

24) Consider the following code segment.

```
double a = Math.random();  
double b;
```

Which of the following statements can be used to assign b a random value in between 0.5 and 5.5?

- (A) $b = a + 0.5;$
- (B) $b = a + 0.5 * 5.0;$
- (C) $b = a * 5.0;$
- (D) $b = a * 5.0 + 0.5;$
- (E) $b = a * 5.5;$

Basic
#2

27) Consider the following code segment.

```
int a = 6;  
int b = 4;  
int c = 3;  
a -= b + c;  
b += a - c;  
c -= a + b;  
System.out.println(a + " " + b + " " + c);
```

What will be displayed upon execution of the code?

- (A) -1 2 4
- (B) -2 4 -1
- (C) 4 2 1
- (D) -1 0 4
- (E) 4 3 6

For Questions 28 - 29, refer to following code.

```
public int f(int y)
{
    return y + 2;
}
```

```
public int g(int y)
{
    return y * 2;
}
```

28) What will be printed when we execute the following code segment?

```
int y = 1;
y += f(g(6)) - g(f(6));
System.out.println(y);
```

- (A) 0
- (B) -1
- (C) -2
- (D) 3
- (E) 4

29) What will be printed when we execute the following code segment?

```
int y = 1;  
y += f(g(2)) - g(f(4));  
System.out.println(y);
```

(A) -4

(B) -6

(C) -8

(D) -2

(E) 1

36) Consider the following code segment.

```
int x = 0;

if (<condition 1>)
{
    x++;
}
if (<condition 2>)
{
    x++;
}
if (<condition 3>)
{
    x++;
}
```

Assume that none of the conditions can influence the value of x. What are the possible final values of x after the code segment is executed?

- (A) 0 only
- (B) 1 only
- (C) 0 or 1
- (D) 1, 2, or 3
- (E) 0, 1, 2, or 3

37) Consider the following code segment.

```
int odd = 1;

if(odd)
{
    System.out.println("odd");
}
else
{
    System.out.println("even");
}
```

Which of the following statements is always true?

- I. "Odd" will be printed
 - II. "Even" will be printed
 - III. A compile time error will occur
- (A) I only
(B) II only
(C) III only
(D) I and II
(E) II and III

40) Consider the following code segment.

```
double d = Math.round(2.5 + Math.random());
System.out.println(d);
```

What will be the output of the above code?

- (A) 2.0
(B) 3.0
(C) 4.0
(D) 5.0
(E) 4.5

5) Consider the incomplete method. The method `checkLength()` is intended to return the length of the String passed to it.

```
public int checkLength(String s)
{
    // missing code
}
```

Which of the code segments shown below can be used to replace `// missing code` so that `checkLength()` will work as intended?

(A) `int length = s.length;`
`return length;`

(B) `int length = s.length();`
`return length;`

(C) `length = s.length();`
`return length;`

(D) `int length = length();`
`return length;`

(E) None of the above

13) Consider the following code segment.

```
public class Output
{
    public static void main(String args[])
    {
        String c = "Hello I love java";
        boolean var;
        var = c.startsWith("hello");
        System.out.println(var);
    }
}
```

What is the output of the above code?

- (A) true
- (B) false
- (C) 0
- (D) 1
- (E) 3

14) Consider the following code segment.

```
String s1 = new String("AbraCadabra");
String s3;
s3 = s1.substring(1, 5);
System.out.println(s3);
```

What is the output of the above code?

- (A) braC
- (B) baCILLO
- (C) AbraC
- (D) raCI
- (E) braCI

16) Consider the following code segment.

```
int j;
for (int i = 0; i < 14; i++)
{
    if (i < 10)
    {
        j = 2 + i;
    }
    System.out.println("j: " + j + " i: " + i);
}
```

What error is expected during the compilation?

I. Local variable j may not have been initialized

II. Syntax error

III. No error

(A) II only

(B) I and II only

(C) III only

(D) I only

(E) I, II, and III

17) Consider the following code segment.

```
public boolean boolCheck(int x)
{
    if (x == 0)
    {
        return true;
    }
    else
    {
        return false;
    }
}
```

For what values of x does the method boolCheck() return true?

- (A) 1
- (B) 2
- (C) 3
- (D) 0
- (E) 4

32) Consider the following code segment.

```
int arr[] = new int[] {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};  
int n = 6;  
n = arr[arr[n] / 2];  
System.out.println(arr[n] / 2);
```

What is the output of above code segment?

