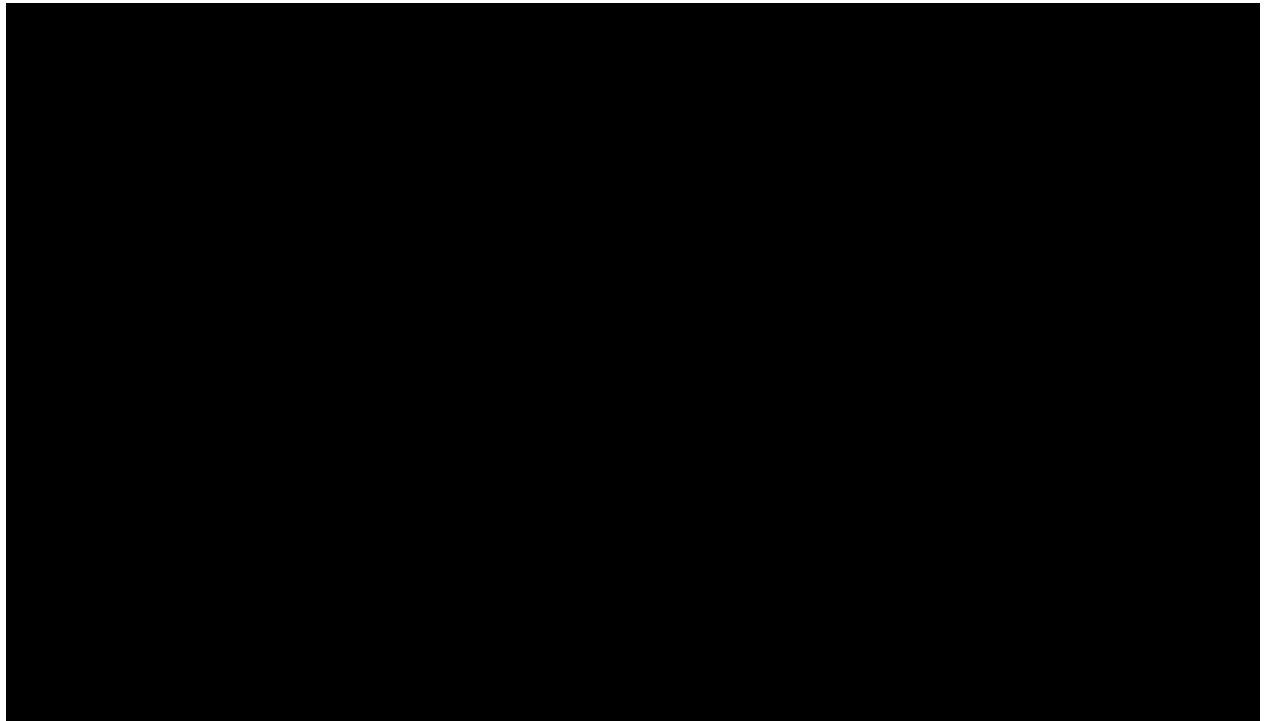


# Computing Science 10

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## SECTION 2

[What's an algorithm? TED-ED](#)



**Demonstrate an understanding of the nature, design and use of basic algorithms associated with problems involving the sequential inputting, processing and outputting of data**

*Define algorithms and explain how they are used*

An algorithm is a general solution of a problem which can be written as a verbal description of a precise, logical sequence of actions.

The instructions should be simple enough that each step can be done without thinking about it.

Algorithms are often used to describe how a computer might solve a problem.

***Real World Examples: Cooking recipes, assembly instructions for appliances and toys, or precise directions to reach a friend's house, are all examples of algorithms.***

A computer program is an algorithm expressed in a specific programming language. An algorithm is the key to developing a successful program.

### ***Informal definition for algorithm***

***“A set of rules that precisely defines a sequence of operations”***

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There is usually more than one way to solve a problem. There may be many different recipes to make a certain dish which look different but end up tasting the same when all is said and done. The same is true for algorithms. However, some of these ways will be better than others.

**Complexity** measures how hard an algorithm is. When we ask how complex an algorithm is, often we want to know how long it will take a computer to solve the problem at hand.

## *Demonstrate a number of core algorithms*

### **SORTING BY COLORS**

This is an example of an algorithm for sorting cards with colors on them into piles of the same color:

STEP 1 - START

STEP 2 - PICK UP ALL OF THE CARDS.

STEP 3 - PICK A CARD FROM YOUR HAND AND LOOK AT THE COLOR OF THE CARD.

STEP 4 - IF THERE IS ALREADY A PILE OF CARDS OF THAT COLOR, PUT THIS CARD ON THAT PILE.

STEP 5 - IF THERE IS NO PILE OF CARDS OF THAT COLOR, MAKE A NEW PILE OF JUST THIS CARD COLOR.

