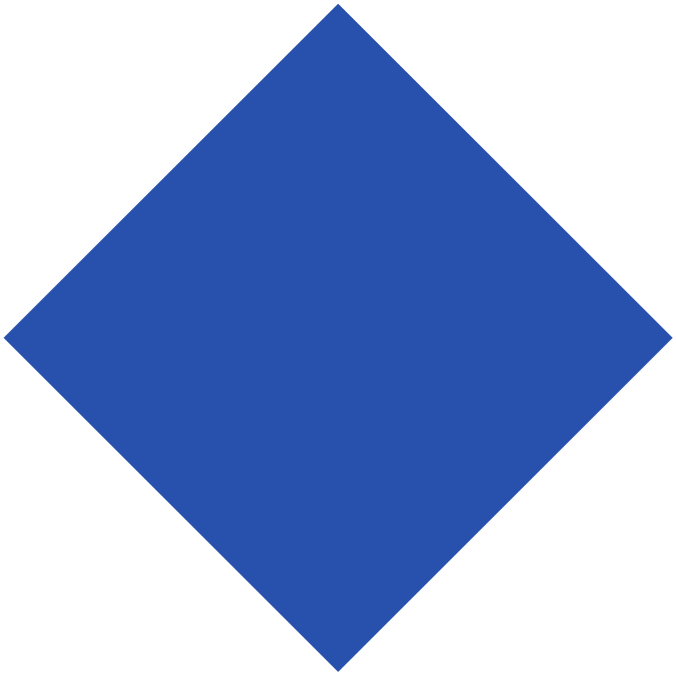
Introduction to Flowcharts and Algorithms

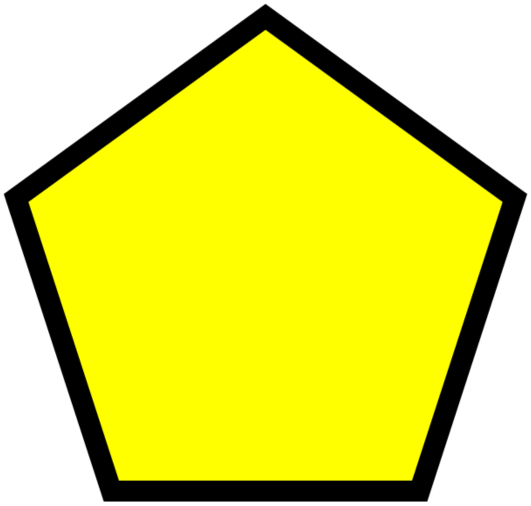
PART I: Introduction to flowcharts

A flowchart is a graphical representation of an algorithm. These flowcharts play a vital role in the programming of a problem and are quite helpful in understanding the logic of complicated and lengthy problems. Once the flowchart is drawn, it becomes easy to write the program in any high level language. Often we see how flowcharts are helpful in explaining the program to others. Hence, it is correct to say that a flowchart is a must for the better documentation of a complex program.

Flowcharts are usually drawn using some standard symbols; however,

Symbol	Purpose
	OVAL-2 per algorithm -used to indicate the start and end of an algorithm
	ARROW-used to show the direction of the logic and connects different parts together
	PARALLELOGRAM -used for all inputs and outputs

	RECTANGLE-for math and data processing
	DIAMOND-used for decisions -only symbol to have 2 arrows exiting it
	PENTAGON-comes as a pair, is labeled with matching capital letters-is used to connect distant parts

		of an algorithm together

The following are some guidelines in flowcharting:

a. In drawing a proper flowchart, all necessary requirements should be listed out in logical order.
b. The flowchart should be clear, neat and easy to follow. There should not be any room for ambiguity in understanding the flowchart.
c. The usual direction of the flow of a procedure or system is from left to right or top to bottom.
d. Only one flow line should come out from a process symbol.

e. Only one flow line should enter a decision symbol, but two, one for each possible answer, should leave the decision symbol.

f. Only one flow line is used in conjunction with terminal symbol.

h. If the flowchart becomes complex, it is better to use connector symbols to reduce the number of flow lines. Avoid the intersection of flow lines if you want to make it more effective and better way of communication.
i. Ensure that the flowchart has a logical *start* and *finish.*
j. It is useful to test the validity of the flowchart by passing through it with a simple test data.