- (A) 3
- (B) 2
- (C) 5
- (D) 1
- (E) 0

19) Consider the following code segment.

```
String s = "JAVA";  
System.out.println(s.substring(1, 5).substring(1, 4).substring(0, 3));
```

What is the output of above code segment?

- (A) Compile time error
- (B) JA
- (C) VA
- (D) JAV
- (E) JAVA

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}

Wha
(A)
(B)
(C)
(D)
(E)

34) Consider the following code segment.

```
int g = 3;  
System.out.print(++g * 8);
```

What is the output of above code segment?

- (A) 32
- (B) 34
- (C) 28
- (D) 33
- (E) 35

35) Consider the following code segment.

```
boolean var1 = true;  
boolean var2 = false;  
if (var1)  
{  
    System.out.println(var1);  
}  
else  
{  
    System.out.println(var2);  
}
```

What is the output of above code segment?

- (A) 0
- (B) 1
- (C) true
- (D) false
- (E) None of the above

36) Consider the following code segment.

```
boolean var1 = true;  
boolean var2 = false;  
System.out.println((var2 & var2));
```

What is the output of above code segment?

- (A) true
- (B) false
- (C) Syntax error
- (D) Compile time error
- (E) None of the above

37) Consider the following code segment.

```
String var1 = 65.5;  
String var2 = 97.8;  
System.out.println((int) var1 + " " + (int) var2);
```

What is the output of above code segment?

- (A) 65 97
- (B) 97 65
- (C) 67 65
- (D) 87 9
- (E) 90 65

38) Which of the following would compile without error?

- (A) `int a = Math.abs(-5);`
- (B) `int a = Math.abs(5.5);`
- (C) `int a = Math.abs(5F);`
- (D) A and B
- (E) None of the above

39) Which of the following are valid calls to `Math.max`?

- I. `Math.max(1, 4)`
 - II. `Math.max(1, 4.8)`
 - III. `Math.max(1.1, 4)`
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I, II and III
 - (E) II and III

40) Which is the valid declaration to of a boolean?

- I. `boolean b1 = 0;`
 - II. `boolean b2 = "true";`
 - III. `boolean b3 = true;`
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I, II and III
 - (E) None of these

1) Consider the following code segment.

```
1 String s = "Hello World";
2 int i = s.indexOf('o');
3 int j = s.lastIndexOf('l');
4 System.out.print(i + " " + j);
```

What will be displayed upon execution of this code segment?

- (A) 4 8
- (B) 5 9
- (C) 4 9
- (D) 5 8
- (E) None of the above

2) Consider the following code segment.

```
String[] names = new String[10];
System.out.println(names);
```

What will be displayed upon execution of this code segment?

- (A) Null
- (B) Memory location of the array
- (C) 0 0 0 0 0 0 0 0 0 0
- (D) Run time error
- (E) None of the above

10) Consider the following code segment.

```
public static void main(String [] args)
{
    int a;
    int b;
    int c;
    a = 100;
    b = ++a;
    c = b++ + ++a;
    System.out.println(a + " " + b + " " + c);
}
```

What will be the output for the above code?

- (A) 100 101 201
- (B) 101 101 202
- (C) 102 102 203
- (D) 101 102 202
- (E) None of the above

16) Which of the following code segments randomly picks values?

- (A) `Math.min()`
- (B) `Math.pickrandom()`
- (C) `Math.random()`
- (D) `Math.pow()`
- (E) B and C

21) Consider the following method.

```
public void strcom(String str1, String str2, String str3)
{
    System.out.print(str1.equals(str2) + " ");
    System.out.print(str1.equals(str3) + " ");
    System.out.print(str2.equalsIgnoreCase(str3));
}
```

What will be the output if `strcom("java.com","Java.com","JAVA.COM")`?

- (A) false false true
- (B) true false true
- (C) false true true
- (D) false false false
- (E) Compile time error

23) If `a, b, c` are integers, which of the following will be true based on this expression?

`(a < b && b < c && c > a) = true`

- (A) `b` is greater than `a`
- (B) `c` is the greatest
- (C) `a` is the greatest
- (D) A and B
- (E) Not enough information

27) Consider the following code segment.

```
int num = (int) (Math.random() * 5) + 3;  
System.out.println("num = " + num);
```

What will the output be?

- (A) Integer between 3 and 8
- (B) Integer between 0 to 8
- (C) Integer between 0 to 50
- (D) Integer between 1 and 8
- (E) None of the above

28) Consider the following code segment.

```
String Str = "Super keyword";  
System.out.println( Str.substring(3,8));
```

What will the output be?

