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4017 5600

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Assignment 2

I certify that this submission is my original work and
meets the faculty's Expectations of Originality.

4017 5600 ~~A~~

Question 1:

The image shows a C++ program in Visual Studio. The code is in a file named 'Question_1' and is set to 'Global Scope'. The program calculates and displays temperature conversions from Celsius to Fahrenheit and Kelvin for values from 1 to 50. It uses `cout` with `setw` and `setprecision` for formatted output.

```
4
5 #include <iostream>
6 #include <iomanip>
7 using namespace std;
8
9 // main body of the program
10 int main() {
11     double kel, fah; // kelvin and fahrenheit variables
12     const float kelConst = 273.15; // absolute zero kelvin constant
13
14     // top header layout of the three temperatures with corresponding spacing between
15     cout << setw(9) << "Celsius" << setw(15) << "Fahrenheit" << setw(10) << "Kelvin" << endl;
16
17     // for-loop that repeats body code 50 times
18     for (double cel = 1; cel <= 50; cel++)
19     {
20         fah = (cel * 9 / 5) + 32; // celsius to fahrenheit equation
21         kel = cel + kelConst; // celsius to kelvin equation
22
23         // 3 version of same output, but different 'setw' to clean up output format
24         if (cel <= 9){
25             cout << setw(3) << setprecision(0) << cel << fixed; // celsius, 0 decimal place
26             cout << setw(14) << setprecision(1) << fah; // fahrenheit, 1 decimal palce
27             cout << setw(17) << setprecision(2) << kel << endl; // kelvin, 2 decimal place
28         } else if (cel <= 37) {
29             cout << setw(4) << setprecision(0) << cel << fixed; // celsius, 0 decimal place
30             cout << setw(13) << setprecision(1) << fah; // fahrenheit, 1 decimal palce
31             cout << setw(17) << setprecision(2) << kel << endl; // kelvin, 2 decimal place
32         } else {
33             cout << setw(4) << setprecision(0) << cel << fixed; // celsius, 0 decimal place
34             cout << setw(14) << setprecision(1) << fah; // fahrenheit, 1 decimal palce
35             cout << setw(16) << setprecision(2) << kel << endl; // kelvin, 2 decimal place
36         }
37     }
38
39     return 0;
40 }
```

The Microsoft Visual Studio Debug Console shows the output of the program, which is a table of temperature conversions:

| | Celsius | Fahrenheit | Kelvin |
|----|---------|------------|--------|
| 1 | 33.8 | 93.2 | 274.15 |
| 2 | 35.6 | 96.1 | 275.15 |
| 3 | 37.4 | 99.3 | 276.15 |
| 4 | 39.2 | 102.6 | 277.15 |
| 5 | 41.0 | 105.8 | 278.15 |
| 6 | 42.8 | 109.0 | 279.15 |
| 7 | 44.6 | 112.1 | 280.15 |
| 8 | 46.4 | 115.3 | 281.15 |
| 9 | 48.2 | 118.8 | 282.15 |
| 10 | 50.0 | 122.0 | 283.15 |
| 11 | 51.8 | 125.2 | 284.15 |
| 12 | 53.6 | 128.5 | 285.15 |
| 13 | 55.4 | 131.7 | 286.15 |
| 14 | 57.2 | 135.0 | 287.15 |
| 15 | 59.0 | 138.2 | 288.15 |
| 16 | 60.8 | 141.4 | 289.15 |
| 17 | 62.6 | 144.7 | 290.15 |
| 18 | 64.4 | 148.3 | 291.15 |
| 19 | 66.2 | 151.6 | 292.15 |
| 20 | 68.0 | 154.8 | 293.15 |
| 21 | 69.8 | 158.0 | 294.15 |
| 22 | 71.6 | 161.3 | 295.15 |
| 23 | 73.4 | 164.5 | 296.15 |
| 24 | 75.2 | 167.8 | 297.15 |
| 25 | 77.0 | 171.0 | 298.15 |
| 26 | 78.8 | 174.2 | 299.15 |
| 27 | 80.6 | 177.5 | 300.15 |
| 28 | 82.4 | 180.7 | 301.15 |
| 29 | 84.2 | 183.9 | 302.15 |
| 30 | 86.0 | 187.2 | 303.15 |
| 31 | 87.8 | 190.4 | 304.15 |
| 32 | 89.6 | 193.7 | 305.15 |
| 33 | 91.4 | 196.9 | 306.15 |
| 34 | 93.2 | 200.2 | 307.15 |
| 35 | 95.0 | 203.4 | 308.15 |
| 36 | 96.8 | 206.6 | 309.15 |
| 37 | 98.6 | 209.9 | 310.15 |
| 38 | 100.4 | 213.1 | 311.15 |
| 39 | 102.2 | 216.4 | 312.15 |
| 40 | 104.0 | 219.6 | 313.15 |
| 41 | 105.8 | 222.8 | 314.15 |
| 42 | 107.6 | 226.1 | 315.15 |
| 43 | 109.4 | 229.3 | 316.15 |
| 44 | 111.2 | 232.6 | 317.15 |
| 45 | 113.0 | 235.8 | 318.15 |
| 46 | 114.8 | 239.0 | 319.15 |
| 47 | 116.6 | 242.3 | 320.15 |
| 48 | 118.4 | 245.5 | 321.15 |
| 49 | 120.2 | 248.8 | 322.15 |
| 50 | 122.0 | 252.0 | 323.15 |