Software that can aid the design of flowcharts include:

creately.com

https://www.lucidchart.com

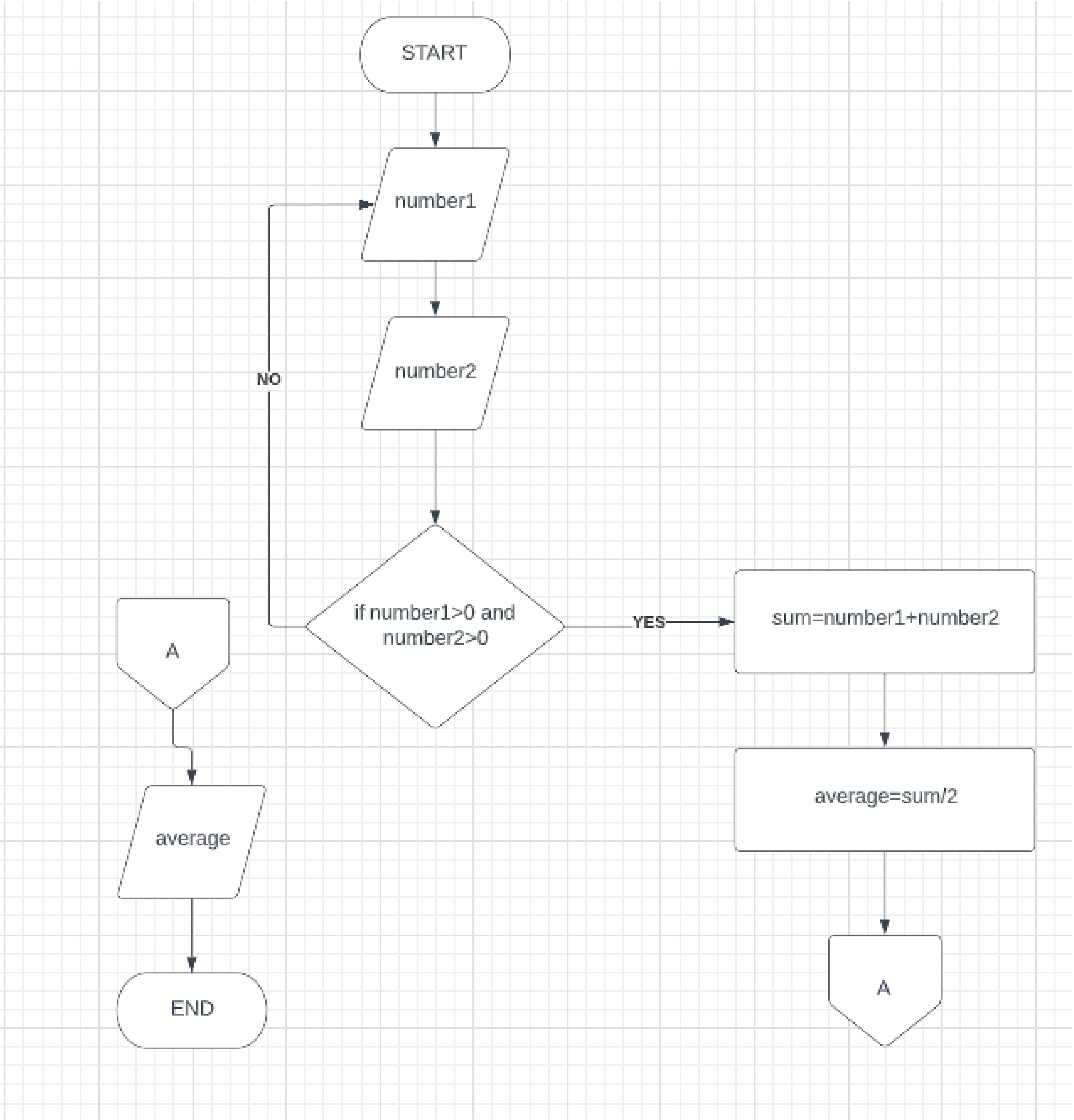
http://www.gliffy.com/

diaportable

PART II: Example of a flowchart:

