APCS Recursion Multiple Choice Name: _____

1.
```
public int mystery(int k, int n)
{
    if (n==k)
        return k;
    else if (n > k)
        return mystery(k, n-k);
    else
        return mystery(k-n, n);
}
```

Based on the method defined above, what is the value of mystery(6,8)?

a) 1
b) 2
c) 3
d) 4
e) 8

2. Given the following method:

```
public int F (int x)
{
    if ( (x == 1) || (x==3) )
        return x;
    else
        return x * F(x-1);
}
```

Consider invoking F with the following statement:

```
int z = F( F(2) + F(5) );
```

If the *int* data type were large enough(had enough bytes) to allow the program above to be executed, then at the end of the program, the value of z would be

a) 62
b) 5! + 2!
c) (5! + 2!)!
d) (7!)!
e) (62!) / (2!)

Questions 3-4 refer to the following method.

```
public int whatIsIt (int x,  int n)
{
    if ( n == 1 )
        return x;
    else
        return x * whatIsIt(x, n-1);
}
```

3. What is the value returned by **whatIsIt**(4, 4)?

a) 8

b) 16

c) 24

d) 64

e) 256

4. Which of the following is a necessary and sufficient condition for the method **whatIsIt** to return a value if it is assumed that the values of n and x are small in magnitude?

a) $n > 0$

b) $n \geq 0$

c) $n > 0$ and $x > 0$

d) $x \leq n$ and $n > 0$

e) $n \leq x$ and $n > 0$

5.
```
public void wow (int n)
{
    if (n > 1)
            wow (n / 2);
    System.out.print(n + " ");
}
```

The method call *wow*(16) will yield as output which of the following sequences of numbers?

a) 10 8 6 4 2

b) 16 8 4 2 1

c) 1 2 4 8 16

d) 32 16 8 4 2

e) 2 4 8 16 32

6. Consider the following method:

```
public int mult(int x, int y)
{
    //precondition:     x > 0
    //postcondition:    returns x* y

    if ( x == 1 )
            <statement 1>
    else
            <statement 2>
}
```

Which of the following statement pairs properly completes the method?

	<statement 1>	<statement 2>
a)	return x * y	<none>
b)	return y	return mult(x-1, y+1)
c)	return y	return mult(x, y-1) + y
d)	return y	return mult(x-1, y) + y
e)	return y	return mult(x-1, y) * y

Questions 7-8 refer to the following method.

```
public int answer (int n)
{
   if ( n == 1 )
            return 2;
   else
      return 2 * answer( n-1 );
}
```

7. What value does *answer*(5) return?

(A) 2
(B) 8
(C) 10
(D) 32
(E) 120

8. If n is a positive integer, how many times will answer be called to evaluate *answer*(n) (including the initial call)?

(A) 2
(B) n
(C) 2n
(D) n^2
(E) 2^n

9. What happens when the program segment shown below is compiled and executed?

```
public int recurse (int x)
{
    x = 3;
    if (x==0)
        return 0;
    else  {
        x -= 1;
        return x + recurse (x);
    }
}

// this statement is located in some method in the same class as recurse()

System.out.print( recurse (0) );
```

(A) The program writes the value 5.
(B) The program writes the value 6.
(C) The program fails to compile because of illegal use of *recurse* on the right-hand side of an assignment statement.
(D) The program fails to terminate because of infinite recursion.
(E) The program fails to compile because the value returned by a method cannot be the actual parameter of a System.out.print call.

10. Consider the following method.

```
public void mystery (int n)
{
    if (n>2)
        mystery (n % 3);
    System.out.println( (n / 3) + " " );
}
```

The method call *mystery(38)* will yield as output which of the following sequences of numbers?

(A) 0 12
(B) 12 0
(C) 1 1 0 2
(D) 1 1 1 1
(E) 2 0 1 1

11. Given the input line **ABCD** followed by an end-of-line, what does the following method print?

```
public void p rocessLine(String str, int pos)
//precondition:      str = "ABCD", pos=0
{
        if (pos < str.length)
    {
            int i;
            for (i=0; i<=pos; i++)
                System.out.println( str.substring(pos, pos+1) );
            processLine(str, pos + 1);
            for (i=0; i<=pos; i++)
                System.out.println( str.substring(pos, pos+1) );
        }
     }
```

(A) ABCDCBA

(B) ABBCCCDDDD

(C) ABBCCCDDDDDDDDCCCBBA

(D) AABABCABCDABCDABCABA

(E) ABBCCCDDDDDDDDCCCCBBBBAAAA

12. Consider the following method.

```
public int something (int a, int b)
{
        if (b <= 1)
        {
            return a;
        }
        else
        {
            return something (a, b-1);
        }
}
```

What value is returned by the call something (4, 6)?

(a) 4
(b) 6
(c) 24
(d) 1296
(e) 4096

13. Consider the incomplete method powerOf given below.
The call powerOf(n, x) should return the quantity n^x.

```
public int powerOf(int base, int power)
// precondition:        power >= 1
// postcondition:       returns base^power
{
        int result;

        if ( <expression1> == 1 )
        {
                result = <expression2> ;
        }
        else
        {
                result = <expression3> * powerOf(base, power – 1);
        }
        return result;
}
```

Which of the following could be used to replace <expression1>, <expression2>, and <expression3> so that powerOf will work as intended?

	<expression1>	<expression2>	<expression3>
(a)	power	base	result
(b)	power	base	power
(c)	power	base	base
(d)	base	power	result
(e)	base	power	base

14. Consider the following incomplete method.

```
public int mystery(int k)
{
   if (k <= 0)
   {
        return 0;
   }
   else
   {
        return ( <missing code> );
   }
}
```

Which of the following could be used to replace <missing code> so that the value of mystery(5) is 15?

(a) k + mystery(k – 1)
(b) k * mystery(k – 1)
(c) mystery(k – 1)
(d) mystery(k + 1)
(e) mystery(k – 1) * mystery(k + 1)

15. Consider the following method.

```
public void print(int count)
{
        if ( count > 0 )
        {
                int k = IO.readInt();    // reads an integer
                print( count – 1 );
                System.out.println( k );
        }
}
```

Of the following, which text best describes what is printed as a result of the call Print (10)?

(a) Nothing is printed because a run-time error occurs.
(b) Nothing is printed because the if condition never evaluates to true.
(c) Ten integers are printed in the same order in which they were read.
(d) Ten integers are printed in the reverse order in which they were read.
(e) Only the non-zero values that were read are printed: they are printed in the same order in which they were read