- (A) erke
- (B) keywo
- (C) per k
- (D) er ke
- (E) er key

38) Consider the following method.

```
public void number(int num)
{
    int num1 = 0;

    while (num != 0)
    {
        num1 = num1 * 10;
        num1 = num1 + num % 10;
        num = num / 10;
    }

    System.out.println(num1);
}
```

What will be the output if number(125) ?

- (A) 8
- (B) 521
- (C) 125
- (D) 10
- (E) None of the above

31) Consider the following code segment.

```
int n = 100;
for (int i = 0; i < 10; i++)
{
    n = n + n++;
}
System.out.println(n);
```

What will be the output?

- (A) 102401
- (B) 10240
- (C) 102400
- (D) 1024
- (E) None of the above

1. Given the declarations

```
int p = 5, q = 3;
```

which of the following expressions evaluate to 7.5?

- I. `(double)p * (double)q / 2;`
- II. `(double)p * (double)(q / 2);`
- III. `(double)(p * q / 2);`

- (A) I only
- (B) II only
- (C) I and II
- (D) I, II, and III
- (E) None of the above

6. Suppose a , b , and c are positive integers under 1000 and x satisfies the formula

$$\frac{a}{b} = \frac{c}{x}$$

The integer value d is obtained by truncating x to an integer. Which of the following code segments correctly calculates d ?

- I. `d = c * b / a`
- II. `int temp = c * b;`
`d = temp / a;`
- III. `int temp = b / a;`
`d = c * temp;`

- (A) I only
- (B) II only
- (C) I and II
- (D) II and III
- (E) I, II, and III

9. Which of the following is NOT a good reason to use comments in programs?

- (A) To document the names of the programmers and the date of the last change
- (B) To document requirements for correct operation of a method
- (C) To document which methods of a class are private
- (D) To describe parameters of a method
- (E) To explain a convoluted piece of code

3. Assuming that c and d are Boolean variables, the expression

$!c \ || \ d$

is equivalent to which of the following?

- (A) $!(c \ \&\& \ d)$
- (B) $!(c \ \&\& \ !d)$
- (C) $c \ \&\& \ !d$
- (D) $!(c \ || \ !d)$
- (E) $!(!c \ \&\& \ d)$

4. Suppose method `fun2` is defined as:

```
public int fun2(int x, int y)
{
    y -= x;
    return y;
}
```

What are the values of variables a and b after the following code is executed?

```
int a = 3, b = 7;
b = fun2(a, b);
a = fun2(b, a);
```

- (A) a is -1 and b is 4
- (B) a is -4 and b is 7
- (C) a is -4 and b is 4
- (D) a is 3 and b is 7
- (E) a is 3 and b is 4

5. Assuming that a and b are Boolean variables, when is the following expression true?

$!(!a \ || \ b) \ || \ (!a \ \&\& \ b)$

- (A) If and only if a and b have different values
- (B) If and only if a and b have the same value
- (C) If and only if both a and b are true
- (D) If and only if both a and b are false
- (E) Never

11. Which of the following will evaluate to true only if boolean expressions A, B, and C are all false?

- (A) !A && !(B && !C)
- (B) !A || !B || !C
- (C) !(A || B || C)
- (D) !(A && B && C)
- (E) !A || !(B || !C)

12. Assume that a and b are integers. The boolean expression

`!(a <= b) && (a * b > 0)`

will always evaluate to true given that

- (A) `a = b`
- (B) `a > b`
- (C) `a < b`
- (D) `a > b` and `b > 0`
- (E) `a > b` and `b < 0`

13. Given that a, b, and c are integers, consider the boolean expression

`(a < b) || !((c == a * b) && (c < a))`

Which of the following will *guarantee* that the expression is true?

- (A) `c < a` is false.
- (B) `c < a` is true.
- (C) `a < b` is false.
- (D) `c == a * b` is true.
- (E) `c == a * b` is true, and `c < a` is true.

14. In the following code segment, you may assume that a, b, and n are all type int.

```
if (a != b && n / (a - b) > 90)
{
    /* statement 1 */
}
else
{
    /* statement 2 */
}
/* statement 3 */
```

What will happen if `a == b` is false?

- (A) `/* statement 1 */` will be executed.
- (B) `/* statement 2 */` will be executed.
- (C) Either `/* statement 1 */` or `/* statement 2 */` will be executed.
- (D) A compile-time error will occur.
- (E) An exception will be thrown.