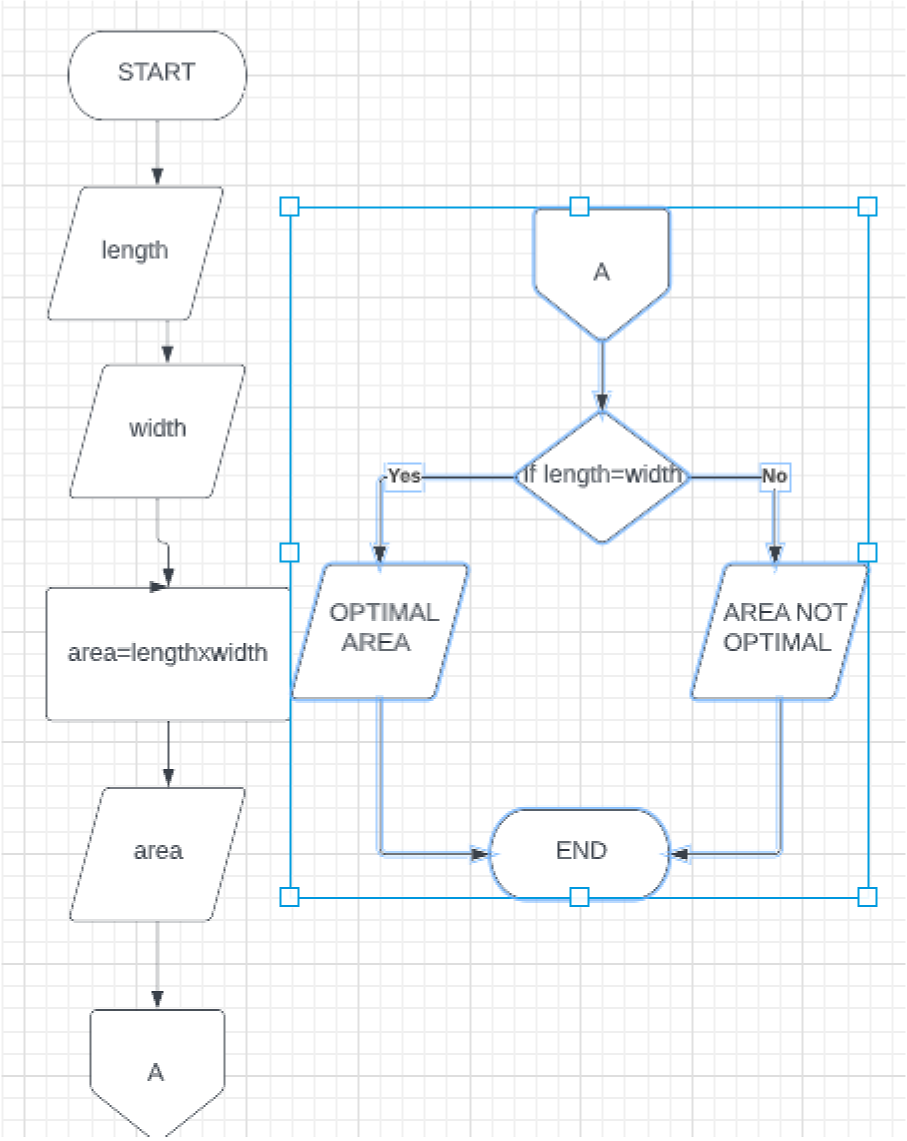
Problem 1: Write an algorithm and draw the flowchart for finding the average of two positive numbers (check that numbers entered are positive).

Algorithm:


START
number1
number2
NO
if number1>0 and number2>0
YES
sum=number1+number2
average=sum/2
A
A
average
END

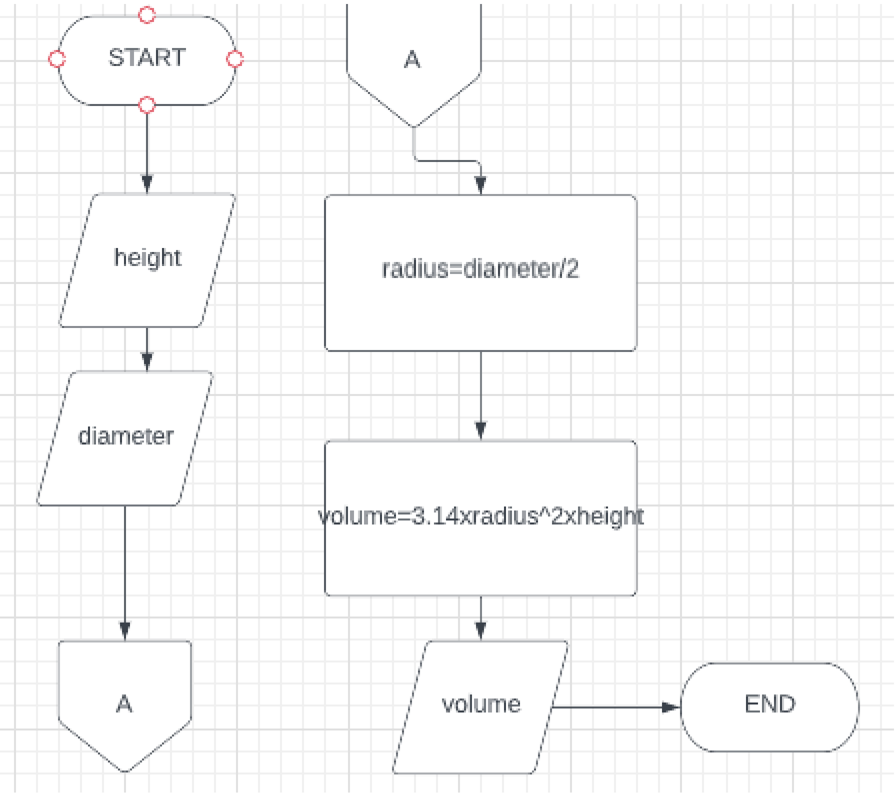
PART III: Problem 2: Write an algorithm for finding the area and perimeter of a rectangle by getting the length and width. If the dimensions represent a square indicate that the area is optimal given the perimeter.