The status bar at the bottom indicates '100%' zoom and 'No issues found'. The file path is 'E:\vsCode\Project Location\COEN 243 code 0.'.

Question 2:

```
1 // Assignment 2, Question 2, Week 5
2 // Hei Wang Andre Law, 4017 5600
3 // Program: Prime number filter
4
5 #include <iostream>
6 #include <cmath>
7 using namespace std;
8
9 // main body of program
10 int main() {
11     int num; // user input integer
12     bool isNotPrime = true; // true means it is indeed NOT prime
13
14     // ask user to input an integer
15     cout << "Enter an integer: ";
16     cin >> num; // store that integer into 'num'
17
18     // anything below 1 isn't a prime number, continue otherwise
19     if (num > 1){
20         isNotPrime = false; // set integer being prime and prove otherwise
21
22         // prime only 2 factors, themselves and 1, so don't loop unless i < num
23         for (double i = 2; i < num; ++i) {
24             // check if exists WHOLE divisible factor
25             if (floor(num / i) == num / i) {
26                 isNotPrime = true; // set integer being NOT prime
27                 break; // break loop because there is a divisible factor
28             }
29         }
30
31         // display results based on the boolean
32         if (isNotPrime) {
33             cout << endl << num << " is NOT a prime number." << endl;
34         }
35         else {
36             cout << endl << num << " is a prime number." << endl;
37         }
38         return 0;
39     }
```

Microsoft Visual Studio Debug Console

Enter an integer: 7

7 is a prime number.

E:\vsCode\Project Location\code 0.

To automatically close the console when debugging stops, press any key to close the console.

Question 3: (part 1)

```
1 // Assignment 2, Question 3, Week 5
2 // Wei Wang Andre Law, 4017 5600
3 // Program: House drawing with a roof, walls and flooring
4
5 #include <iostream>
6 #include <iomanip>
7 using namespace std;
8
9 // main body of program
10 int main() {
11     string name; // user input of their name
12     string drawAnswer; // answer if they want to draw or not
13     int numHouse = 0; // number of house counter
14     int width, height; // width and height of the house
15     int halfWidth; // half the width of the house
16     int tries; // number of tries from miss-input of width input
17
18     // 1) ask and store user name with a welcome message
19     cout << "What is your name? ";
20     cin >> name;
21     cout << "Well " << name << ", welcome to the house drawing program.";
22
23     // do-while loop of entire house drawing
24     do {
25         // welcome question about wanting to draw a house or not
26         cout << "\nDo you want me to draw a simple house for you? (yes/no) ";
27         cin >> drawAnswer;
28         if (drawAnswer == "no") {
29             break; // end program if user doesn't want to draw, keep going otherwise
30         }
31
32         // 2.1) request house dimensions (height)
33         cout << "\nEnter height of the house you want me to draw: ";
34         cin >> height; // ask user the height of the house
35
36         // 2.2) request house dimensions (width), for-loop for valid input
37         for (tries = 0; tries < 3; tries++) { // allows the user 3 tries before error, end of program
38             cout << "Please enter an even number for the width of the house (must be even numbers and bigger than 2): ";
39             cin >> width;
40
41             // filter value of width with personalized error message
42             if (width > 2 && width % 2 == 0) { // valid input
43                 break; // stops the loop and continue the program
44             }
45             else if (width == 0) { // invalid input of zero
46                 cout << "You enter " << width << " for the width. Not an even number nor larger than 2!\n\n";
47             }
48         }
49     } while (drawAnswer != "no");
50 }
```

