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CS111 Summer Term II- Midterm

7/15/18

**Summer II Midterm****Part I - Algorithms - 3 points each**

a) RemoveNLastDigits returns the number passed in minus digitsToRemove

digitsToRemove must be positive

RemoveNLastDigits(123456,2) ==> 1234

RemoveNLastDigits(123456,5) ==> 1

```
int RemoveNLastDigits(int num, int digitsToRemove
```

```
{  
    while (digitsToRemove)  
    {  
        num /= 10;  
        digitsToRemove--;  
    }  
    return(num);  
}
```

b) LastDigit returns the last digit of the number passed in

LastDigit(123456) ==> 6

LastDigit(1) ==> 1

```
int LastDigit(int num)
```

```
{  
    return(num % 10);  
}
```

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c) MoveDecimal - moves the decimal point of the decimal passed in to the right if places is positive and to the left if places is negative

MoveDecimal(123.4,2) ==> 12340

MoveDecimal(123.4,-2) ==> 1.234

```
double MoveDecimal(double num,int places)
```

```
{
    while (places)
    {
        if (places < 0)
        {
            num /= 10;
            places++;
        }
        else
        {
            num *= 10;
            places--;
        }
    }
    return(num);
}
```

d) RandBetween1AndN(100) ==> returns 1...100

RandBetween1AndN(4) ==> returns 1..4

RandBetween1AndN(0) ==> 0

RandBetween1AndN(-100) ==> -100...-1

```
int RandBetween1AndN(int highestNumber)
```

```
{
    // prevent divide by 0
    if (highestNumber == 0)
        return(0);

    srand(time(0));
    int ret = (rand() % highestNumber) + 1;
    return(highestNumber>0? ret:-ret);
}
```

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e) the max function returns the higher of two numbers

write the max function using the ? operator

max(1,2) ==&gt; 2

max(4,2) ==&gt; 4

int max(int x,int y)

{

return(x &gt; y ? x : y);

}

f) Just by looking at the two different prototypes for f1, what difference do you see?

void f1(int i, int j)

void f1(int i, int &amp;j)

ANSWER In the second function f1 can change j's value after f1 returns

g) write the function IsEven using the ? operator

IsEven(0) ==&gt; true IsEven(1) ==&gt; false

bool IsEven(int n)

{

return(n % 2 == 0);

}

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## Part II - Programming - 8 Points each

- 1) write a minimum program that outputs "Hello World" followed by a new line. You do not need to include and header files.

```
int main()
{
    cout << "Hello World";
    return(0);
}
```

- 2) Using the define below and a string object, ask the user to enter a pswd and then give the user a message if it is too short or if it is valid.  
#define MIN\_PASSWORD\_LENGTH 8

```
void f()
{
    #define MIN_PASSWORD_LENGTH 8
    string s;
    cout << "Enter a password greater than " << MIN_PASSWORD_LENGTH << "\n";
    cin >> s;
    if (s.length() < MIN_PASSWORD_LENGTH)
        cout << "PSWD too short..\n";
    else
        cout << "Good Pswd...\n";
}
```

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3) Write a function void Factors(int num) that writes out all the number including one and itself that divide evenly into a number

Factors(49) ==> [1,49] [7,7] Factors(12) ==> [1,12] [2,6] [3,4]

void Factors(int num)

```
{
    // prevent divide by 0
    if (num == 0)
    {
        cout << "[" << 0 << "," << 0 << "]" ";
        return;
    }

    for (int i = 1; i <= sqrt(num); i++)
    {
        if (num%i == 0)
            cout << "[" << i << "," << num / i << "]" ";
    }
}
```

4) Write a function void PrimeNumbersLessThanN (int num) that writes the first num prime numbers. You can assume there is an existing function bool IsPrime(int n) function that you can use.

void PrimeNumbersLessThanN (4) ==> 2 3 5 7

bool IsPrime(int n)

```
{
    for (int i = 2; i < n; i++)
        if (n%i == 0)
            return(false);

    return(true);
}
```

void PrimeNumbersLessThanN (int num)

```
{
    for (int i = 2; i <= num; i++)
        if (IsPrime(i))
            cout << i << " ";
}
```

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5) Write a function void FirstNMultiplesOfNum (int num,int times) that writes the first multiples of a number.

