EGR 125 Due date: _____
Introduction to Engineering Methods (C++)
File: N125H4

Homework Assignment #4

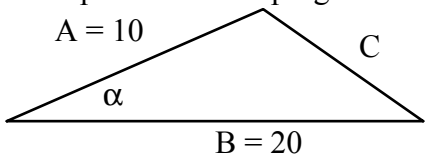
Reading Assignment:
Read Chapter 6 in Programming In C++, by D'Orazio
Exercises 6.1 – 6.5 (not to be submitted, but good practice for tests)

Problem Assignment:
Submit each of the following by the assigned due date.

1. **While loops (14 pts):**
   Write a C++ program using a **while loop** to calculate the value of π accurate to 8 digits after the decimal point using the following series:

   $$\pi = 4 - 4/3 + 4/5 - 4/7 + 4/9 - 4/11 + \ldots\ldots$$

   Turn in a printout of the program and a printout of the results.
2. **Do while loops (14 pts):**
   Write a C++ program to determine the smallest integer such that $2N^3 - 6N^2 > 12500$ using a **do while loop**. Begin with N = 0 and increment N until the result is found. Turn in a printout of the program and a printout of the results.
3. **For loops:**
   A) (14 pts) Write a C++ program to display a table of values for angle α (in degrees) and side C of the triangle shown. The length of side C can be calculated using the law of cosines as shown below. Use a **for loop** to calculate C as angle α varies from 0 to 90 degrees in 5 degree increments. The output should be a table of values for A, B, C, and α. Turn in a printout of the program and a printout of the results.



$$C^2 = A^2 + B^2 - 2(A)(B)\cos(\alpha)$$

   B) (14 pts) Write a C++ program that uses a **for loop** for problem 17 in Chapter 6 of the text. Turn in a printout of the program, the input data file, and the results.
   C) (14 pts) Write a C++ program to display a 12 x 12 multiplication table using **nested for loops**. The table should appear as shown below. Turn in a printout of the program and the output. (Note: only output a single value each time in the inner loop.)

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	40	60	72	84	96	108	120	132	144

(continued)

4. (30 pts) For each part below, show the output produced. 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	`for (int i = 5; i > 0; i--)`
	`  cout << i << " cubed = "`
	`  << i*i*i << endl;`
		`5 cubed = 125`
		`4 cubed = 64`
		`3 cubed = 27`
		`2 cubed = 8`
		`1 cubed = 1`

1	`for (int i = 10; i > 0; i -=2)`
	`  cout << i << " squared = "`
	`  << i*i << endl;`	

2	`for (int i = 1; i <= 5; i++)`
	`{`
	`  cout << i << endl;`
	`  for (int j = i; j >= 1; j -= 2)`
	`  cout << j << endl;`
	`}`	

3	`int k = 5;`
	`for (int i = -2; i < 5; i += 2)`
	`{`
	`  cout << i + k << endl;`
	`  k = 1;`
	`}`	

4	`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;`	

5	`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;`
	`  }`	

6	`i = 5;`
	`j = 1;`
	`for (;;)`
	`{`
	`  k = 2 * i – j;`
	`  if (k < 0) break;`
	`  cout << i << j << k << endl;`
	`  j++;`
	`  i--;`
	`}`
	`cout << i << j << k << endl;`	

7	`k = 5;`
	`i = 32;`
	`while (i > 0)`
	`{`
	`  cout << “base-2 log of “ << i << “ = “`
	`  << k << endl;`
	`  i /= 2;`
	`  k--;`
	`}`	

8	`i =1;`
	`while (i*i < 10)`
	`{`
	`  j = i;`
	`  while (j*j < 100)`
	`  {`
	`  cout << i + j << endl;`
	`  j *= 2;`
	`  }`
	`  i++;`
	`}`
	`cout << “\n*****\n”;`	

9	`i = 1;`
	`do`
	`{`
	`  k = i * i * i – 3 * i + 1;`
	`  cout << i << k << endl;`
	`  i++;`
	`} while (k <= 2);`	

10	`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);`	