

Technical Software Development

Assignment 2

Rainwater Harvesting Table

This assignment is worth 5% of the subject assessment.

Submit soft copies of the .cpp file and report document (doc / pdf) through the assignment area of this unit on CANVAS <http://www.swinburne.edu.my/canvas>

Due Date: 11.59pm, Friday 30 April 2020

Introduction:

This assignment requires knowledge of variables, constants, stream input / output, output formatting, repetition, validation and/or function.

The assignment:

Develop and submit an original program in C++ that generates the rainwater harvesting table for a range of roof area and precipitation amount.

The problem:

Rainwater harvesting has been widely used as an alternative source of water supply. The amount of water collected by a rainwater harvesting system can be calculated using the formula below.

Amount of Rainwater Harvested (liter) = Roof Area (m²) X Precipitation Amount (mm)

(Source: <https://www.watercache.com/resources/rainwater-collection-calculator>)

You are required to write a program to generate the rain water harvesting table for a range of roof area and precipitation amount.

Software Development Task 1 (Basic Task):

Develop and submit an original C++ program that:

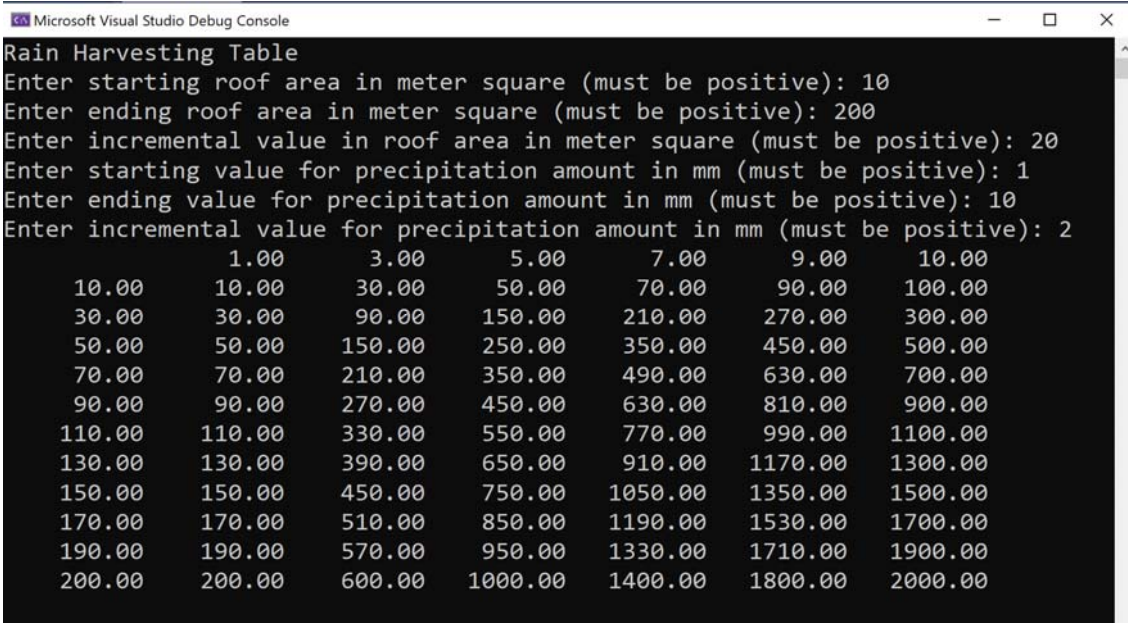
1. asks the user to enter the starting value and ending value (both inclusive) of the roof area in m² to be used in each row of the rain harvesting table.
2. asks the user to enter the incremental value in roof area in m² from one row to the next row.
3. asks the user to enter the starting value and ending value (both inclusive) of the precipitation amount in mm to be used in each column of the rain harvesting table.
4. asks the user to enter the incremental value in precipitation amount in mm from one column to the next column.

