2024 Boo-vitational

October 2024

General Directions (Please read carefully!)

1. DO NOT OPEN THE EXAM UNTIL TOLD TO DO SO.

2. There are 40 questions on this contest exam. You will have 45 minutes to complete this contest.

3. All answers must be legibly written on the answer sheet provided. Indicate your answers in the

appropriate blanks provided on the answer sheet. Clean erasures are necessary for accurate grading.

4. You may write on the test packet or any additional scratch paper provided by the contest director, but

NOT on the answer sheet, which is reserved for answers only.

5. All questions have ONE and only ONE correct answer. There is a 2-point penalty for all incorrect answers.

6. Tests may not be turned in until 45 minutes have elapsed. If you finish the test before the end of the

allotted time, remain at your seat and retain your test until told to do otherwise. You may use this time

to check your answers.

7. If you are in the process of actually writing an answer when the signal to stop is given, you may finish

writing that answer.

8. All provided code segments are intended to be syntactically correct, unless otherwise stated. You may

also assume that any undefined variables are defined as used.

9. A reference to many commonly used Java classes is provided with the test, and you may use this

reference sheet during the contest. AFTER THE CONTEST BEGINS, you may detach the reference sheet from the test booklet if you wish.

10. Assume that any necessary import statements for standard Java SE packages and classes (e.g., `java.util`, `System`, etc.) are included in any programs or code segments that refer to methods from these classes and packages.

11. NO CALCULATORS of any kind may be used during this contest.

Scoring

1. Correct answers will receive **6 points.**

2. Incorrect answers will lose **2 points.**

3. Unanswered questions will neither receive nor lose any points.

4. In the event of a tie, the student with the highest percentage of attempted questions correct shall win the tie.

2024-2025 Boo-vitational – Computer Science Written

Note: Correct responses are based on Java SE Development Kit 12 (JDK 12) from Sun Microsystems, Inc. All provided code segments are intended to be syntactically correct, unless otherwise stated (e.g., "error" is an answer choice) and any necessary Java SE 12 Standard Packages have been imported. Ignore any typographical errors and assume any undefined variables are defined as used. **For all output statements, assume that the System class has been statically imported using:**

```
import static java.lang.*;
```

Question 1
What is $274_8 - 1110010_2$?

   A) $1F_{16}$

   B) 1110284_{10}

   C) $4A_{16}$

   D) 240_8

Question 2
What is output by the code to the right?

   A) -1.3333333333

   B) 83

   C) -1

   D) 0

```
out.print(84 / 7 % 3 – 4 / 3);
```

Question 3
What is output by the code to the right?

   A) Say \"Boo!\"

   B) Say Boo!

   C) Say "Boo!"

   D) There is no output due to an error.

```
out.print("Say \"Boo!\"");
```

Question 4
What is output by the code to the right?

   A) The Skeleton Won War!

   B) The Skeleton Wn War!

   C) For The Skeleton War!

   D) The Skeleton WWar!

```
String s1 = "For The Skeleton War!";
String sub1 = s1.substring(4,16);
String sub2 =
     s1.substring(s1.length() - 7);
out.print(sub1 + " W" + sub2);
```

Question 5
What is output by the code to the right?

   A) true

   B) false

```
out.print(false&&true^true||false);
```

Question 6
What is output by the code to the right?
  A) 12.0
  B) 15.0
  C) 14.0
  D) 16.0
	`out.print(Math.pow(3,2) +`
	`                        Math.ceil(6.1));`

Question 7
What is output by the code to the right?
  A) -33.0
  B) 34.0
  C) -32.0
  D) There is no output due to an error.
	`double w = 4 / 5;`
	`int h = 'A';`
	`int s = 0;`
	`out.print(w - ++h + h / (s+=2));`

Question 8
What is output by the code to the right?
  A) 10
  B) 6
  C) 0
  D) 5
	`int x = 0, j = 10, k = 5;`
	`if(j % k != 0){`
	`    if(j / k > j - k){`
	`        x = 10;`
	`    }`
	`    else x = 6;`
	`}`
	`out.print(x);`