<u>Algorithm:</u>

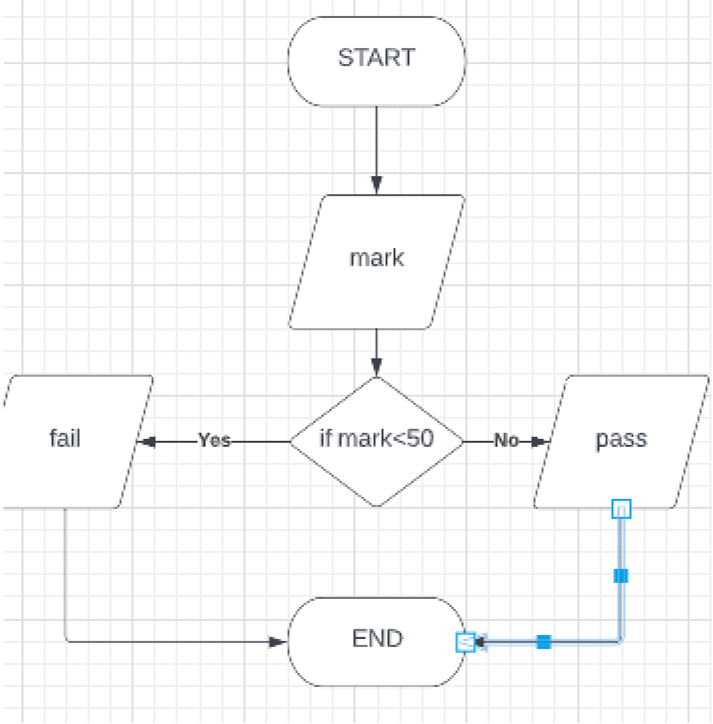


Practice:

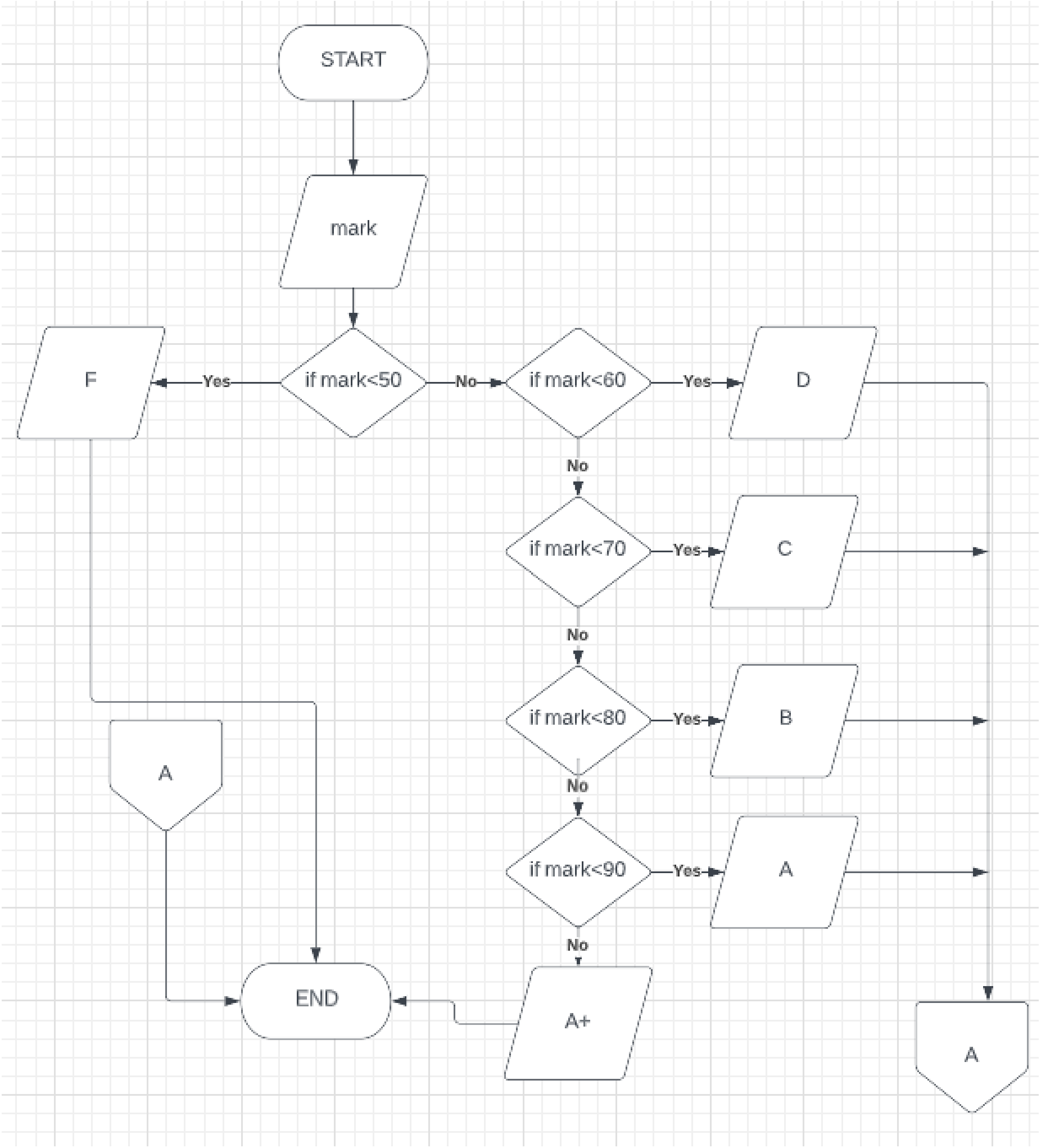
Draw a flowchart to find the volume of a cylinder by first asking for its height and diameter.