15. Given that n and $count$ are both of type `int`, which statement is true about the following code segments?

```
I for (count = 1; count <= n; count++)
    System.out.println(count);
```

```
II count = 1;
while (count <= n)
{
    System.out.println(count);
    count++;
}
```

- (A) I and II are exactly equivalent for all input values n .
(B) I and II are exactly equivalent for all input values $n \geq 1$, but differ when $n \leq 0$.
(C) I and II are exactly equivalent only when $n = 0$.
(D) I and II are exactly equivalent only when n is even.
(E) I and II are not equivalent for any input values of n .
16. The following fragment intends that a user will enter a list of positive integers at the keyboard and terminate the list with a sentinel:

```
int value = 0;
final int SENTINEL = -999;
while (value != SENTINEL)
{
    //code to process value
    ...
    value = IO.readInt();    //read user input
}
```

The fragment is not correct. Which is a true statement?

- (A) The sentinel gets processed.
(B) The last nonsentinel value entered in the list fails to get processed.
(C) A poor choice of `SENTINEL` value causes the loop to terminate before all values have been processed.
(D) The code will always process a value that is not on the list.
(E) Entering the `SENTINEL` value as the first value causes a run-time error.
17. Suppose that base-2 (binary) numbers and base-16 (hexadecimal) numbers can be denoted with subscripts, as shown below:

$$2A_{\text{hex}} = 101010_{\text{bin}}$$

Which is equal to $3D_{\text{hex}}$?

- (A) 111101_{bin}
(B) 101111_{bin}
(C) 10011_{bin}
(D) 110100_{bin}
(E) 101101_{bin}

9) What is the result of the following expression?

```
int result = 5 / 3 + 6 - 2 * 2;
```

- (A) 4
- (B) -4
- (C) 3
- (D) -3

10) Consider the following code segment.

```
public class Test
{
    public static void main(String[] args)
    {
        int result1 = 2 - 6 / 3 * 4 + 2 % 5;
        int result2 = (2 - 6) / 3 * (2 + 2);
        System.out.println(result1);
        System.out.println(result2);
    }
}
```

What numbers are printed as a result of executing the code segment?

- (A) Both numbers are the same
- (B) -4, -1
- (C) 4, 1
- (D) -3, -1

11) Which of the following code segments properly declares and assigns the variable x a value?

I. `int x = 2;`

II. `int x = 20000;`

III. `int x = 21.2;`

IV. `double x = "X";`

V. `String x = "X";`

(A) Only I

(B) Only I and II

(C) I, II, III, V

(D) I, II, V

12) If x is a double variable with a value of 654321 and y is a double variable with a value of 654321.0, what will result from the following expression?

`x == y`

(A) true

(B) false

(C) 0

(D) Compile time error

13) Consider the following code segment.

```
boolean x = true;
boolean y = false;
boolean z = !x;

System.out.println("Result 1: " + (x | y));
System.out.println("Result 2: " + (y & z));
System.out.println("Result 3: " + (!z));
```

What is printed as a result of executing the code segment?

(A) Result 1: true
Result 2: true
Result 3: true

(B) Result 1: true
Result 2: false
Result 3: true

(C) Result 1: true
Result 2: false
Result 3: false

(D) Result 1: false
Result 2: false
Result 3: true

14) What occurs if an attempt is made to compile and execute the following code segment?

```
double big = 45.67;
int small = 45;
boolean result = (big > small && small != 100);
System.out.println("The result is " + result);
```

- (A) The result is true
- (B) The result is false
- (C) An error will occur at Line 3
- (D) An error will occur at Line 4

1) Consider the following code segment.

```
int number = 100;

if (number == 100)
{
    System.out.print("equal");
}

if (number < 100)
{
    System.out.print("less than 100" );
}
else
{
    System.out.print("greater than 100");
}
```

What will be displayed upon execution of this code segment?

- (A) The statements will not compile.
- (B) greater than 100
- (C) less than 100
- (D) equalgreater than 100

2) Consider the following code segment.

```
int a = 1;
int n = 0;
int result = a / n;

if (n == 0)
{
    System.out.println("divide by zero"); // statement1
}
else
{
    System.out.println(result); // statement2
}
```

Which of the following occur upon execution of the code segment?

- (A) A syntax error
- (B) statement1 is executed
- (C) statement2 is executed
- (D) Both statements are executed

3) Consider the following code segment.

```
int x = 30;
int y = 10;
int z = 50;

if (x > y)
{
    if (z <= y)
    {
        System.out.print("x ");
    }
    else
    {
        System.out.print("x or z ");
        System.out.print("xyz ");
    }
}
else
{
    if (y > z)
    {
        System.out.print("y ");
    }
}
}
```

What will be displayed upon execution of this code segment?