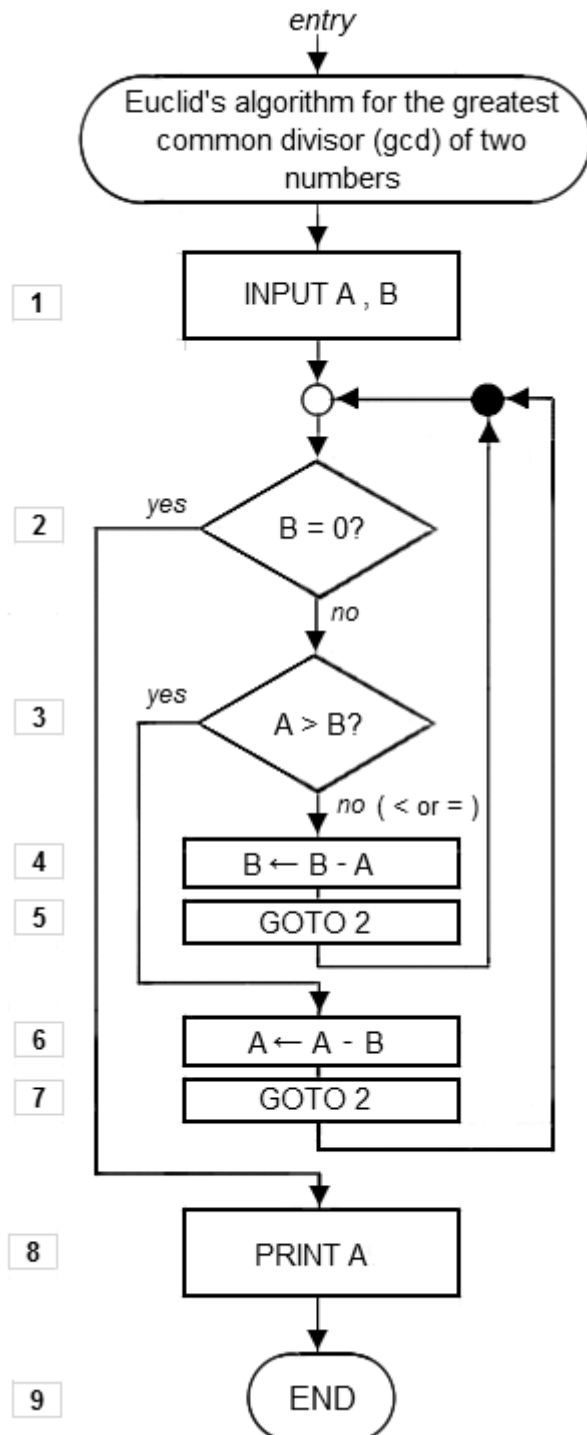
STEP 6 - IF THERE IS STILL A CARD IN YOUR HAND; GO BACK TO THE THIRD STEP.

STEP 7 - IF THERE IS NOT STILL A CARD IN YOUR HAND, THEN THE CARDS ARE SORTED. YOU ARE DONE.

STEP 8 – STOP

### EUCLID'S ALGORITHM

Flow chart of an algorithm for calculating the GCD of two numbers (a and b) in locations A and B. Flow charts will be touched on more later.



## ACCUMULATION

STEP 1 - START

STEP 2 - DETERMINE THE FIRST NUMBER, CALL IT A

STEP 3 - CHECK TO SEE IF THERE IS ANOTHER NUMBER

STEP 4 - IF THERE IS ANOTHER NUMBER, CALL IT B

STEP 5 - ADD A+B, REPLACE A WITH THE RESULT

STEP 6 - CHECK TO SEE IF THERE IS ANOTHER NUMBER

STEP 7 - IF THERE IS ANOTHER NUMBER GO BACK TO STEP 3

STEP 8 - IF THERE ARE NO MORE NUMBERS, DISPLAY A

STEP 9 – STOP

## DETERMINING MEAN FOR A SET AMOUNT OF NUMBERS

$$avg = (x+y+z)/3$$

STEP 1 - START

STEP 2 - DETERMINE THE FIRST NUMBER, CALL IT X

STEP 3 - DETERMINE THE SECOND NUMBER, CALL IT Y

STEP 4 - DETERMINE THE THIRD NUMBER, CALL IT Z

STEP 5 - FIND THE SUM OF X, Y, AND Z, CALL IT S

STEP 6 - DIVIDE S BY 3, CALL IT RESULT

STEP 7 - DISPLAY RESULT

STEP 8 – STOP

## DETERMINING MEAN FOR AN UNKNOWN AMOUNT OF NUMBERS

STEP 1 - START

STEP 2 - DETERMINE THE FIRST NUMBER, CALL IT A

STEP 3 - CHECK TO SEE IF THERE IS ANOTHER NUMBER

STEP 4 - IF THERE IS ANOTHER NUMBER, CALL IT B, OTHERWISE GO TO STEP 7

STEP 5 - ADD A+B, REPLACE A WITH THE SUM

STEP 6 - GO BACK TO STEP 3

STEP 7 - DETERMINE THE NUMBER OF INTEGERS COUNTED, CALL IT S FOR SUM

STEP 8 - DIVIDE A BY S, CALL THE RESULT RESULT.

STEP 9 - DISPLAY RESULT

STEP 10 – STOP

## DETERMINING MIN/MAX

STEP 1 - START

STEP 2 - DETERMINE THE FIRST NUMBER, CALL IT A

STEP 3 - CHECK TO SEE IF THERE IS ANOTHER NUMBER, IF THERE IS NOT GO TO STEP 8

STEP 4 - IF THERE IS ANOTHER NUMBER, CALL IT N

STEP 5 - COMPARE A AND N

STEP 6 - IF  $N < A$ , REPLACE A WITH N

STEP 7 - GO BACK TO STEP 3

STEP 8 - DISPLAY A

STEP 9 - STOP

*What change do we need to make to switch from min to max?*

## Assignment – Algorithms

Create an algorithm that clearly describes how to perform a simple task.

Example, solve a math problem, give directions for a recipe.

Your algorithm must be well ordered, understandable, solve the problem, and terminate (6 marks)

Also indicate the basic operations by **bolding** them. (i.e. get, spread, add) (2 marks)

Answer the following question:

*For every problem, is there only 1 correct algorithm that can be used as a solution? Why or why not? (2 marks)*

Save the document using the naming convention: LastName\_FirstName\_Assignment2