1. **Generics:**
2. Which of the following will compile assuming E is unbounded?
3. E temp;
4. E temp = new E();
5. E[] arr = new E[10];
6. E[] arr = (E[]) new Object[10];
7. temp instanceOf E;
8. Only I
9. I and II
10. I and IV
11. I, III, and V
12. All of the above
13. True/False: You can pass a primitive type in as a type parameter.
    1. True
    2. False
14. **Searching:**
15. Given the following input array, show the elements at each step of binary search for the element. If there is part of the array that is not being considered during a particular step, don’t write anything in those places. Use integer division to decide where to split.

Input:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 12 | 14 | 15 |

**Search for: 9**

Step 1:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |

Step 2:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |

Step 3:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |

1. **Asymptotics:**
2. What is the **best** Big O approximation for binary search?
   1. O(n)
   2. O(log n)
   3. O(n^2)
   4. O(2n)
3. What is the **best** Big O approximation for the following method?

public int sumThree(int[] arr) {

int total = 0;

for (int i = 0; i < 3; i++) {

total += arr[i];

}

return total;

}

1. O(1)
2. O(n)
3. O(log n)
4. O(n^2)
5. What is the **best** Big O approximation for the following method?

public boolean containsName(String[][] arr, String name) {

boolean found = false;

for (int i = 0; i < arr.length; i++) {

for (int j = 0; j < arr[i].length; j++) {

if (arr[i][j].equals(name)) {

found = true;

}

}

}

return found;

}

1. O(n)
2. O(2n)
3. O(n log n)
4. O(n^2)
5. What is the **best** Big O approximation for the following method?

public int middleValue(int[] arr) {

int min = arr[0];

for (int i = 0; i < arr.length; i++) {

if (arr[i] < min) {

min = arr[i];

}

}

int max = arr[0];

for (int j = 0; j < arr.length; j++) {

if (arr[j] > max) {

max = arr[j];

}

}

return (min + max) / 2;

}

1. O(n)
2. O(2n)
3. O(1)
4. O(n^2)
5. What is the **best** Big O approximation for the following method?

public int partialSum(int[] arr) {

int total = 0;

for (int i = 0; i < arr.length; i \*= 2) {

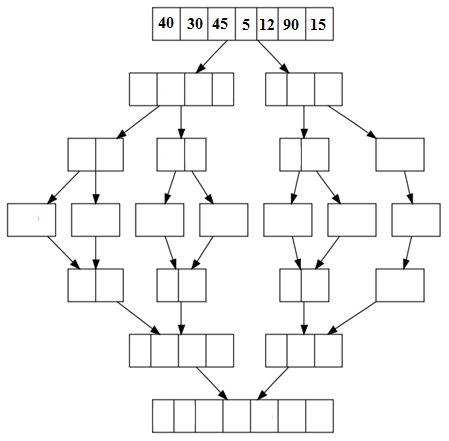
total += arr[i];

}

return total;

}

1. O(n)
2. O(n / 2)
3. O(log n)
4. O(n^2)
5. **Sorting:**
6. Given the following array, show the elements after each step of merge sort:



1. How many passes would it take to sort the following array using the **bubble sort** algorithm?

[1, 2, 6, 3, 10, 14]

1. 1
2. 2
3. 4
4. 6
5. Which interface must be implemented by a class in order to use .sort() on a List of its type?
   1. Comparator<T>
   2. Sortable<T>
   3. Comparable<T>
   4. Ordered<T>
6. **Recursion**
7. What is the function of the following recursive method?

public String mysteryMethod(String str) {

if (str.length() == 1) {

return str;

}

return mysteryMethod(str.substring(1)) + str.charAt(0);

}

1. It returns the first character of the passed in String
2. It reverses the passed in String
3. It counts the number of characters in the passed in String
4. It returns the passed in String
5. What parts are required in a recursive method?
6. A base case
7. A recursive call
8. Progress toward the base case
9. All of the above
10. **Exceptions**
11. Which of the following method headers is correctly throwing a FileNotFoundException?
12. public FileNotFoundException errorMethod()
13. public void errorMethod() throw FileNotFoundException
14. public void errorMethod() new FileNotFoundException
15. public void errorMethod() throws FileNotFoundException
16. \_\_\_\_\_\_\_\_\_\_ Exceptions must be handled for your code to compile.
    1. Checked
    2. Unchecked
17. True/False: The finally block will always execute, even if the try block throws an Exception.
    1. True
    2. False

**VII. File I/O**

1. Observe the following code snippet and answer the questions that follow.

public static void main(String[] args) {

try {

Scanner scan = new Scanner(new File("test.txt"));

PrintWriter writer = new PrintWriter("SomeFile.txt");

int num = 0;

while (scan.hasNextLine()) {

num++;

String str = scan.nextLine();

if (str.contains("hello!")) {

writer.println(num + ": " + str.toUpperCase());

writer.flush();

}

}

} // \*\*\*missing code\*\*\*

ex.printStackTrace();

}

}

1. Briefly explain what the main method does?
2. What should go in place of the missing code to make this code compile?

2) When using PrintWriter, it will overwrite the contents of the file

1. True
2. False

**VIII. JavaFX and EventHandling**

1. Which of the following event handlers are NOT valid if any assuming that "bt" is a properly initialized Button?
2. bt.setOnAction(e -> {

System.out.println(“Button is pressed”);

});

1. bt.setOnAction(new ActionEvent e() -> {

System.out.println(“Button is pressed”);

}

1. bt.setOnAction(new EventHandler<ActionEvent>() {

@Override

public void handle(ActionEvent e) {

System.out.println(“Button is pressed”);

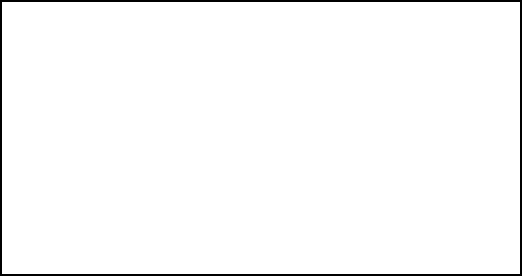
}

});

1. All are valid.

2)

* Create a VBox and add in a rectangle to the VBox
* Create a HBox and add in a into the HBox
* Create a primaryStage that contains a scene that has primaryStage.show() to be true
* Add the VBox into the HBox, then you add the HBox into the scene. Draw a rough picture of what the JavaFX program would look like in the box below.



**XI. Inner classes, Anonymous Inner Classes and Lambdas**

1. Given a class

public class Card {

int num;

Suit suit; // Suit is a enum

…

}

1. If you have a ArrayList of Cards named list, you were given this lambda expression

Collections.sort(list, (a, b) -> a.ordinal - b.ordinal);

Convert that to an anonymous inner class.

2)

**XII. ADT’s**

1. Use the code below to answer parts a and b.

HashSet<String> mango = new HashSet<String>(5);

mango.add(“mango”);

mango.add(“MANGO”);

mango.add(“mAnGo”);

mango.add(“mango”);

1. How many more elements can be added to mango?
2. 1
3. 2
4. 3
5. An essentially unlimited number
6. None of the above

b) What is the value of mango.size()?

1. 3
2. 4
3. 5
4. None of the above

2) Complete the following code for a Linkedlist

public class Node<T> {

Public T data;

Public Node<T> next;

public Node (T data, Node<T> next ) {

this.data = data;

this.next = next;

}

}

public class LinkedList<T> {

private Node<T> head;

private Node<T> tail;

private int size;

public void addFirst(T data) {

// \*\*WRITE CODE HERE\*\*

}

}