Question 9
What is output by the code to the right?
  A) 4444433333222221111100000
  B) 43210
  C) 444443333222110
  D) 433222111100000
	`int i = 5;`
	`while(i >0){`
	`    i--;`
	`    out.print((""+i).repeat(5-i));`
	`}`

Question 10
What is output by the code to the right?
  A) [-4.2, 4.8, 5.1, 2.3, 7.4]
  B) [1.2, 4.8, 5.1, 2.3, 7.4]
  C) [1.2, 4.8, -4.2, 2.3, 7.4]
  D) There is no output due to an error.
	`double[] mike = {1.2, 4.8, 5.1,`
	`                2.3, 7.4};`
	`double myers =`
	`    mike[(int)mike[mike.length-2]];`
	
	`mike[mike.length-(int)myers] = -4.2;`
	`out.print(Arrays.toString(mike));`

Question 11
What is output by the code to the right?
  A) the monster mash a graveyard smash
  B) monster mash a graveyard smash
  C) monstermashgraveyardsmash
  D) the monster mashagraveyardsmash
	``java
	String s="they did the monster mash";
	String t="it was a graveyard smash";
	Scanner sc = new Scanner(s+"\n"+t);
	sc.next(); sc.next();
	String s1 = sc.nextLine();
	String[] words =
	sc.nextLine().split(" ");
	out.print(s1+words[2]+words[3]+
	                          words[4]);```

Question 12
What is output by the code to the right?
  A) H
  B) 72
  C) B
  D) 66
	``java
	char c = 'Z';
	c%=8.2;
	out.print(c+64);```

Question 13
What is output by the code to the right?
  A) 7
  B) 63
  C) 112
  D) 0
	``java
	int z = 4 * 8
		(16 + 4) << 2;
		out.println(z);```

Question 14
Which of the following data types could NOT replace <type> in the code to the right without error?
  A) short
  B) byte
  C) float
  D) long
	``java
	<type> x = 2048;
	out.println(x);```

Question 15
What is output by the code to the right?
  A) 3 in the hood
  B) true In Space
  C) In Space
  D) true in the hood
	``java
	ArrayList<String> lep = new
	ArrayList<String>();
	lep.add("1"); lep.add("2");
	lep.add("3"); lep.add("In Space");
	lep.add("in the Hood");
	lep.add("Back 2 tha Hood");
	lep.add("Origins");
	lep.add("Returns");
	out.print(lep.remove("3") + " " +
	                       lep.get(3));```

Question 16

What is output by the code to the right?
- A) 1
- B) -1
- C) 5
- D) -5

```
out.print("Halloween".compareTo("Chri
stmas"));
```

Question 17

Which of the following is NOT valid in a separate class, assuming c is an object of type Car?
- A) int nW = c.numWheels;
- B) double g = c.getMPG();
- C) Object o = c;
- D) double mpg = c.travel(400, 10);

Question 18

What is output by the client code below?
```
Car d = new Car();
d.travel(2000, 40);
out.print(d.getMiles());
```
- A) 50.0
- B) 2000.0
- C) 0.0
- D) There is no output due to an error.

Question 19

What is output by the client code below?
```
Car e = new Car("GH0ST", 84, 4);
e.travel(206, 16);
out.print(e +" " + e.getMPG());
```
- A) e 14.5
- B) 14.5 14.5
- C) e e.getMPG()
- D) GH0ST 14.5

```java
class Car{
    private String license;
    private double gallons, odo;
    public final int numWheels = 4;
    public Car(){
        this("VOID", 0, 20);
    }
    public Car(String l, double m,
                    double g){
        license = l;
        odo = m;
        this.gallons = g;
    }
    public String toString(){
    return license;
    }
    public double getMPG(){
        return odo / gallons;
    }
    public double getMiles(){
        return odo;
    }
    public void travel(int miles, int
                    tankUsed){
        odo += miles;
        gallons += tankUsed;
    }
}
```

