

Chapter 5 Homework

Reading Assignment:

Read Chapter 5 in Introduction to Programming with C++, 3rd Edition by Liang

Problem Assignment:

1. **While loops (20 pts):**

- A) (10 pts) Write a C++ program using a **while loop** for Programming Exercise 5.15 on p. 195 (find the largest n such that $n^3 < 12,000$). Additionally, display a table of values for n and n^3 beginning with n = 0 and incrementing n until the result is found. Turn in printouts of the program and the results.
- B) (10 pts) Write a C++ program using a **while loop** for Programming Exercise 5.27 on p. 198 with the following change: Instead of displaying π for values of i shown, use a while loop to continue adding terms until π is accurate to 6 digits after the decimal point.

$$\pi = 4 \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \dots \right)$$

Display the following and turn in printouts of the program and the results.

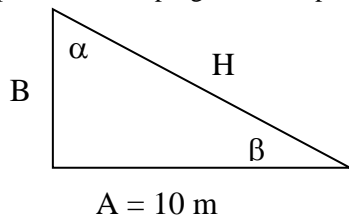
- The number of terms needed to find π
- The value of π using `acos(-1)` using 10 digits after the decimal point.
- The value of π found with the series using 10 digits after the decimal point (the first 6 digits after the decimal point should match the value above).

2. **Do while loops (20 pts):**

- A) (10 pts) Write a C++ program using a **do while loop** for Programming Exercise 5.10 on p. 195 (Find the highest score). The program should work for any number of students. Run the program for 3 cases:
- Case 1: 3 students, first grade is the highest
 - Case 2: 4 students, last grade is the highest
 - Case 3: 5 students, middle grade is the highest
- Turn in a printout of the program and a printout of the results for all cases.
- B) (10 pts) Write a C++ program using a **do while loop** for Programming Exercise 5.1 on p. 193.
- Turn in a printout of the program and a printout of the results.
 - Test the program for the two test cases in the book along with a third test case that includes 10 valid numbers (including some negative and some positive).

3. **For loops (30 pts):**

- A) (10 pts) Write a C++ program to display a table of values for side B, side H, angle α (in degrees) and β (in degrees) for the right triangle shown. Use a **for loop** to calculate H, α and β as side B from 2 m to 20 m in 2 m increments. The output should be a table of values for B, H, α and β similar to the one shown below (no lines are required). Use 0 digits after the decimal point for B, 3 digits after the decimal point for H, and 2 digits after the decimal point for α , and β . Turn in a printout of the program and a printout of the results. The table should be nicely aligned.



B (m)	H (m)	α (degrees)	β (degrees)
2			
4			
6			
8			
10			
12			
14			
16			
18			
20			

- B) (10 pts) Write a C++ program that uses a **for loop** for Programming Exercise 5.53 on p. 203 (count the number of vowels and consonants in a string).
- The program should work for any string, not just the example (Programming is fun).
 - Turn in a printout of the program and a printout of the results.
 - Run the program for the example string in the text and for your full name.
- C) (10 pts) Write a C++ program that uses a **for loop** for Programming Exercise 5.5 on p. 194 (table of conversions from kilograms to pounds and from pounds to kilograms):
- Turn in a copy of the program and the results (one page of results is sufficient).

(continued)

4. (30 pts) For each part below, show the output produced (exactly as it would appear on the computer screen). Problem 0 is an example. Trace these program segments on paper (use a table) and in your head rather than using the C++ compiler.

Prob#	Loop to trace	Output
0	<pre>for (int i = 2; i <= 10; i+=2) cout << i << "squared = " << i*i << endl;</pre>	<pre>2 squared = 4 4 squared = 16 6 squared = 36 8 squared = 64 10 squared = 100</pre>
1	<pre>for (int i = 3; i >= -3; i --) cout << i << " cubed = " << i*i*i << endl;</pre>	
2	<pre>for (int i = 1; i <= 5; i++) { cout << i; for (int j = 5; j >= i; j -= 2) cout << j; cout << endl; }</pre>	
3	<pre>int k = 1; for (int i = 5; i >= -4; i-=2) { cout << i + k << endl; k+=i; }</pre>	

4	<pre>for (int i = 3; i > 0; i--) for (int j = i; j > 0; j--) for (int k = j; k > 0; k--) cout << i << j << k << endl;</pre>	
5	<pre>for (int i = 4; i > 1; i--) for (int j = 4; j > 1; j--) { for (int k = j; k >= i; k--) cout << i << j << k << endl; }</pre>	
6	<pre>int i = 6; int k, j = 2; for (;;) { k = 3 * i - j; if (k < 0) break; cout << i << j << k << endl; j++; i--; } cout << i << j << k << endl;</pre>	

7	<pre> int k = 0; int i = 1; while (k < 7) { cout << "log(base 2) of " << i << " = " << k << endl; i *= 2; k++; } </pre>	
8	<pre> int j, i = 1; while (i*i < 10) { j = i; while (j*j*j < 100) { cout << i + j << endl; j++; } i++; } cout << "\n*****\n"; </pre>	
9	<pre> int k, i = 1; do { k = i * i * i - 4 * i + 1; cout << i << k << endl; i++; } while (k <= 20); </pre>	
10	<pre> int j, k, i = 1; do { j = i * i * i; cout << i; do { k = i + 2*j; cout << j << k; j += 2; } while (k <= 10); cout << endl; i++; } while (j <= 8); </pre>	