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CS111 Midterm Spring 2019**Section 1 – C++ Question:****C++ is a *compiled* language. This means that... 5 points****Q1) Code produced by compiler is machine code native to the CPU. Machine code is normally smaller and faster than non-machine code.****SECTION 2 - Write a complete C++ program 10 Points****Q2) Write a complete C++ program that does the following.**

1. Asks the user to enter a whole number between 100 and 9999.
2. If the user entered number is out of range, the program forces the user to re-enter more numbers until a number in the correct range is entered.
3. Then the program prints the digits of the number entered, in reverse, separated by commas.

Sample input → output:

2 → "Entry Invalid. Enter a number between 100 and 9999 "

1234 → "The digits you entered were: 4,3,2,1"

```
#include "stdafx.h"
#include "stdlib.h"
#include "time.h"
#include <iostream>
using namespace std;
int main()
{
    int num;
    do
    {
        cout << "Enter a whole number between 100 and 9999" << endl;
        cin >> num;
    } while (num < 100 || num > 9999);

    while (num > 0)
    {
        cout << num % 10;
        num /= 10;
        if (num > 0)
            cout << ",";
    }
    cout << endl;
    return(0);
}
```

Section 3 – Programming 8 Points Each

Write C++ statements to carry out the following tasks. Do not write complete programs, just give a few lines of C++ code. Your answers must be short and should fit in the spaces provided.

Q3)//Prompt user for input character and read values as a lower case letter, upper case letter, number, or not a character.

//Sample input→output:

a → "Lowercase letter"

A → "Uppercase letter"

7 → "Digit"

* → "Invalid Input"

//The first few lines have been provided...

```
cout << "Enter a lower or uppercase case letter from 'a' to 'z' or 'A' to 'Z'
or a number from 0 through 9 and I will tell you what you entered" <<
endl;
```

```
char c;
```

```
cin >> c;
```

```
if (c >= 'a' && c <= 'z')
    cout << "Lowercase Letter";
else if (c >= 'A' && c <= 'Z')
    cout << "Uppercase Letter";
else if (c >= '0' && c <= '9')
    cout << "Digit";
else
    cout << "Invalid Input";
cout << endl;
```

Q4) Prompt user for input number and print the pattern shown below. The input is a whole number greater than three and the code should use two for loops

Sample input/output:

INPUT: 5

OUTPUT: Pattern below

```
//+++++
//+====+
//+====+
//+====+
//+====+
//+++++
```

```
cout << "Enter a number three are greater and I will draw a cool shape"
```

```
<< endl;
```

```
int squareSize;
```

```
cin >> squareSize;
```

```
for (int row = 1; row <= squareSize; row++)
{
    for (int col = 1; col <= squareSize; col++)
    {
        if (row == 1 || row == squareSize ||
            col == 1 || col == squareSize)
            cout << "+";
        else
            cout << "=";
    }
    cout << endl;
}
```

Q5) Prompt user for a whole number one or greater. Use the number entered to calculate the factorial of that number using a loop.

Only output the factorial.

Sample input → output:

1 → 1

3 → 6 //(3*2*1)

5 → 120 //(5*4*3*2*1)

```
cout << "Enter a whole number greater than 1 and I will tell you it's
```

```
factorial" << endl;
```

```
int n;
cin >> n;
int factorial = 1;
while (n > 1)
{
    factorial *= n;
    n--;
}
cout << factorial << endl;
```

Q6) Prompt user for a whole number. Use the number to calculate the sum of all the numbers before it (including the number itself) using a loop. Output the result.

Only output the factorial.

Sample input→output:

3 → 6 (3 + 2 + 1)

4 → 10 (4 + 3 + 2 + 1)

```
cout << "Enter a whole number" << endl;
int n;
cin >> n;
int sum = 0;
while (n > 0)
{
    sum += n;
    n--;
}
cout << sum << endl;
```

Q7) Prompt user for a whole number between 2 and 10. Generate a multiplication table that is the size entered by the user.

Sample input/output:

Sample input: 4

OUTPUT: Table below Note the numbers should line up nicely as below.