Microsoft Visual Studio Debug Console

What is your name? Anna
Well Anna, welcome to the house drawing program.
Do you want me to draw a simple house for you? (yes/no) yes

Enter height of the house you want me to draw: 3
Please enter an even number for the width of the house (must be even numbers and bigger than 2): 3
You enter 3 for the width. Not an even number!

Please enter an even number for the width of the house (must be even numbers and bigger than 2): 5
You enter 5 for the width. Not an even number!

Please enter an even number for the width of the house (must be even numbers and bigger than 2): 11
You enter 11 for the width. Not an even number!

It seems you are having troubles entering even numbers larger than 2! Program ends now.

E:\vsCode\Project Location\COEN 243 Assignments\Assignment 2\Question_3\Debug\Question_3.exe (process code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close when debugging stops.
Press any key to close this window . . .

Question 3: (part 2)

```

42 Question_3
43
44 if (width > 2 && width % 2 == 0) { // valid input
45     break; // stops the loop and continue the program
46 }
47 else if (width == 0) { // invalid input of zero
48     cout << "You enter " << width << " for the width. Nor an even number nor larger than 2!\n\n";
49 }
50 else if (width <= 2 && width % 2 != 0) { // invalid input below 2 and odd
51     cout << "You enter " << width << " for the width. Nor an even number nor larger than 2!\n\n";
52 }
53 else if (width < 2) { // invalid input below 2
54     cout << "You enter " << width << " for the width. Not larger than 2!\n\n";
55 }
56 else { // invalid input of odd number
57     cout << "You enter " << width << " for the width. Not an even number!\n\n";
58 }
59 }
60 // 2.3) because of too many tries, termination of program and end message
61 if (tries == 3) {
62     cout << "It seems you are having troubles entering even numbers larger than 2! Program ends now.\n";
63     return 0;
64 }
65
66 // 3) draw the house
67 halfWidth = width / 2; // the roof is half the width of the house
68
69 // 3.1) for-loop of the roof drawing
70 for (int i = 1; i <= halfWidth; i++) { // "i" Layer of roofing
71     cout << endl; // cleanup, space the roof to match the one space distance from the wall
72     for (int j = 0; j <= width; j++) { // "j" amount of "*" in one layer
73         if (j == (halfWidth - i) && j <= (halfWidth + i)) {
74             cout << "*"; // yes roofing
75         }
76         else {
77             cout << " "; // no roofing
78         }
79     }
80     cout << endl; // proceed to the next layer (next iteration loop)
81
82 // 3.2) for-loop of the walls drawing
83 for (int w = 0; w < height; w++) {
84     cout << "|"; // left side of the wall
85     for (int z = 1; z <= width; z++) { // amount of empty space between walls, same as width
86         cout << " "; // empty space
87     }
88     cout << "|"; // right side of the wall
89     cout << endl; // proceed to the next layer (next iteration loop)
90 }
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```

Question 3: (part 3)