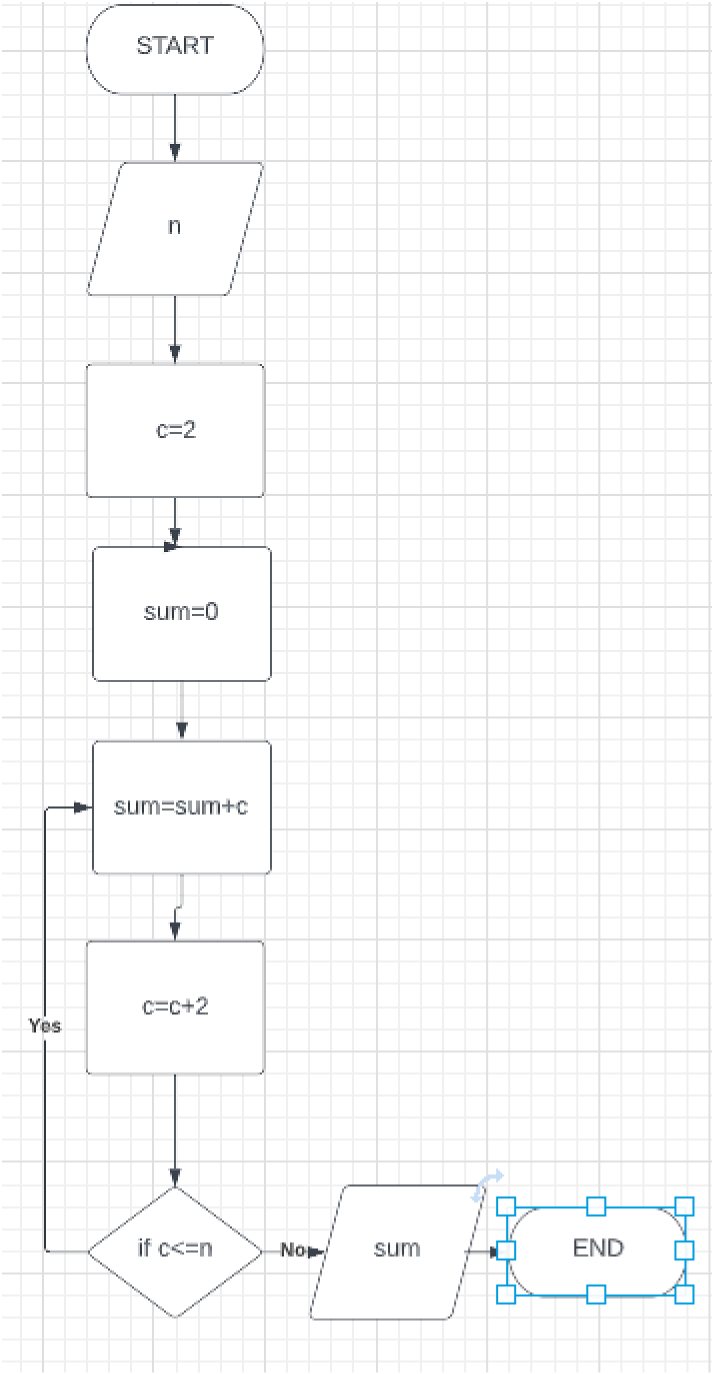
Draw a flowchart to ask a student for their mark and tell them if they failed or not.