Your program must then use appropriate loops to generate the Amount of Rainwater Harvested in Liter using the formula given above, for the given range of roof area and precipitation amount. Note that all the numeric values should be displayed with the

precision of TWO decimal places. You should also set aside appropriate and sufficient widths to display all values of the calculated Amount of Rainwater Harvested values in liter using output formatting in C++.

A sample screenshot of the program is given below. Please note that your program output needs to observe the same output formatting of the sample screenshot.

Sample Screenshot:



```

Microsoft Visual Studio Debug Console
Rain Harvesting Table
Enter starting roof area in meter square (must be positive): 10
Enter ending roof area in meter square (must be positive): 200
Enter incremental value in roof area in meter square (must be positive): 20
Enter starting value for precipitation amount in mm (must be positive): 1
Enter ending value for precipitation amount in mm (must be positive): 10
Enter incremental value for precipitation amount in mm (must be positive): 2

    1.00    3.00    5.00    7.00    9.00   10.00
10.00   10.00   30.00   50.00   70.00   90.00  100.00
30.00   30.00   90.00  150.00  210.00  270.00  300.00
50.00   50.00  150.00  250.00  350.00  450.00  500.00
70.00   70.00  210.00  350.00  490.00  630.00  700.00
90.00   90.00  270.00  450.00  630.00  810.00  900.00
110.00  110.00  330.00  550.00  770.00  990.00 1100.00
130.00  130.00  390.00  650.00  910.00 1170.00 1300.00
150.00  150.00  450.00  750.00 1050.00 1350.00 1500.00
170.00  170.00  510.00  850.00 1190.00 1530.00 1700.00
190.00  190.00  570.00  950.00 1330.00 1710.00 1900.00
200.00  200.00  600.00 1000.00 1400.00 1800.00 2000.00
  
```

Technical Requirements:

- This assignment must be written in C++ and must compile and run in a Visual Studio 2019 solution.
- Each user's input to the program must be validated using appropriate validation loops:
 - starting and ending values - validating for positive value
 - incremental values - validating for positive value
- Use cout manipulators to control output formatting.

Software Development Task 2 (Challenge Task):

Use recursive function calls (instead of loops) to generate the rainwater harvesting table. (Note that validation tasks may still use loops. You do not need to use recursive function call for validation).

Reporting Tasks:

1. Discuss what is/are the limitation(s) of using recursive functions instead of loops to generate the rainwater harvesting table. (word count limit: 100 words)

Testing Task:

1. Prepare at least 3 screen shots from 3 test inputs with different sets of input values.

Submission:

Submission of the .cpp file and report document must be made through CANVAS before the due date/time.

- The name of your .cpp and report document (doc / pdf) files must be your student number.
- Do not include the Visual studio solution files or folders or exe files.

Marking Scheme:**Software Development Tasks (3 marks)**

Criteria	Marks		
Correctly implemented the Software Development Task 1 (Basic Task)?	Yes: 1.5 marks	Partially Correct (1 to 2 mistakes): 0.75 mark	No (more than 2 mistakes): 0 mark
Correctly implemented the Software Development Task 2 (Challenge Task)?	Yes: 1 mark	Partially correct (1 mistake): 0.5 mark	No (more than 1 mistake): 0 mark
Good programming styles: (1) Provide header comments that contain name, date, and program description. (2) Provide inline comments to explain your code. (3) Use consistent naming conventions and indentation.	0.5 mark for implementing all three good programming styles 0.25 mark for implementing two out of the three good programming styles. 0 mark for implementing less than two out of the three good programming styles		

Reporting Task (0.8 mark)

Criteria	Marks	
Reporting Task. Valid limitation(s) of using recursive functions instead of loops to generate the rainwater harvesting table.	Yes (0.8 mark)	No (0 mark)

Testing Tasks (1.2 mark)

Prepare at least 3 screenshots with 3 sets of user inputs.

Criteria	Marks
Testing Task. 3 screenshots with 3 sets of user inputs.	0.4 mark for each screenshot of program test run observing the output formatting provided in the sample screenshot provided.