```
58 // 2.3) because of too many tries, termination of program and end message
59 if (tries == 3) {
60     cout << "It seems you are having troubles entering even numbers larger than 2! Program ends now.\n";
61     return 0;
62 }
63
64 // 3) draw the house
65 halfWidth = width / 2; // the roof is half the width of the house
66
67 // 3.1) for-loop of the roof drawing
68 for (int i = 1; i <= halfWidth; i++) { // "i" layer of roofing
69     cout << setw(2); // cleanup, space the roof to match the one space distance from the wall
70     for (int j = 0; j <= width; j++) { // "j" amount of "*" in one layer
71         if (j >= (halfWidth - i) && j < (halfWidth + i)) {
72             cout << "*"; // yes roofing
73         }
74         else {
75             cout << " "; // no roofing
76         }
77     }
78     cout << endl; // proceed to the next layer (next iteration loop)
79 }
80
81 // 3.2) for-loop of the walls drawing
82 for (int w = 0; w < height; w++) {
83     cout << "|"; // left side of the wall
84     for (int z = 1; z <= width; z++) { // amount of empty space between walls, same as width
85         cout << " "; // empty space
86     }
87     cout << "|"; // right side of the wall
88     cout << endl; // proceed to the next layer (next iteration loop)
89 }
90
91 // 3.3) for-loop of the floor drawing
92 cout << setw(2); // cleanup, space the flooring to match the roof
93 for (int r = 1; r <= width; r++) { // amount of flooring, same as width
94     cout << "-";
95 }
96
97 // increase the counter number of house built so far
98 numHouse = numHouse + 1;
99
100 }while (drawAnswer != "no"); // restart loop until user prompt "no" for stopping the drawing
101
102 // wrap up message with the amount of house built number displayed
103 cout << "\nHope you like your " << numHouse << " house(s)\n";
104 return 0;
105 }
```

100 % No issues found

Question 4: (part 1)

```
1 // Assignment 2, Question 4, Week 5
2 // Hei Wang Andre Law, 4017 5600
3 // Program: Call function based on entered character
4
5 #include <iostream>
6 #include <iomanip>
7 using namespace std;
8
9 // function prototype for the three functions
10 int function1(int, int); // function prototype for 'a'
11 void function2(int, int, int &); // function prototype for 'b'
12 double function3(double, double); // function prototype for 'c'
13
14 // main body of the program
15 int main() {
16     // 1) State the necessary variables
17     int lbound, ubound; // lower and upper bound
18     string letter; // input that call functions, string because 'char' cannot differentiate between: 'a', 'abc', 'abbb', etc.
19     int result; // variable by reference of function 2
20
21     // 2) Beginning statement and prompt user for inputs
22     cout << "Please enter two positive integer numbers (Lower bound/Upper bound): ";
23     cin >> lbound >> ubound; // lower and upper bound variable
24
25     // 3) Choose which function to call by inputting a specific character
26     cout << "\nPlease enter a character (a, b or c): ";
27     cin >> letter; // char that calls its function
28
29     // 4) filter that calls different functions depending on the letter input
30     if (letter == "a") { // first function, 'a'
31         function1(lbound, ubound);
32     }
33     else if (letter == "b") { // second function, 'b'
34         function2(lbound, ubound, result);
35         cout << "\nThe difference between two numbers is " << result;
36     }
37     else if (letter == "c") { // third function, 'c'
38         cout << "\nThe value of sum is: " << function3(lbound, ubound);
39     }
40     else { // All invalid input ends program with terminations message
41         cout << "\nInvalid input";
42     }
43     cout << endl;
44     return 0;
45 }
46
```

Microsoft Visual Studio Debug Console

Please enter two positive integer numbers (Lower bound/Upper bound): 11 63

Please enter a character (a, b or c): a

List of numbers in this interval which are multiple of both 2 and 7: 14 28 42 56

E:\vsCode\Project Location\COEN 243 Assignments\Assignment 2\Question_4\Debug\Question_4.exe (1156) (x86)
To automatically close the console when debugging stops, enable Tools->Options->Debug->Automatically close console when debugging stops.
Press any key to close this window . . .

100 % No issues found

Question 4: (part 2)