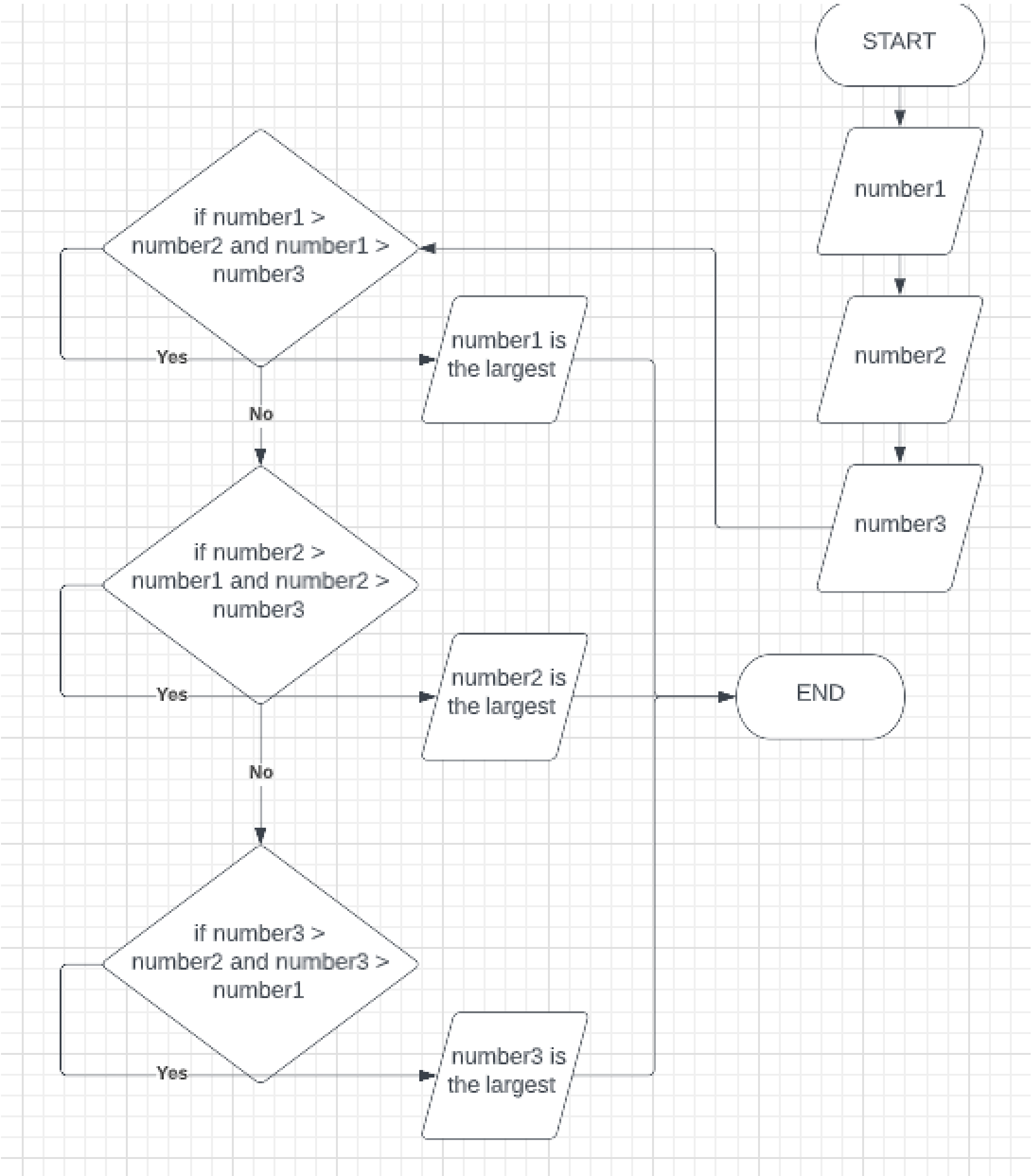
Modify the last flowchart so that you also tell them their letter grade i.e. A+,A,B,C,D,F.



