

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- 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

PART ONE: Multiple Choice

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

1. The size of a `boolean` variable is
 - (a) 1 byte
 - (b) 4 bytes
 - (c) 1 bit
 - (d) 16 bits
2. When adding an `int` to a `double`, the resulting variable will be
 - (a) an `int` with lower precision
 - (b) an `int` with the same precision
 - (c) a `double` with lower precision
 - (d) a `double` with same precision
3. When the modifier `private` is used, where could one could access the member?
 - (a) Inside the same `class`
 - (b) Inside the same `package`
 - (c) Inside the same superclass
 - (d) Only the processor could access the member
4. When should one use the modifier `static`?
 - (a) When the member should not be modified
 - (b) When the member needs to be shared across all instances of the class
 - (c) When the member should not be accessed by the end-user
 - (d) When the member changes in value frequently
5. What data type does a conditional statement return?
 - (a) `int`
 - (b) `boolean`
 - (c) `boolean*` `pointer`
 - (d) conditional statements do not return any data type

6. What is the outcome when one executes the following code?

```
public static void main(String[] args) {  
    int x = 3;  
    int []y= {3,4};  
    if((x > (int) Math.PI) && (y[2] <= 3))  
        System.out.print("True");  
    System.out.print("False");  
}
```

- (a) True
- (b) True False
- (c) False
- (d) Runtime Error: ArrayIndexOutOfBoundsException

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

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}
```

- (a) True
- (b) True False
- (c) False
- (d) Runtime Error: ArrayIndexOutOfBoundsException

8. Which of the following is an equivalent statement for $(x \parallel y) \&\& !x$

- (a) $y \&\& x$
- (b) $x \parallel y$
- (c) $!y$
- (d) $y \&\& (y \parallel x)$

9. Example Question One

- (a) Answer One
- (b) Answer Two

- (c) Answer Three
- (d) Answer Four

10. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

11. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

12. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

13. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

14. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

15. Example Question One

- (a) Answer One

- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

16. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

17. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

18. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

19. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

20. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

21. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

22. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

23. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

24. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

25. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

26. Example Question One

- (a) Answer One
- (b) Answer Two
- (c) Answer Three
- (d) Answer Four

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PART TWO: Open Ended Response

*Instructions: Write the most efficient solution to the following methods. You will **not** be given any extra paper.*

1. Write a method that will return an array of n length, filled with the decimal approximations of the sequence $\left[\frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{n}\right]$ where n is the integer parameter of the method.

```
public static int[] problem1(int n){
```

DO NOT CONTINUE UNTIL INSTRUCTED TO DO SO

2. Write a method that will recursively determine if a word *str* is a palindrome, where *str* is a string parameter of the method.

```
public static boolean problem2(String str){
```

END OF EXAM