Introduction to **Java**

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This test will evaluate the familiarity of basic programming concepts as well as the knowledge of the Java programming language, which is used as the programming language of numerous FIRST®robotics competitions.

The following topics will be on this test:

- Primitive Types and Operations (`int`, `byte`, `boolean`, `etc.`)
- Modifiers (`final`, `public`, `static`, `etc.`)*
- Comparison Operators (`==`, `!=`, `>=`,`etc.`)
- Assignment operators (`+=`, `*=`, `=`, `etc`)
- Flow Control (`if`, `for`, `break`, `etc`)
- Methods and Parameters*
- Single-Dimensional and Multi-Dimensional Arrays
- Object Oriented Programming*
- Inheritance and Polymorphism*
- Programming Habits and Conventions

* Starred items are extremely important in programming a robot

DO NOT BEGIN UNTIL INSTRUCTED TO DO SO

Use this page for scratch work if desired

Scratch work will not be graded

PART ONE: Multiple Choice

Instructions: Choose the correct solution to the problem, there is only one correct answer for each problem.

1. Which of these values can an `int` not hold? (1 pt)

   (a) 25

   (b) -12

   (c) 2147483647

   (d) 23.5

2. What do you get when you add an `int` to a `double`? (1 pt)

   (a) an `int`

   (b) a `double`

   (c) a compile error

   (d) a runtime error

3. What is the output of the following program? (1 pt)

```java
public class Main {
  public static void main(String[] args) {
    double answer = 5 / 2;
    System.out.println(answer);
  }
}
```

   (a) 2.5

   (b) 2

   (c) 3

   (d) 2.0

4. List the eight primitive types and possible values they can hold. An example has been provided for you. One bonus point will be awarded for each correct minimum/maximum value given for each data type. (7 pts)

Ex: boolean	true or false
byte	
short	
float	

Questions 5-6 refer to the following 2D array:

```
int[][] myArray = new int[] {
                  new int[]{2, 5, 9, 10},
                  new int[]{1, 2, 3, 4, 5}
};
```

5. What is the result of `Array[1][1] + myArray[1][2]`? (1 pt)

   (a) 7

   (b) 5

   (c) 3

   (d) Runtime Error: ArrayIndexOutOfBoundsException

6. What is the result of `myArray[2][1] + myArray[2][2]`? (1 pt)

   (a) 7

   (b) 5

   (c) 3

   (d) Runtime Error: ArrayIndexOutOfBoundsException

7. What is the outcome when one executes the following method?

```
public void numberSeven() {
        for (int i = 0; i < 10; i++) {
                if (i < 6 && i % 2 == 0) {
                        System.out.print(i);
                }
        }
}
```

(a) 123456789

(b) 123456

(c) 256

(d) 135

(e) None of the above

8. What is the result of the following? (1 pt)

```
(true && 5 > 0) || (1 % 2 == 0 && 2 / 5 >= 1)
```

(a) true

(b) false

9. What can access something with the `private` access modifier? (1 pt)

(a) Anything

(b) Nothing

(c) items in the same `class`

(d) Items in the same `package`

10. What is the output of `Bar.main();`? (1 pt)

```
public class Foo {
  public void foo() {
    this.bar();
  }

  public void bar() {
    System.out.print("Foo");
  }
}

public class Bar extends Foo {
  public void bar() {
    System.out.print("Bar");
  }

  public static void main(String[] args) {
    Foo foo = new Bar();
    foo.foo();
  }
}
```

(a) Foo

(b) Bar

(c) Compile Error

(d) Runtime Error

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Section II: Free Response

Instructions: Write the most efficient solution to the following methods.

11. Write a method fibonacciFinder that accepts an integer n and returns the nth Fibonacci number. One bonus point for using a recursive method. (3 pt)

12. Use any method to sort a given array of integers in ascending order. (3pts)

```
public void sort(int[] numbers) {









}
```

Questions 13 && 14 refer to the BankAccount and SavingsAccount class.

```
public class BankAccount {
        private double balance;

        public BankAccount(double balance) {
                this.balance = balance;
        }

        public double getBalance() {
                return this.balance;
        }

        protected void setBalance(double balance) {
                this.balance = balance;
        }
}
```

```
public class SavingsAccount extends BankAccount {
        double interestRate = 0.07; // 7% Interest Rate

       // put class constructor below









}
```

13. Write a constructor for SavingsAccount that accepts a balance and uses the given mutator method to set `balance` in the `BankAccount` class. (3 pts)

14. Complete the method to calculate interest and add it to the balance (2 pts)

```
public void calculateInterest() {









}
```

15. Briefly describe what an interface is. Can interfaces be instantiated? (2 pts)

Extra Credit: Describe the header of the main method: (5 pts)

```
public static void main(String[] args) {






}
```

END OF EXAM