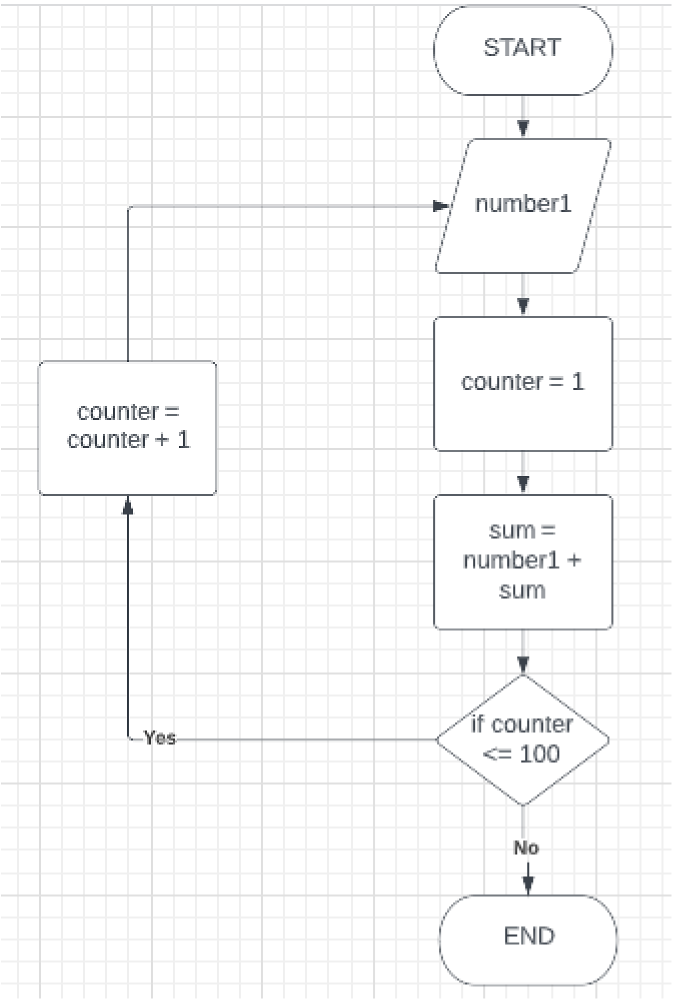
Design an algorithm and the corresponding flowchart for finding the sum of the numbers 2, 4, 6, 8, …, n



Using flowcharts, write an algorithm to read three numbers then display the largest.

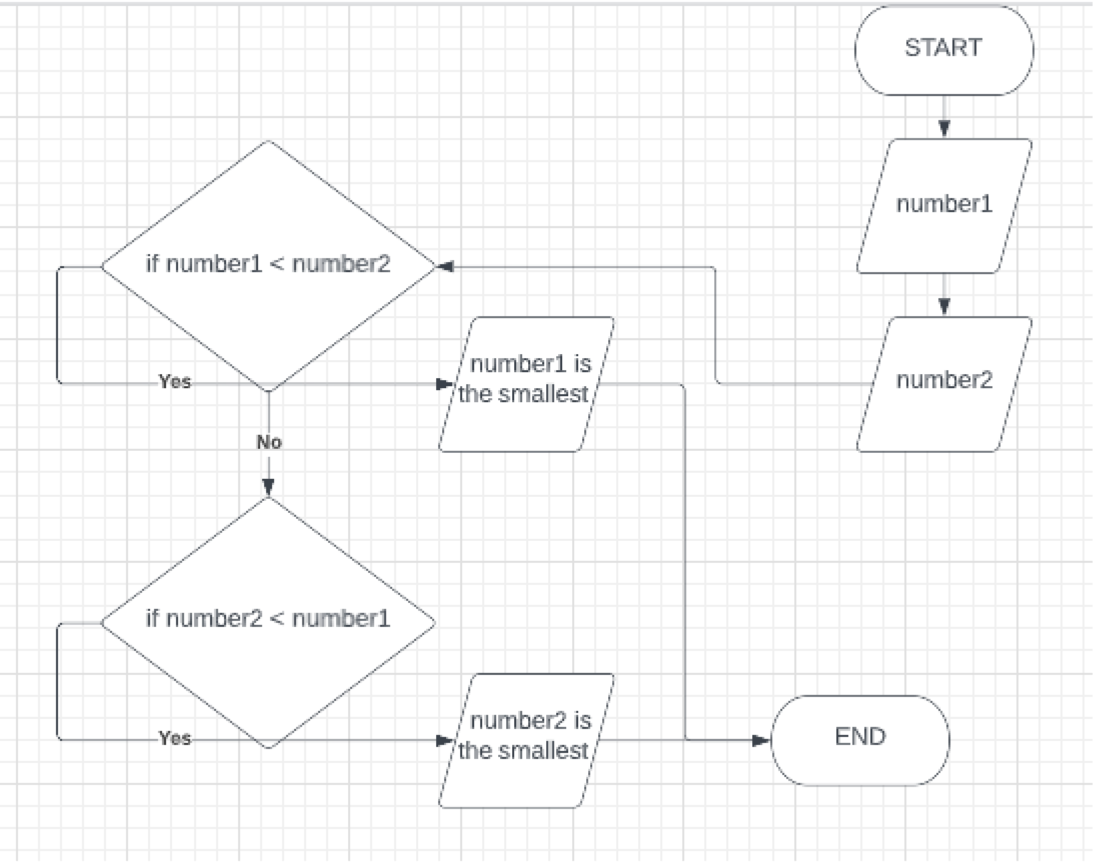

START
number1
number2
number3
if number1 > number2 and number1 > number3
Yes
No
number1 is the largest
if number2 > number1 and number2 > number3
Yes
No
number2 is the largest
END
if number3 > number2 and number3 > number1
Yes
number3 is the largest

Using flowchart, write an algorithm to read 100 numbers and then display the sum.