- (A) The statements will not compile.
- (B) x y
- (C) x or z y
- (D) x or z xyz

4) Consider the following code segment.

```
boolean x = false;  
  
if (x)  
{  
    System.out.print("false");  
}  
System.out.print("true");
```

What will be displayed upon execution of this code segment?

- (A) Nothing will be displayed.
- (B) true
- (C) false
- (D) falsetrue

15) Which of the following code segments can be used to determine whether x is an odd number?

```
(A) if ( x % 2 = 0 )
    {
        System.out.println("You entered an even number.");
    }
    else
    {
        System.out.println("You entered an odd number.");
    }
```

```
(B) if ( x / 2 = 0 )
    {
        System.out.println("You entered an even number.");
    }
    else
    {
        System.out.println("You entered an odd number.");
    }
```

```
(C) if ( x % 2 == 0 )
    {
        System.out.println("You entered an even number.");
    }
    else
    {
        System.out.println("You entered an odd number.");
    }
```

```
(D) if ( x / 2 == 0 )
    {
        System.out.println("You entered an even number.");
    }
    else
    {
        System.out.println("You entered an odd number.");
    }
```

17) Consider the following code segment.

```
int x = 7;  
int y = 6;  
int z = 1234;  
System.out.println(" " + x + y + z);
```

What will be displayed upon execution of this code segment?

- (A) 761234
- (B) 23
- (C) 1247
- (D) The code will not compile.

21) If $x = 2$ and $y = 5$ after executing the following code segment, what are the original values of x and y respectively?

```
int temp;  
temp = x;  
x = y;  
y = temp;
```

- (A) 2, 5
- (B) 2, temp
- (C) 5, 2
- (D) temp, 5

23) Consider the following code segment.

```
int temperature = 50;
if (temperature < 50)
{
    System.out.println("It's cold."); // Line 1
}
else if (temperature < 80)
{
    System.out.println("It's nice."); // Line 2
}
else
{
    System.out.println("It's hot."); // Line 3
}
```

Which lines are displayed upon execution of this code segment?

- (A) Line 1
- (B) Line 1 and Line 2
- (C) Line 2
- (D) Line 2 and Line 3
- (E) Line 3

1) Which of these classes is a superclass of all other classes?

- (A) Math
- (B) Process
- (C) System
- (D) Object

2) What is the value of double constant 'PI' defined in Math class?

- (A) approximately 3
- (B) approximately 3.14
- (C) approximately 2.72
- (D) approximately 0

3) Which of these methods is a function of Math class?

- (A) max()
- (B) min()
- (C) abs()
- (D) All of the above

4) What is the value of double constant 'E' defined in Math class?

- (A) approximately 3
- (B) approximately 3.14
- (C) approximately 2.72
- (D) approximately 0

5) What will be displayed upon execution of this code segment?

```
double x = 3.14;  
int y = (int) Math.abs(x);  
System.out.print(y);
```

- (A) 0
- (B) 3
- (C) 3.0
- (D) 3.1

6) What will be displayed upon execution of this code segment?

```
double x = 3.1;  
double y = 4.5;  
double z = Math.max( x, y );  
System.out.print(z);
```

- (A) True
- (B) False
- (C) 3.1
- (D) 4.5

7) What will be displayed upon execution of this code segment?

```
double x = 2.0;  
double y = 3.0;  
double z = Math.pow( x, y );  
System.out.print(z);
```

- (A) 9
- (B) 8
- (C) 8.0
- (D) 9.0

8) Which of these methods returns a random number?

- (A) `rand()`
- (B) `random()`
- (C) `randomNumber()`
- (D) `randGenerator()`

9) Consider the following code. Will this generate same output if executed twice?

```
int y = Math.random();  
System.out.print(y);
```

- (A) Yes
- (B) No
- (C) Depends on the compiler
- (D) Depends on the operating system

10) Which of the following code segments will successfully compile?

- I. `System.out.println(Math.max(x));`
- II. `System.out.println(Math.random());`
- III. `System.out.println(Math.abs(10));`
- IV. `System.out.println(Math.random(10,3));`
- V. `System.out.println(Math.abs(10,3));`

- (A) I and II
- (B) I, III, and V
- (C) II and III
- (D) III and IV

11) Which of these is a wrapper for data type int?

- (A) Integer
- (B) Long
- (C) Byte
- (D) Double

12) What is the output of this program?

```
Integer i = new Integer(257);  
int x = i.intValue();  
System.out.print(x);
```

- (A) 0
- (B) 1
- (C) 256
- (D) 257

13) Which of the following methods returns the value as a double?