Question 20

$$(A+B)*(\bar{B}*B+A*\bar{B})$$

Which of the following expressions is equivalent to the boolean expression above?
- A) $A*\bar{B}$
- B) A
- C) B
- D) Always true

Question 21
What is the possible range of values that could be output by the code to the right?
   A) 2 (exclusive) to 13 (exclusive)
   B) 0 (inclusive) to 13 (inclusive)
   C) 2 (exclusive) to 13 (inclusive)
   D) 2 (inclusive) to 13 (exclusive)
	`Random r = new Random();`
	`double d = r.nextDouble(2,6);`
	`int i = r.nextInt(7);`
	`out.println(d+i);`

Question 21

What is the possible range of values that could be output by the code to the right?
   A) 2 (exclusive) to 13 (exclusive)
   B) 0 (inclusive) to 13 (inclusive)
   C) 2 (exclusive) to 13 (inclusive)
   D) 2 (inclusive) to 13 (exclusive)

```
Random r = new Random();
double d = r.nextDouble(2,6);
int i = r.nextInt(7);
out.println(d+i);
```

Question 22

What is output by the client code shown here?

```
A b = new B();
out.println(b instanceof B);
```
   A) true
   B) false

Question 23

What line in the client code shown here contains an error?

```
B b = new B(); // LINE #1
b.val+=3; // LINE #2
out.println(b.getVal()); // LINE #3
out.println(b); // LINE #4
```
   A) **// LINE #1**
   B) **// LINE #2**
   C) **// LINE #3**
   D) **// LINE #4**

```
public class A{
    private int val;
    public A(int v){
        val = v;
    }
    public int getVal(){
        return val;
    }
}
public class B extends A{
    public B(){
        // CODE 1
    }
}
```

Question 24

What should replace **// CODE 1** so that the val instance variable of all B objects is initialized to 12?
   A) this.val = 12;
   B) getVal() = 12;
   C) super(12);
   D) this(12);

Question 25

Which of the following 8-bit binary numbers is the two's complement representation of -113?
   A) 10001111
   B) 01110001
   C) 11110001
   D) 11111111

Question 26

What should replace **<CONDITION>** so that the selectionSort function correctly implements selection sort?

    A) a[i] > a[min]

    B) a[i] < a[min]

    C) a[j] > a[min]

    D) a[j] < a[min]

```java
static void selectionSort(int[] a){
    for(int i=0; i<a.length; i++){
        int min = i;
        for(int j=i+1;j<a.length;j++){
            if(<CONDITION>){
                min = j;
            }
        }
        if(j != min){
            int t = a[i];
            a[i] = a[min];
            a[min] = temp;
        }
    }
}
```

Question 27

What is output by the client code shown here?

```java
int[][] m = {{3,4,5},{1},{6,7,9,0},
             {2,4,6,8},{-3,-5,-1}};
out.println(Arrays.toString(fun(m)));
```

    A) [4.0, 1.0, 5.5, 5.0, -3.0]

    B) [3.0, 0.25, 5.5, 5.0, -2.25]

    C) [0.0, 0.0, 0.0, 0.0, 0.0]

    D) There is no output due to an error.

```java
public static double[] fun(int[][]
                                mat){
    double res[] = new
            double[mat.length];
    for(int i=0; i<mat.length; i++){
        for(int j=0; j<mat[i].length;
                              j++){
            res[i] += mat[i][j];
        }
        res[i]/=mat[i].length;
    }
    return res;
}
```

Question 28

What is output by the code to the right?

    A) Bman, Woman

    B) atlf

    C) atman, lfman

    D) There is no output due to an error.

```java
Pattern p = Pattern.compile(
        "[^A-Z]{1,2}(?=man)");

String n = "Batman, Wolfman";
for(String s: p.split(n)){
    out.print(s);
}
```

Question 29

What is output by the code to the right?

