CS 161A: Programming and Problem Solving I

# Discussion 1 Algorithmic Design Document

*Make a copy before you begin (File -> Make a copy). The sections will expand as you type. When you are finished, download this document as a PDF (File -> Download -> PDF) and submit to D2L.*

*This document contains an interactive checklist. To mark an item as complete, click on the box (the entire list will be highlighted), then right click (the clicked box will only be highlighted), and choose the checkmark.*

Planning your program before you start coding is part of the development process. In this document you will:

* Write a detailed description of your program, at least two complete sentences
* If applicable, design a sample run with test input and output
* Identify the program inputs and their data types
* Identify the program outputs and their data types
* Identify any calculations or formulas needed
* Write the algorithmic steps as pseudocode or a flowchart
* Tools for flowchart - [Draw.io - Diagrams.ne](https://www.draw.io/)t

## Program Description

In the box below, describe the purpose of the program. You must include a detailed description with at least two complete sentences.

|  |
| --- |
| **Program description:** |
| Maintaining a potted tomato plant outside can be difficult and confusing to beginners. WIth a little bit of math, dedication, and scheduling watering it can be made easy and you will be able to keep your plants healthy and vibrant and get some tomatoes grown. |

## Sample Run

If you are designing your own program, you will start with a sample run. Imagine a user is running your program - what will they see? What inputs do you expect, and what will be the outputs from the given inputs? Choose test data you will use to test your algorithm. Calculate and show the expected outputs. Use the sample run to test your algorithm.

|  |
| --- |
| **Sample run:** |
| Following these steps your tomato plants should be vibrant green with waxy leaves during the process. There shouldn’t be any yellow leaves, wilted leaves, or soggy soil over the course of this task. The soil will stay slightly moist beneath the surface but not soggy. The soil will have a well balanced amount of nutrients.The tomatoes will grow at a fast rate if done correctly and produce fruit at 70 days from seed.  Sample run  \*The tomato plant pot is square with sides measuring 30cm  \*Calculate surface area : 5cm \* 5cm = 25cm^2  \*Calculate volume of water needed: 25cm^2 \* 2cm = 50cm^3 = 50ml  \*Every 7 days, add 50ml of water to potted tomato plant soil  \*After doing this for 70 days, tomato plant is healthy and producing fruit. |

## Algorithmic Design

Before you begin coding, **you must first plan out the logic** and think about what data you will use to test your program for correctness. All programmers plan before coding - this saves a lot of time and frustration! Use the steps below to identify the inputs and outputs, calculations, and steps needed to solve the problem.

|  |
| --- |
| **Algorithmic design:** |
| 1. Identify and list all of the user input and their data types. |
| An outdoor potted tomato, water, watering pail with ml markings, sunlight |
| 1. Identify and list all of the user output and their data types. |
| 1. A healthy potted tomato plant that has grown and produces tomatos at 70 days and has adequate levels of moisture. |
| 1. What calculations do you need to do to transform inputs into outputs? List all formulas needed, if applicable. If there are no calculations needed, state there are no calculations for this algorithm. |
| \*To find how much water to use for a potted tomato plant, calculate the surface area of the soil in the pot, use cm and answer should be in cm^2.  \*The plant should receive enough water once per week to cover the surface area of the soil in the pot with 2cm of water.Calculate the volume of water in ml needed by taking the surface area and multiplying it by 2cm. The answer will be in cubic cm (cm^3). 1 cm^3 is equivalent to 1ml of volume. |
| 1. Design the logic of your program using pseudocode or flowcharts. Here is where you would use conditionals, loops or functions (if applicable) and list the steps in transforming inputs into outputs. Walk through your logic steps with the test data from the assignment document or the sample run above. |
| 1. Obtain potted tomato plant that is at least 8 inches wide. 2. Measure and calculate the surface area of the soil in cm / cm^2. 3. Multiply the surface are by 2cm. 4. Convert to ml, 1 cm^3 = 1ml. 5. Once per week in the morning add the amount of water in ml to your tomato plant. Avoid watering leaves. 6. Repeat step 5 once every 7 days. 7. After doing this 10 times over 70 days, enjoy your freshly grown tomatoes. |