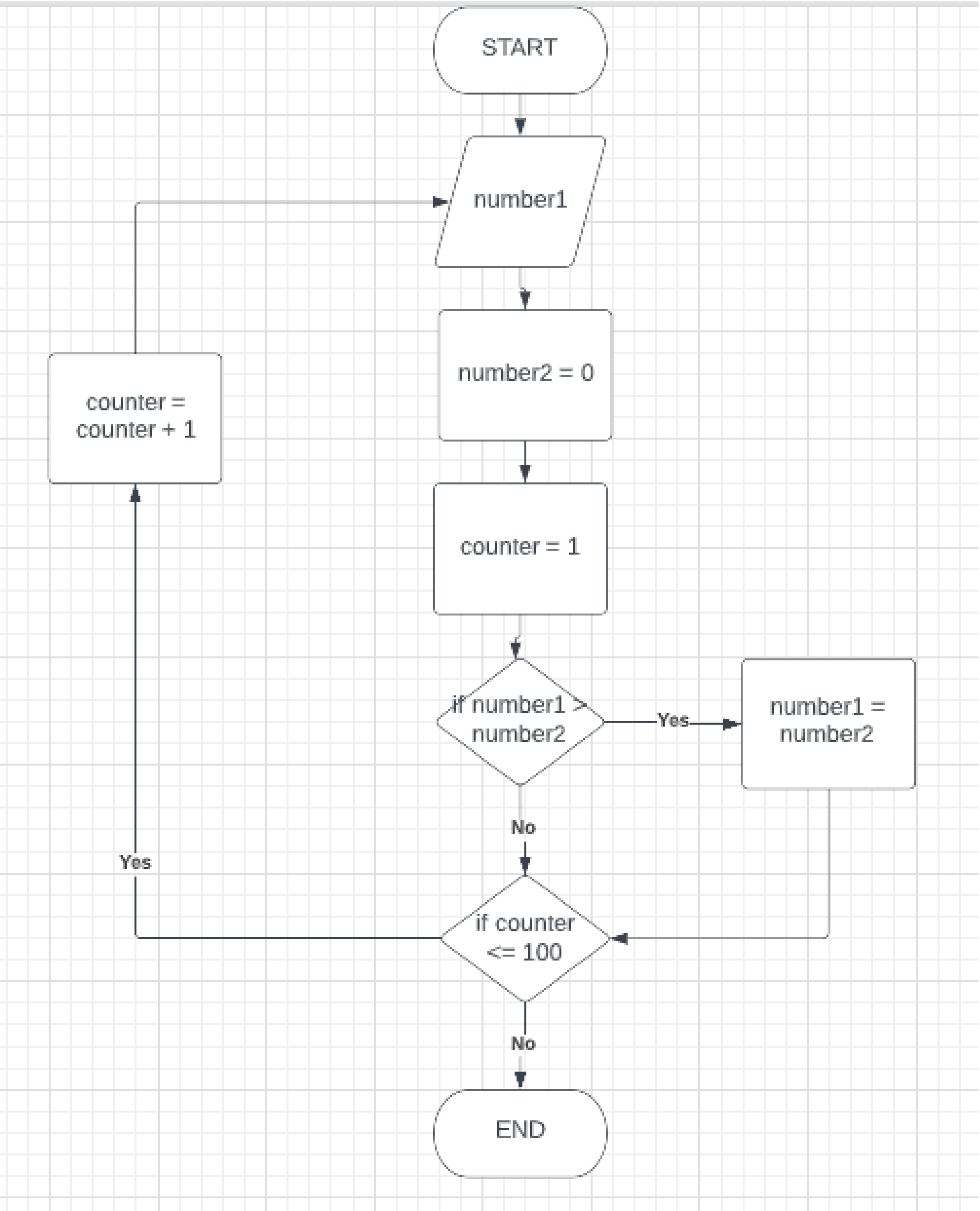


Using flowcharts, write an algorithm to read two numbers then display the largest.

Using flowchart, write an algorithm to read two numbers then display the smallest



Using flowchart, write an algorithm to read 100 numbers then display the largest.



Draw a flowchart for a program that will input a list of N test scores (test score >= 0) and finds the average test score and the number of the students whose score is 50 or above