1 2 3 4

2 4 6 8

3 6 9 12

4 8 12 16

```
cout << "Enter a number between 2 and 10 and I will draw a nice
multiplication table" << endl;
```

```
int size;
```

```
cin >> size;
```

```
for (int n1 = 1; n1 <= size; n1++)
{
    for (int n2 = 1; n2 <= size; n2++)
    {
        int num = n1 * n2;
        cout << num;
        if (num <= 9)
            cout << " "; // three spaces
        else if (num <= 99)
            cout << " "; // two spaces
        else
            cout << " "; // one space
    }
    cout << endl;
}
```

Q8) Use a loop to find the greatest common factor of two numbers, that is the largest whole number that will divide evenly into both numbers.

Sample input/output:

3,9 → 3

7,8 → 1

20,15 → 5

12,12 → 12

```
cout << "Enter two whole numbers greater than 0 and I will tell you the greatest  
common factor using a loop" << endl;
```

```
int n1,n2;
```

```
cin >> n1;
```

```
cin >> n2;
```

```
int gcf = 1;
```

```
int i = 1;
```

```
while (i <= n1 && i <= n2)
```

```
{
```

```
    if (n1%i == 0 && n2%i == 0)
```

```
        gcf = i;
```

```
    i++;
```

```
}
```

```
cout << gcf << endl;
```

SECTION 4 - Logical Understanding of Code **8 Points**

Write what the expected output of the code fragments below. If the output never ends, enter the first 10 numbers followed by three dots and the infinite symbol ∞ .

For example, the output of the code below,

```
int i = 0;
```

```
while (true) cout << i++;
```

Output: 012345678910... ∞

The output of the code below,

```
int i = 0;
```

```
while (true) if(i%2==0) cout << i++;
```

Output: 024681012141618... ∞

Q9)

```
int num = 5;
```

```
while (num >= 5 || num <= 10)
```

```
{
```

```
    cout << num << " ,";
```

```
    num++;
```

```
}
```

Q9 Output: 5,6,7,8,9,10,11,12,13,14,15... ∞

Q10)

```
int i = 7;
```

```
while (true)
```

```
{
```

```
    i++;
```

```
    if (i % 2 == 0) continue;
```

```
    if (i % 9 == 0) break;
```

```
    cout << i << " ,";
```

```
}
```

```
cout << i << endl;
```

Q10 Output: 9

Q11)

```
int q = 2, r = 5, s = 4, t = 1;
```

```
int u = 0;
```

```
while (q){u += 1000;q--;} 
```

```
while (r) { u += 100; r--; } 
```

```
while (s) { u += 10; s--; } 
```

```
while (t) { u += 1; t--; } 
```

```
cout << u << endl;
```

Q11 Output: 2541

Q12)

```
int g = 4;
int h = 5;
g = h*g;
h = g/h;
g = g/h;
cout << g << h << endl;
```

Q12 Output: 54

Q13)

Which values for I and d will cause the following code to output true?

```
int i;
double d;
cout << "Enter a whole number and decimal that makes this statement true"
<< endl;
cin >> i;
cin >> d;
if ((i < (i*i) &&
((i*i) > (i*i*i)) &&
(d > d*d) &&
(i + (2 * d) == 0))
cout << "true" << endl;
```

Q13) Values for “i” and “d”: i = -1 d = 0.5

Section 5 - Extra Credit 8 Points

EC 1) Write code that outputs a random password that contain 8 random characters.

- 1) Each character must be either a lower case character 'a' – 'z', an upper case character 'A'-'Z', or a digit '0'-'9'
- 2) The characters 'a' – 'z' and 'A'-'Z' each must have a 3 times higher probability of appearing than a digit character '0'-'9'.

Sample output: "AhjF3Hp8" Improbable output (too many numbers):
"123hU88Q"

```
srand(time(0));
for (int i = 0; i < 8; i++)
{
    int r = rand() % 7;
    char c = ' ';
    if (r == 0) // one chance in 7
        c = '0' + rand() % ('9' - '0' + 1);
    else if (r >= 1 && r <= 3) // 3 chances in 7
        c = 'A' + rand() % ('Z' - 'A' + 1);
    else // 3 chances in 7
        c = 'a' + rand() % ('z' - 'a' + 1);
    cout << c;
}
cout << endl;
```