# Week 3 Assessment

**Task:**

Write a C++ program that takes a single positive integer input n (from 1 to 9) and prints **a number pyramid** of height n using only loops and decision statements.

Each row i (1-based) of the pyramid should contain:

* A total of 2n - 1 characters.
* The numbers from 1 to i and back down to 1, centred in the row.
* All other positions should be filled with spaces.

For example, if the user enters in the number 4 the output should be:  
A number on a white background

AI-generated content may be incorrect.

Once complete you should paste the code on the following page.

You should document the steps you take as you develop the solution. You will need to write a brief report on your approach on the following page.

**Rules:**

* You **must not** use arrays, functions, or any advanced features. This exercise is designed to strengthen your understanding of loops and decision-making, which are the foundational building blocks of programming. By not using these features you are encouraged to think algorithmically, master nested loops and develop your logic manually.
* You **must** use nested loops and if/else statements.
* You **must** manually control spacing and number printing using loop counters.
* The use of any AI tools are prohibited within this assignment.

**Code Task:** Please paste the code below **(10 marks)**:

#include <iostream>

using namespace std;

int main() {

int height; char outputChar;

cout << "enter single digit: "; cin >> height;

while (height < 1 || height > 9) {

cerr << "error: that’s not a single digit" << endl;

cout << "enter single digit: "; cin >> height;

}

cout << endl;

for (uint8\_t i = 1; i <= height; i++) {

for (uint8\_t j = 1; j < 2 \* height; j++) {

if (j <= height - i || j >= height + i) {

outputChar = ' ';

}

else {

if (j <= height) {

outputChar = i - height + j;

}

else {

outputChar = height + i - j;

}

outputChar += 0x30;

}

cout << outputChar;

}

cout << endl;

}

}

**Report Task:** Please explain the steps you took and the approach you adopted in developing your solution.This is a minimum 200 words, if you write a report with less than 180 words marks will be deducted on a sliding scale. You should include an image of the code running as part of this **(5 marks).**

(refine this)

step 1: try three j loops inside the i loop

step 2: realise you're being an idiot

step 3: try two loops from 1 to height

step 4: realise you're being an idiot (again)

step 5: correct the inner loop to be from 1 to 2\*height

step 6: if j isn't in the range height ± i, set output char to space, otherwise set it to (temp value - will be corrected later) j - i; output char at end of inner loop and endl at end of outer loop

new problem: figure 1 - problem.png

step 7: after moving from library to 4506 due to time, realise a single if/else won't cut it

step 8: nest another if inside the else block; add 0x30 to char at end of else block so it shows as a digit

step 9: for now, if j > height, set output char to 0

step 10: otherwise, set output char to (i - height) + j (see figure 2 for reasoning)

figure 2: helpfulTable.png

step 11: correct value of char if j > height - set it to height + i - j

done - figure 3: finalOutput.png

**Marking criteria for code**

|  |  |
| --- | --- |
| **Criteria** | **Marks** |
| **1. Input Handling & Validation** | **1 mark** |
| **2. Loop Structure** | **2 marks** |
| **3. Correct Pyramid Shape** | **2 marks** |
| **4. Number Pattern Accuracy** | **2 marks** |
| **5. Code Readability** | **1 mark** |
| **6. Comments and Explanation** | **1 mark** |
| **7. Constraint Adherence** | **1 mark** |

**Marking Criteria for Report**

|  |  |
| --- | --- |
| **Criteria** | **Marks** |
| **1. Clarity of Explanation** | **1 mark** |
| **2. Understanding of Loops and Decisions** | **1 mark** |
| **3. Step-by-Step Breakdown** | **1 mark** |
| **4. Problem-Solving Approach** | **1 mark** |
| **5. Reflection and Insight** | **1 mark** |

**Word Count Penalty (if <180 words)**

|  |  |
| --- | --- |
| **Word Count** | **Penalty** |
| **150–179 words** | **–1 mark** |
| **120–149 words** | **–2 marks** |
| **<120 words** | **–3 marks** |