```
Question_4 (Global Scope)
31     function1(lbound, ubound);
32 }
33 else if (letter == "b") { // second function, 'b'
34     function2(lbound, ubound, result);
35     cout << "\nThe difference between two numbers is " << result;
36 }
37 else if (letter == "c") { // third function, 'c'
38     cout << "\nThe value of sum is: " << function3(lbound, ubound);
39 }
40 else { // All invalid input ends program with terminations message
41     cout << "\nInvalid input";
42 }
43 cout << endl;
44 return 0;
45 }
46
47 // function 1: Range of number being multiples of 2 and 7 in bound
48 int function1(int l, int u) {
49     cout << "\nList of numbers in this interval which are multiple of both 2 and 7: ";
50     while (l <= u) { // while-loop to test all values between bound
51         if (l % 2 == 0 && l % 7 == 0) { // multiples of 2 and 7 ONLY when remains of factor are zero
52             cout << l << " "; // print out result of this iteration loop
53         }
54         l++;
55     }
56     return l; // return back to function2 the results
57 }
58
59 // function 2: Difference between upper and lower bound
60 void function2(int l, int u, int &res) {
61     res = u - l; // subtraction between upper bound to lower bound
62 }
63
64 // function 3: Sum calculation with type double
65 double function3(double l, double u) {
66     cout << fixed << setprecision(3); // set 3 decimal places
67     double sum = 0;
68     for (double temp= l; temp<= u; temp++) { // for-loop from lower to upper bound
69         sum += 1 / temp; // equation of the sum
70     }
71     return sum; // return back to function3 the results
72 }
```

Microsoft Visual Studio Debug Console

Please enter two positive integer numbers (Lower bound/Upper bound): 11 63

Please enter a character (a, b or c): b

The difference between two numbers is 52

E:\vsCode\Project Location\COEN 243 Assignments\Assignment 2\Question_4\Debug Code 0.

To automatically close the console when debugging stops, enable Tools->Options when debugging stops.

Press any key to close this window . . .

100 % No issues found

Question 4: (part 3)

```
Question_4 (Global Scope)
43     cout << endl;
44     return 0;
45 }
46
47 // function 1: Range of number being multiples of 2 and 7 in bound
48 int function1(int l, int u) {
49     cout << "\nList of numbers in this interval which are multiple of both 2 and 7: ";
50     while (l <= u) { // while-loop to test all values between bound
51         if (l % 2 == 0 && l % 7 == 0) { // multiples of 2 and 7 ONLY when remains of factor are zero
52             cout << l << " "; // print out result of this iteration loop
53         }
54         l++;
55     }
56     return l; // return back to function2 the results
57 }
58
59 // function 2: Difference between upper and lower bound
60 void function2(int l, int u, int &res) {
61     res = u - l; // subtraction between upper bound to lower bound
62 }
63
64 // function 3: Sum calculation with type double
65 double function3(double l, double u) {
66     cout << fixed << setprecision(3); // set 3 decimal places
67     double sum = 0;
68     for (double temp= l; temp<= u; temp++) { // for-loop from lower to upper bound
69         sum += 1 / temp; // equation of the sum
70     }
71     return sum; // return back to function3 the results
72 }
```

Microsoft Visual Studio Debug Console

Please enter two positive integer numbers (Lower bound/Upper bound): 20 25

Please enter a character (a, b or c): c

The value of sum is: 0.268

E:\vsCode\Project Location\COEN 243 Assignments\Assignment 2\Question_4\Debug\Question_4.exe (process 15940) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close the console when debugging stops.
Press any key to close this window . . .

100 % No issues found

Question 4: (part 4)

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72 }
```

Microsoft Visual Studio Debug Console

Please enter two positive integer numbers (Lower bound/Upper bound): 20 25

Please enter a character (a, b or c): z

Invalid input

E:\vsCode\Project Location\COEN 243 Assignments\Assignment 2\Question_4\Debug\Question_4.exe (process 2216) exited with code 0.
To automatically close the console when debugging stops, enable Tools->Options->Debugging->Automatically close console when debugging stops.
Press any key to close this window . . .

100% No issues found