- (A) doubleValue()
- (B) converDouble()
- (C) getDouble()
- (D) getDoubleValue()

14) What will be displayed upon execution of this code segment?

```
Double i = new Double(257.578);  
int x = i.intValue();  
System.out.print(x);
```

- (A) 0
- (B) 1
- (C) 258
- (D) 257

15) Which of these methods of the String class can be used to test to strings for equality?

- (A) isequal()
- (B) isequals()
- (C) equal()
- (D) equals()

16) What will be displayed upon execution of this code segment?

```
String obj = "I" + "like" + "Java";  
System.out.println(obj);
```

- (A) I
- (B) Like
- (C) Java
- (D) IlikeJava

17) What will be displayed upon execution of this code segment?

```
String obj = "I LIKE JAVA";  
System.out.println(obj.length());
```

- (A) 9
- (B) 10
- (C) 11
- (D) 12

18) What will be displayed upon execution of this code segment?

```
String obj = "hello";  
String obj1 = "world";  
String obj2 = "hello";  
System.out.println(obj.equals(obj1) + " " + obj.equals(obj2));
```

- (A) false false
- (B) true true
- (C) true false
- (D) false true

19) Which of these methods of the String class is used to extract a substring from a String object?

- (A) substring()
- (B) Substring()
- (C) SubString()
- (D) None of the above

20) What will be displayed upon execution of this code segment?

```
String s1 = "Hello World";  
String s2 = s1.substring(0 , 4);  
System.out.println(s2);
```

- (A) Hell
- (B) Hello
- (C) Worl
- (D) World

21) What will be displayed upon execution of this code segment?

```
String s = "Hello World";  
int i = s.indexOf('o');  
int j = s.lastIndexOf('l');  
System.out.print(i + " " + j);
```

- (A) 4 8
- (B) 5 9
- (C) 4 9
- (D) 5 8

22) What will be displayed upon execution of this code segment?

```
String s1 = "Moksh";  
String s2 = "Moksh";  
String s3 = "Jawa";  
System.out.print(s1.compareTo(s2) + " ");  
System.out.print(s1.compareTo(s3) + " ");  
System.out.print(s3.compareTo(s1));
```

- (A) 0 0 0
- (B) 0 3 3
- (C) 0 -3 -3
- (D) 0 3 -3

10. *Top-down* program development methodology is best characterized by:

- (A) Defining a class's methods and class variables first and instance variables and constructors later
- (B) Coding classes and methods that implement higher-level tasks first, using temporary "stubs" for lower-level classes and methods
- (C) Having a project leader design the software and then divide the work among programmers
- (D) Assembling the program from reusable components
- (E) Designing data structures first and classes and objects later

14. Which of the following statements about Java's platform independence are true?

- I. The number of bytes used by an `int` variable is the same on any computer.
- II. Java source code is compiled into bytecodes, which may then be run on any computer that has a Java Virtual Machine installed.
- III. Overflow in arithmetic operations occurs at the same values regardless of the platform on which the Java program is running.

- (A) I only
- (B) II only
- (C) I and II
- (D) II and III
- (E) I, II, and III

15. Given two initialized `String` variables, `str1` and `str2`, which of the following conditions correctly tests whether the value of `str1` is greater than or equal to the value of `str2` (in lexicographical order)?

- (A) `str1.compareTo(str2) == true`
- (B) `str1.compareTo(str2) >= 0`
- (C) `str1 >= str2`
- (D) `str1.equals(str2) || str1.compareTo(str2) == 1`
- (E) `str1.length() > str2.length() || str1 >= str2`

23. What is the output from the following code segment?

```
double pi = 3.14159;  
int r = 100;  
int area = (int)(pi * Math.pow(r, 2));  
System.out.println(area);
```

- (A) 30000
- (B) 31415
- (C) 31416
- (D) 314159
- (E) Depends on the particular computer system

2. Assuming that `x` and `y` are `int` variables, the expression

```
!(x > y && y <= 0)
```

is equivalent to which of the following?

- (A) `!(x <= y) || (y > 0)`
- (B) `x > y && y <= 0`
- (C) `x <= y || y > 0`
- (D) `x > y || y < 0`
- (E) `x <= y && y <= 0`

3. Which of the following could serve as a postcondition in the following method?

```
// precondition: amt represents a positive value in dollars
//                and cents (for example, 1.15 represents
//                one dollar and fifteen cents)
private int process(double amt)
{
    return (int)(amt * 100 + 0.5) % 100;
}
```

7. Which of the following Boolean expressions properly implement a comparison for equality of two `String` objects `str1` and `str2` and evaluate to `true` if and only if `str1` and `str2` hold the same values?

