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CS111 Summer Term 1- Midterm

6/14/18

Section 1

- 1) Write a program that picks a random number between 1 and 100. This program gives the user 5 guesses to guess the random value. Each time the user guesses a number, the program tells the user if they are getting closer or further to the random number compared to the previous guess (the first guess we obviously cannot tell them this) and how many guesses they have left.

```

#include "stdafx.h"
#include <iostream>
include <string>
#include "time.h"

using namespace std;

int main()
{
    srand(time(NULL));
    int randomNumber = rand() % 100 + 1;
    int numberOfGuesses = 5;
    int currentGuess = 0;
    int lastGuess = 0;
    do
    {
        cout << "Guess a number";
        cin >> currentGuess;
        if (currentGuess == randomNumber)
        {
            cout << "you win" << endl;
            break;
        }
        numberOfGuesses--;
        if (lastGuess > 0)
        {
            if (abs(lastGuess - randomNumber) <= abs(randomNumber - currentGuess))
                cout << "you are getting colder" << endl;
            else
                cout << "you are getting warmer" << endl;
        }
        lastGuess = currentGuess;
        cout << "You have " << numberOfGuesses << " chances left" << endl;
    } while (numberOfGuesses > 0);

    if (currentGuess != randomNumber)
        cout << "The number was " << randomNumber << endl;
}

```

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2) Write a Function **int StringLength(charArray[])** that uses a while loop to loop through a character array and returns the length of the string it contains.

```
int StringLength(char str[])
{
    int i = 0;
    while(str[i])
        i++;
    return(i);
}
```

3) Write a Function, **void DivisibleBy(int Number)** that outputs all the factors (besides 1 and **Number**) that divide evenly into it. The answer should be in pairs of factors. No pair should be repeated twice. Big Hint: *The first factor will always be \leq to $\sqrt{\text{Number}}$.*

DivisibleBy(4) → (2,2)

DivisibleBy(5) → ()

DivisibleBy(49) → (3, 13) (7,7)

```
void DivisibleBy(int Number)
{
    for (int i = 2; i <= sqrt(Number); i++)
    {
        if (Number%i == 0)
            cout << "(" << i << ", " << Number / i << ") ";
    }
}
```

4) Write a function **int NthDigit(int Number,int dDigitSpot)** that returns the digit at the digit location. Assume there exists a function **int NumOfDigits(int NumOfDigits)** that returns the total number of digits in a number.

If there is nothing there, then return -1

NthDigit(124,1) → 1

NthDigit(124,2) → 2

NthDigit(124,5) → 1

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```
// returns the number of digits in a number
int NumOfDigits(int number)
{
    int numDigits = 1; // always at least one digit
    while (number > 10)
    {
        numDigits++;
        number /= 10; // remove last digit
    }
    return(numDigits);
}

// return the digit at the spot location
int NthDigit(int Number, int Spot)
{
    // remove digits we are not interested in
    int digitsToRemove = NumOfDigits(Number) - Spot;
    while (digitsToRemove > 0)
    {
        Number /= 10;
        digitsToRemove--;
    }
    return(Number%10);
}
```

5) Write a function that prompts the user for a number and then creates an diagonal line for that number of columns and rows

Output for the input 5 looks like this...

```

    X
  X
X
X
X
```

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```
void DrawBackwardX()
{
    cout << "How Large?" << endl;
    int size = 0;
    cin >> size;
    for (int row = size; row >= 1; row--)
    {
        for (int col = 1; col <= size; col++)
        {
            if (row == col)
                cout << "X";
            else
                cout << " ";
        }
        cout << endl;
    }
}
```

Extra Credit

6) Write a recursive function **int SumAll(int x)** that sums all the numbers before it. For example.

SumAll(5) ==> 15 (5 + 4 + 3 + 2 + 1)

SumAll(4) ==> 10 (4 + 3 + 2 + 1)

```
int SumAll(int n)
{
    if (n == 1)
        return 1;
    return n + SumAll(n - 1);
}
```

7) Why do C and C++ Programs have header or .h files?

What does the linker do?

Answer

- a) So that the compiler recognizes various functions and variables not declared in the file before they are called/used.
- b) The linker combines the machine code from all the various modules and creates an executable

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Section 2

What is the output of the following fragments:

a)
`bool firstime = true;
for (int i = 10; i > 5; i--)
{
 if (!firstime)
 cout << " ";
 cout << i;
 firstime = false;
}`

Answer
10;9;8;7;6

b)
`for (int i = 10; i < 100; i += 10)
{
 if (i == 50)
 continue;
 else if (i < 30)
 break;
 cout << i << " , ";
}`

Answer
NOTHING!!

c)
`int i = 20;
while (i < 30)
{
 cout << i << " , ";
 i += 5;
}`

Answer
20,25,

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d)

```
int k = 0;
for (int i = 0; i < 10; i++)
{
    for (int j = 10; j > i; j--)
    {
        if (k < (i*j))
            k = i * j;
    }
}
cout << k;
```

Answer
90

e)

```
int k = 0;
for (int i = 0; i < 10; i++)
{
    for (int j = 10; j > 0; j--)
    {
        if (k < (i*j) && i == j)
            k = i * j;
    }
}
cout << k;
```

Answer
81

f)

```
bool b = false;
int j = 20;
do
{
    cout << j << ", ";
    j += 20;
} while (b);
```

Answer
20,

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```
g)  int j = 1;
    do
    {
        j++;
        cout << j << ", ";
    } while (j*j < 100);
```

Answer
 2,3,4,5,6,7,8,9,10,

```
h)  cout << 0%2 ;
```

Answer
 0

```
l)  cout << ((9345/2323)*2323) + (9345%2323) ;
```

Answer
 9345

```
j)  for (int i = 1; i <= 10; i += 4)
    {
        if ((i % 2) == 0)
            cout << i << " , ";
        i -= 3;
    }
```

Answer
 2,4,6,8,10,

```
k)  for (int i = 10; i < 10; i++)
    {
        if (i % 2 == 0)
            continue;
        cout << i % 2 << " , ";
    }
```

Answer
 None

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l)

```
srand(time(NULL));  
int random = rand();  
for (int i = 0; i < 10; i++)  
{  
    random = rand();  
    cout << (int)((double)i / random)*random << endl;  
}
```

Answer

0123456789

m)

```
int i = 0.9999;  
cout << i << endl;
```

Answer

0