

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) Write a C++ program using a **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).
- B) Write a C++ program using a **while loop** to calculate the value of $\pi/2$ accurate to 6 digits after the decimal point using the following series:

$$\frac{\pi}{2} = 1 + \frac{1}{3} + \frac{1 \cdot 2}{3 \cdot 5} + \frac{1 \cdot 2 \cdot 3}{3 \cdot 5 \cdot 7} + \dots$$

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

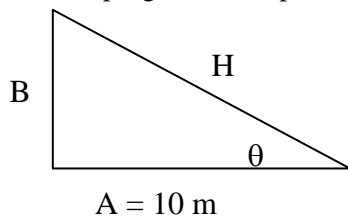
- The number of terms needed to find $\pi/2$
- The value of $\pi/2$ using $\text{acos}(-1)/2$ using 10 digits after the decimal point.
- The value of $\pi/2$ found with the series using 10 digits after the decimal point (the first 6 digits after the decimal point should match the value above).

2. Do while loops (20 pts):

- A) Write a C++ program using a **do while loop** for Programming Exercise 5.8 on p. 195 (table of N and $\text{sqrt}(N)$ for $N = 0$ to 20). Turn in a printout of the program and a printout of the results.
- B) Write a C++ program to determine the smallest integer such that $3N^3 - 27N^2 > 100,000$ using a **do while loop**. Begin with $N = 0$ and increment N until the result is found. Turn in printouts of the program and the results.

3. For loops (30 pts):

- A) (10 pts) Write a C++ program to display a table of values for angle θ (in degrees) and sides B and H for the right triangle shown. Use a **for loop** to calculate B and H as angle θ varies from 5 to 85 degrees in 5 degree increments. The output should be a table of values for θ , B, and H similar to the one shown below. Turn in a printout of the program and a printout of the results. The table should be nicely aligned.



θ (degrees)	B (m)	H (m)
5		
10		
•		
•		
•		
85		

- B) (10 pts) Write a C++ program that uses a **for loop** for Programming Exercise 5.48 on p. 202 (count the number of uppercase letters in a string).
- 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 5.6 on p. 194 (table of conversions from miles to km and km to miles):
- Turn in a copy of the program and the results.

(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 = 5; i > 0; i--) cout << i << " cubed = " << i*i*i << endl;</pre>	<pre>5 cubed = 125 4 cubed = 64 3 cubed = 27 2 cubed = 8 1 cubed = 1</pre>
1	<pre>for (int i = 10; i > 0; i -=2) cout << i << " squared = " << i*i << endl;</pre>	
2	<pre>for (int i = 1; i <= 5; i++) { cout << i << endl; for (int j = i; j >= 1; j -= 2) cout << j << endl; }</pre>	
3	<pre>int k = 5; for (int i = -2; i < 5; i += 2) { cout << i + k << endl; k = 1; }</pre>	

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

7	<pre> int k = 5; int i = 32; while (i > 0) { cout << "base-2 log of " << i << " = " << k << endl; i /= 2; k--; } </pre>	
8	<pre> int j, i = 1; while (i*i < 10) { j = i; while (j*j < 100) { cout << i + j << endl; j *= 2; } i++; } cout << "\n*****\n"; </pre>	
9	<pre> int k, i = 1; do { k = i * i * i - 3 * i + 1; cout << i << k << endl; i++; } while (k <= 2); </pre>	
10	<pre> int j, k, i = 0; 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 <= 5); </pre>	