FirstNMultiplesOfNum (6,4) ==> 6 12 18 24

FirstNMultiplesOfNum (3,5) ==> 3 6 9 12 15

void FirstNMultiplesOfNum (int num,int times)

```
{
    for (int i = 1; i <= times; i++)
    {
        cout << num * i << " ";
    }
}
```

6) Write a function int CountOddDigits(int number) that returns the number of odd digits in a number.

NOTE: the number can be negative

CountOddDigits(2418) ==> 1

CountOddDigits(-1357) ==> 4

int CountOddDigits(int number)

```
{
    int count = 0;
    while (number)
    {
        if ((number % 10) % 2 == 1)
            count++;

        number /= 10;
    }
    return(count);
}
```

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7) void DrawVertical(int col,size)

for example DrawVertical(3,5) will

draw a vertical line on the third column and 5 down

I have written part of the code below. Just fill in the // missing lines

```
/*  
line 1 *  
line 2 *  
line 3 *  
line 4 *  
line 5 *  
*/  
void DrawVertical(int verticalCol,int size)  
{  
    for(int row =1; row <= size; row++)  
    {  
        for(int col =1; col <= size; col++)  
        {  
            // Missing Lines  
            if (col == verticalCol)  
                cout << "*";  
            else  
                cout << " ";  
        }  
        cout << "\n;"  
    }  
}
```

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8) void CrackPassword()

The FBI needs to crack the password of an iphone that:

- a) has a four number password.
- b) each number is larger than the one before it
- c) the second number is even and the fourth number is odd

Calculate all possible valid passwords with the **least** amount of calculations**Hint** - The first possible password is 0,2,3,5

void CrackPassword()

```

{
    for (int n1 = 0; n1 <= 9; n1++)
        for (int n2 = n1 + (n1 % 2 == 1 ? 1 : 2); n2 <= 9; n2+=2)
            for (int n3 = n2 + 1; n3 <= 9; n3++)
                for (int n4 = n3 + (n3 % 2 == 0 ? 1 : 2); n4 <= 9; n4+=2)
                {
                    cout << n1 << n2 << n3 << n4 << "\n";
                }
}

```

9) EXTRA CREDIT - 8 points

Write a function int DigitsAfterDecimal(double decimal) that returns the number of digits after a decimal point DigitsAfterDecimal(12.123) ==&gt; 3

DigitsAfterDecimal(12) ==&gt; 0

The first two lines of the answer have been provided.

int DigitsAfterDecimal(double decimal)

```

{
    int i = decimal;
    while( i < decimal)
    {
        decimal *= 10;
        i = decimal;
        count++;
    }
    return(count);
}

```



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**PART III - What is the output? 2 Points each**

```
double d = 2.5;
int i = 2.5;
while (d>1)
{
    d/=10;
    i /= 10;
}
```

a) what is the output of `cout << i << " " << d << "\n";`ANSWER i = 0 d = .25

```
double d = 25;
int i = 1234567;
for (int x = 0; x < 3; x += 3)
{
    d /= 10;
    i /= 10;
}
```

b) what is the output of `cout << i << " " << d << "\n";`ANSWER 123456 2.5

```
int d = -1;
int i = 4;
while (d)
{
    if (d < 0)
        break;
    d++;
    i /= 10;
}
```

c) what is the output of `cout << i << " " << d << "\n";`ANSWER 4 -1

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```
int d = -1;
int i = 64;
while (d)
{
    i /= 2;
    if (i % 32 == 0)
        continue;
    d+=1;
}
```

d) what is the output of `cout << i << " " << d << "\n";`

ANSWER 16 0

```
int x = 5;
int y = 9;
int z = 10;
int j = x > y ? (z > x ? z : x) : y;
```

e) what is the output of `cout << j << "\n";`

ANSWER 9

f) what is the output of the loop below:  
`for (int g = 1, h = 10; g < 5; g++, h--)`  
 `cout << g << " " << h << "\n";`

```
1 10
2 9
3 8
4 7
```

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g) what is the output below

```
cout << (((true && 1) && 0) || -1) ? "true" : "false" << "\n";
```

ANSWER "true"