- I. `str1 == str2`
- II. `str1.equals(str2)`
- III. `str1.compareTo(str2) == 0`

- (A) I only
- (B) II only
- (C) I and II
- (D) II and III
- (E) I, II, and III

8. What is the output of the following code segment?

```
int a = 3;
int b = 4;
int c = 0;

if (a == b && b/c == 1)
{
    c = a * b;
}
else
{
    c = a + b * c;
    System.out.println(c);
}
```

- (A) Run-time division-by-zero error
- (B) 0
- (C) 3
- (D) 6
- (E) 12

14. Which of the following recommendations for testing software is NOT good advice?

- (A) Test a program with all possible values of input data.
- (B) When testing a large program, test the smaller pieces individually before testing the entire program.
- (C) If possible, use automated testing procedures or read test data from files so that you can re-run the tests after corrections have been made.
- (D) Design test data that exercises as many different paths through the code as is practical.
- (E) Test on data that is at the boundary of program conditionals to check for "off by one" errors.

18. A common use of hexadecimal numerals is to specify colors on web pages. Every color has a red, green, and blue component. In decimal notation, these are denoted with an ordered triple (x, y, z) , where x , y , and z are the three components, each an int from 0 to 255. For example, a certain shade of red, whose red, green, and blue components are 238, 9, and 63, is represented as $(238, 9, 63)$.

In hexadecimal, a color is represented in the format #RRGGBB, where RR, GG, and BB are hex values for the red, green, and blue. Using this notation, the color $(238, 9, 63)$ would be coded as #EE093F.

Which of the following hex codes represents the color $(14, 20, 255)$?

- (A) #1418FE
- (B) #0E20FE
- (C) #0E14FF
- (D) #0FE5FE
- (E) #0D14FF

19. In Java, a variable of type int is represented internally as a 32-bit signed integer. Suppose that one bit stores the sign, and the other 31 bits store the magnitude of the number in base 2. In this scheme, what is the largest value that can be stored as type int?

- (A) 2^{32}
- (B) $2^{32} - 1$
- (C) 2^{31}
- (D) $2^{31} - 1$
- (E) 2^{30}

20. Consider this code segment:

```
int x = 10, y = 0;
while (x > 5)
{
    y = 3;
    while (y < x)
    {
        y *= 2;
        if (y % x == 1)
            y += x;
    }
    x -= 3;
}
System.out.println(x + " " + y);
```

What will be output after execution of this code segment?

- (A) 1 6
- (B) 7 12
- (C) -3 12
- (D) 4 12
- (E) -3 6

Questions 21 and 22 refer to the following method, `checkNumber`, which checks the validity of its four-digit integer parameter.

```
/** @param n a 4-digit integer
 * @return true if n is valid, false otherwise
 */
boolean checkNumber(int n)
{
    int d1,d2,d3,checkDigit,nRemaining,rem;
    //strip off digits
    checkDigit = n % 10;
    nRemaining = n / 10;
    d3 = nRemaining % 10;
    nRemaining /= 10;
    d2 = nRemaining % 10;
    nRemaining /= 10;
    d1 = nRemaining % 10;
    //check validity
    rem = (d1 + d2 + d3) % 7;
    return rem == checkDigit;
}
```

A program invokes method `checkNumber` with the statement

```
boolean valid = checkNumber(num);
```

21. Which of the following values of `num` will result in `valid` having a value of `true`?
- (A) 6143
 - (B) 6144
 - (C) 6145
 - (D) 6146
 - (E) 6147
22. What is the purpose of the local variable `nRemaining`?
- (A) It is not possible to separate `n` into digits without the help of a temporary variable.
 - (B) `nRemaining` prevents the parameter `num` from being altered.
 - (C) `nRemaining` enhances the readability of the algorithm.
 - (D) On exiting the method, the value of `nRemaining` may be reused.
 - (E) `nRemaining` is needed as the left-hand side operand for integer division.