    A) Math.PI 4 eva

    B) 3.14 4 eva

    C) 3.14 eva   4

    D) There is no output due to an error.

```java
out.printf("%,.2f %3$s %2$3d",
Math.PI, 4, "eva");
```

Question 30

```
public class Monster implements Comparable<Monster>{
    //implementation not shown
}
```
Which of the following method headers is required in the Monster class?
- A) public int hashCode()
- B) public boolean equals(Object o)
- C) public int compareTo(Monster m)
- D) public String toString()

Question 31

What is output by the code to the right?
- A) 12
- B) -2
- C) 7
- D) 0

```
Stack st = new Stack<Integer>();
st.push(7);
st.push(6);
st.push(-2);
st.push(st.push(12));
st.pop();
out.print(st.peek());
```

Question 32

What is the height of the binary tree (number of connections between the root and the farthest leaf) created by inserting the values to the right in the order given?
- A) 4
- B) 3
- C) 1
- D) 10

```
5 12 -2 7 0 -4 10 6 8 3
```

Question 33

What is output by the code to the right?
- A) s
- B) fright
- C) ghoul
- D) scary

```
int a = 7;
int b = 14;
String s =
b>a?b/a>2?"fright":"scary":"ghoul";
out.print(s);
```

Question 34

Which of the following does not cause or contain an error?
- A) X u = (X) new Y();
- B) W w = new Y();
- C) Z z = new X();
- D) Y[] xa = {new X(), new W()};

```
class X{}
class Y extends X{}
class Z extends X{}
class W extends Y{}
```

Question 35

What is the output of the code to the right?

    A) 789.0
    B) 18.0
    C) The output is a blank line.
    D) There is no output due to an error.

```
Scanner sc = new Scanner(
                    "12.4\n789 18");
sc.nextDouble();
sc.nextLine();
sc.next();
out.println(sc.nextDouble());
```

Question 36

How much (additional) memory space will a quicksort algorithm use for large sets of data?

    A) O(n)   B) O(1)   C) O(log(n))   D) $O(n^2)$

Question 37

What is returned by the function call scare("trick")?

    A) kckickricktrick
    B) trickrickickckk
    C) trick
    D) tricktricktricktricktrick

```
public static String scare(String A){
    if(A.length()<=1){
        return A;
    }
    return A+scare(A.substring(1));
}
```

Question 38

What is output by the client code shown here?

```
MathFunction m = (a,b) -> a * b + b / a;
out.print(m.operate(2, 0x16));
```

    A) 33
    B) 55
    C) 40
    D) 0

```
interface MathFunction{
    int operate(int a, int b);
}
```

Question 39

What is the value of the prefix notation expression below?

* + 7 3 / 16 2

Question 40

What is the value of the expression below in base 10?

 64 >> 3 | ~21 & 12

BOO-VITATIONAL 2024
COMPUTER SCIENCE WRITTEN TEST- KEY

1.	C	21.	D
2.	C	22.	A
3.	C	23.	B
4.	A	24.	C
5.	B	25.	A
6.	D	26.	D
7.	A	27.	A
8.	C	28.	A
9.	D	29.	C
10.	A	30.	C
11.	D	31.	A
12.	B	32.	A
13.	C	33.	D
14.	B	34.	A
15.	D	35.	B
16.	C	36.	C
17.	D	37.	B
18.	B	38.	B
19.	D	39.	80
20.	A	40.	8

ID _____   Date   _____

BOO-VITATIONAL 2024
COMPUTER SCIENCE WRITTEN TEST

1.   _____   21. _____

2.   _____   22. _____

3.   _____   23. _____

4.   _____   24. _____

5.   _____   25. _____

6.   _____   26. _____

7.   _____   27. _____

8.   _____   28. _____

9.   _____   29. _____

10. _____   30. _____

11. _____   31. _____

12. _____   32. _____

13. _____   33. _____

14. _____   34. _____

15. _____   35. _____

16. _____   36. _____

17. _____   37. _____

18. _____   38. _____

19. _____   39. _____

20. _____   40. _____

Correct _____ x 6 = _____
Incorrect _____ x -2 = _____
           Total Score = _____

Grader 1 _____   Initials _____
Grader 2 _____   Initials _____
Grader 3 _____   Initials _____