



Mathematics and Computer Science Awareness Day

Computer Science Contest

April 3, 2012

Student Name: _____

Team Name: _____

High School: _____

Test Instructions:

1. There are a total of 25 questions.
2. Please mark your answers with a #2 pencil on the Scantron sheet.
3. Please write your name and your team name on the Scantron sheet.
4. Please write down all your work in the space provided with each question. This will help to determine the scores in the event of a tie.

Useful Information:

The Octal number system in base 8 uses $\{0, 1, 2, 3, 4, 5, 6, 7\}$ as its digits. Counting in the Octal system looks like $0=(0)_8$, $1=(1)_8$, $2=(2)_8$, $3=(3)_8$, $4=(4)_8$, \dots , $8=(10)_8$, $9=(11)_8$, etc.

The hexadecimal system uses 16 as the base number. The hexadecimal digits are $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F\}$. In the following questions, hexadecimal numbers have prefix 0x. For example, $10 = 0xA$ and $17 = 0x11$ in hexadecimal. Given the binary, octal, decimal, and hexadecimal systems answer the following questions.



1. What is the octal representation of the binary number $(0100110)_2$?

- (a) $(0100110)_8$ (b) $(046)_8$ (c) $(064)_8$ (d) $(230)_8$ (e) None of these
-

2. The hexadecimal value of the decimal number 2012 is:

- (a) $0xC7D$ (b) $0x7DC$ (c) $0xCD7$ (d) $0x7CD$ (e) $0xD7C$
-

3. What is the hexadecimal representation of the binary number $(11010101)_2$?

- (a) $0x11010101$ (b) $0x46$ (c) $0xD5$ (d) $0x1A5$ (e) None of these
-

4. The decimal number -2 is represented in 8-bit 2's complement notation as:

- (a) $(1000\ 0010)_2$ (b) $(1111\ 1110)_2$ (c) $(1111\ 1101)_2$ (d) $(1111\ 1100)_2$ (e) None of these
-



5. What is the decimal value of 0x2DE is:

- (a) 718 (b) 732 (c) 733 (d) 734 (e) 751

6. The multiplication in the Octal number system $(17)_8 * (34)_8$ is:

- (a) $(420)_8$ (b) $(578)_8$ (c) $(644)_8$ (d) $(902)_8$ (e) None of these

7. The answer of unsigned binary multiplication $(1110)_2 * (1111)_2$ is:

- (a) $(1101\ 1000)_2$ (b) $(1101\ 0010)_2$ (c) $(1101\ 1010)_2$ (d) $(1011\ 0010)_2$ (e) None of these
-



8. Which of the following best describes the circumstances under which the expression

!(a && b) && (a || b)
evaluates to true?

- (a) Always
- (b) Never
- (c) Whenever both a and b are true
- (d) Whenever neither a nor b is true
- (e) Whenever exactly one of a and b is true

9. The expression !(a || b) is equivalent to which of the following expressions?

- (a) (!a) || (!b)
- (b) (!a) && (!b)
- (c) !(a || b)
- (d) (a || b)
- (e) (a || b) && (a && b)

10. Given the function in the box to the right, what is the output of the following program segment?

System.out.print (function(37));

```
static int function(int x)
{
    if(x==0 || x<0) return x;
    int n= x/2+1;
    for(int k= 2; k<n; k++)
    {
        if(x%k==0) return 1;
    }
    return 0;
}
```

- (a) 37
 - (b) 1
 - (c) -37
 - (d) 0
 - (e) None of these
-



11. What is the output of the following program segment?

```
int x = 15;
int y = x<<2;
System.out.print (y);
```

- (a) 30 (b) 60 (c) 45 (d) 90 (e) None of these

12. What is the output of the following program segment?

```
system.out.print (function(-4));
```

```
static int function(int n)
{
    if (n==0 || n==1) return n;
    if(n>1) return n+function(n-1);
    return function((-1)*n);
}
```

- (a)-10 (b) 12 (c) 10 (d) -8 (e) None of these

13. What is the output of the following program segment?

```
int [] array = new int[5];
for (int k =0; k<5;k++) {
    array[k] = (k==0)? 1:array[k-1]*k;
}
System.out.print (array [4]);
```

- (a) 4 (b) 12 (c)24 (d) 60 (e) None of these
-



14. What is the output of the following program segment?

```
int sum = 0;
int item = 0;

do {
    item ++;
    if (item >4) continue;
    sum += item;
} while (item <=5);

System.out.print (sum);
```

- (a) 10 (b) 3 (c) 6 (d) 14 (e) 15

15. What is the output of the following program segment?

```
int a[ ] = {5, 4, 8, 2, 9, 0};
for ( int k= a.length-1; k>1; k--) {
    for (int j =0;j<k; j++){
        if (a[j] > a[j+1]){
            int t = a[j]; a[j] = a[j+1]; a[j+1] = t;
        }
    }
}
System.out.print(a[3]);
```