23. What output will be produced by this code segment? (Ignore spacing.)

```
for (int i = 5; i >= 1; i--)  
{  
    for (int j = i; j >= 1; j--)  
        System.out.print(2 * j - 1);  
    System.out.println();  
}
```

(A) 9 7 5 3 1
9 7 5 3
9 7 5
9 7
9

(B) 9 7 5 3 1
7 5 3 1
5 3 1
3 1
1

(C) 9 7 5 3 1
7 5 3 1 -1
5 3 1 -1 -3
3 1 -1 -3 -5
1 -1 -3 -5 -7

(D) 1
1 3
1 3 5
1 3 5 7
1 3 5 7 9

(E) 1 3 5 7 9
1 3 5 7
1 3 5
1 3
1

24. Which of the following program fragments will produce this output? (Ignore spacing.)

```
2 - - - - -  
- 4 - - - -  
-- 6 - - -  
--- 8 - -  
---- 10 -  
----- 12
```

```
I for (int i = 1; i <= 6; i++)  
{  
    for (int k = 1; k <= 6; k++)  
        if (k == i)  
            System.out.print(2 * k);  
        else  
            System.out.print("-");  
    System.out.println();  
}
```

```
II for (int i = 1; i <= 6; i++)  
{  
    for (int k = 1; k <= i - 1; k++)  
        System.out.print("-");  
    System.out.print(2 * i);  
    for (int k = 1; k <= 6 - i; k++)  
        System.out.print("-");  
    System.out.println();  
}
```

```
III for (int i = 1; i <= 6; i++)  
{  
    for (int k = 1; k <= i - 1; k++)  
        System.out.print("-");  
    System.out.print(2 * i);  
    for (int k = i + 1; k <= 6; k++)  
        System.out.print("-");  
    System.out.println();  
}
```

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I, II, and III

25: Consider this program segment:

```
int newNum = 0, temp;
int num = k;          //k is some predefined integer value  $\geq 0$ 
while (num > 10)
{
    temp = num % 10;
    num /= 10;
    newNum = newNum * 10 + temp;
}
System.out.print(newNum);
```

Which is a true statement about the segment?

- I If $100 \leq \text{num} \leq 1000$ initially, the final value of newNum must be in the range $10 \leq \text{newNum} \leq 100$.
- II There is no initial value of num that will cause an infinite while loop.
- III If $\text{num} \leq 10$ initially, newNum will have a final value of 0.

- (A) I only
- (B) II only
- (C) III only
- (D) II and III only
- (E) I, II, and III

26. Consider the method reverse:

```
/** Precondition: n > 0.
 * Postcondition:
 * - Returns n with its digits reversed.
 * - Example: If n = 234, method reverse returns 432.
 * @param n a positive integer
 * @return n with its digits reversed
 */
int reverse(int n)
{
    int rem, revNum = 0;

    /* code segment */

    return revNum;
}
```

Which of the following replacements for *code segment* would cause the method to work as intended?

```
I for (int i = 0; i <= n; i++)
{
    rem = n % 10;
    revNum = revNum * 10 + rem;
    n /= 10;
}
```

```
II while (n != 0)
{
    rem = n % 10;
    revNum = revNum * 10 + rem;
    n /= 10;
}
```

```
III for (int i = n; i != 0; i /= 10)
{
    rem = i % 10;
    revNum = revNum * 10 + rem;
}
```

- (A) I only
- (B) II only
- (C) I and II only
- (D) II and III only
- (E) I and III only

15) Which of the following variable declarations will not compile successfully?

(A) `String x = 5;`

(B) `double temperature = 15.24;`

(C) `boolean ok;`

(D) `String x = "5";`

16) Upon execution of the code fragment below, what will the values the variables a, b, and c be?

```
int a;  
int b = 5;  
int c = 3;  
int a = --b * c++;
```

(A) a = 16, b = 4, c = 4

(B) a = 42, b = 5, c = 8

(C) a = 48, b = 5, c = 8

(D) a = 12, b = 4, c = 4

17) Consider the following code segment.

```
int g = 3;  
System.out.print(++g * 8);
```

What is printed as a result of executing the code segment?

- (A) 24
- (B) 12
- (C) 32
- (D) 16

18) Consider the following code segment.

```
int g = 3;  
System.out.print(g++ * 8);
```

What is printed as a result of executing the code segment?

- (A) 16
- (B) 24
- (C) 8
- (D) 32

19) Upon execution of the code fragment below, what will the values the variables a, b, and c be?

```
int a;  
int b = 5;  
int c = 3;  
int a = b-- * c++;
```

- (A) a = 16, b = 4, c = 4
- (B) a = 42, b = 5, c = 8
- (C) a = 35, b = 6, c = 7
- (D) a = 15, b = 4, c = 4

20) Which of the following statement(s) is an invalid variable declaration and assignment?

(A) `int a = 10;`

(B) `int a;`
`a = 10;`

(C) `a = 10;`

(D) `int a;`