- (a) 8 (b) 2 (c) 9 (d) 5 (e) None of these



16. Consider the program given below. If its output is:

2 4 6 8
3 6 9 12
What was the input?

```
import java.util.Scanner;
public class Test {
    public static void main(String args[]) {
        int i, j, k, n, r;
        Scanner input = new Scanner(
            System.in);
        k=input.nextInt();
        n=input.nextInt();
        r=input.nextInt();

        for( j=k; j<=n; j++) {
            for( i=1; i<=r; i++) {

                System.out.printf("%d ", i*j) ;
            }
            System.out.println(" ");
        }
    }
}
```

(a) 2 3 4

(b) 3 2 4

(c) 3 4 2

(d) 2 4 3

(e) None of these

17. What is the output of the following program segment?

```
int[][] a = {{0, 1, 2, 3, 4},{1, 2, 3, 4,5},{2, 3, 4, 5,6}};
int b=0;

for (int i = 0; i < a.length; i++)
    for (int j=i; j<a[0].length; j++)
        b += a[i][j];

System.out.print (b);
```

(a) 12

(b) 24

(c) 39

(d) 45

(e) None of these



18. What is the output of the following program segment?

function("gdkkn");

```
static void function(String letters)
{
    int i;
    char charArray[]=letters.toCharArray();
    for (i=0; i<charArray.length; i++)
        charArray[i] = (char) (charArray[i] + 'F' - 'e');
    System.out.println(charArray);
}
```

- (a) GDKKN (b) HELLO (c) gdkkn (d) hello (e) None of these

19. What is the output of the following program?

```
public class Test {
    public static void main( String args[] )
    {
        int a[];
        a = new int[ 10 ];
        for ( int i = 0; i < a.length; i++ )
            a[ i ] = i + 1 * 2;
        int result = 0;
        for ( int i = 0; i < a.length; i++ ) {
            result += a[ i ];
        }
        System.out.println( "Result is : " + result );
        System.exit( 0 );
    }
}
```

- (a) Result is : 62 (b) Result is : 64 (c) Result is : 65 (d) Result is : 67 (e) None of these
-



20. What is the output of the following program segment?

```
int[] list1 = {1, 2, 3};  
int[] list2 = {4, 5, 6};  
list1 = list2;  
list2[0]=7; list2[1] = 8; list2[2]=9;  
for (int i = list1.length -1; i>=0; i--)  
    System.out.print(list1[i] + " ");
```

(a) 1 2 3

(b) 4 5 6

(c) 7 8 9

(d) 6 5 4

(e) 9 8 7

21. What is the output of the following program segment?

```
int[] a = {2, 9, 5, 6, 3};  
function(a);  
  
System.out.print( a[3] );
```

```
static void function (int[] a) {  
    int in, out;  
  
    for(out=1; out<a.length; out++) {  
        int temp = a[out];  
        in = out;  
        while(in>0 && a[in-1] >= temp) {  
            a[in] = a[in-1];  
            --in;  
        }  
        a[in] = temp;  
    }  
}
```

(a) 2

(b) 3

(c) 5

(d) 6

(e) 9



22. What is the output of the following program?

```
public class Test {
    public static void main ( String[ ] args ) {
        int[] list = {1, 2, 3, 4, 5};
        function(list);
        for (int i = 0; i < list.length; i++)
            System.out.print(list[i] + " ");
    }

    public static void function( int[ ] oldList) {
        int[] newList = new int[oldList.length];
        for (int i = 0; i < oldList.length; i++)
            newList[i] = oldList[oldList.length -1 -i];
        oldList = newList;
    }
}
```

- (a) 1 2 3 4 5
- (b) 1 2 3 4 5, and then raises an `ArrayIndexOutOfBoundsException`
- (c) 5 4 3 2 1
- (d) 5 4 3 2 1, and then raises an `ArrayIndexOutOfBoundsException`
- (e) None of the above

23. What is the output of the following program?

```
System.out.print( function(72, 80));
```

- (a) 2 (b) 4 (c) 6
- (d) 8 (e) 12

```
static int function (int m, int n)
{
    int k;

    while (n>0) {
        k = m%n;
        m = n;
        n = k;
    }
    return m;
}
```



24. What is the output of the following program segment?

```
int a[ ] = {5, 4, 8, 2, 9, 0};
for ( int k= 1; k<a.length; k++) {
    for (int j =k+1;j<a.length; j++){
        if (a[j] > a[k]){
            int t = a[j];  a[j] = a[k];  a[k] = t;
        }
    }
}
System.out.print(a[3]);
```

- (a) 8 (b) 2 (c) 9 (d) 5 (e) None of these

25. What is the output of the following program segment?

```
System.out.print( function(4));
```

```
static int function (int k)
{
    int x = 2;
    for (int i=1; i<=k; i++ )
        x = x * x;
    return x;
}
```

- (a) 16 (b) 256 (c) 4096 (d) 65536 (e) None of these
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