READ THIS NOW!

Failure to read and follow the instructions below may result in severe penalties
Failure to adhere to these directions will not constitute an excuse or defense

- Print your name in the space provided below
- Print your name and ID number on the Opscan form; be sure to code your ID number on the Opscan form. Code Form A on the opscan.
- Choose the single best answer for each question. If you mark more than one answer, it will be counted wrong.
- Unless a question determining whether given Java code is syntactically correct, assume that it is. The given code has been compiled and tested, except where there are deliberate errors. Unless a question specifically deals with Java import directives, you should assume the necessary library files have been imported.
- Note that questions about printed values disregard formatting completely.
- In questions/answers that require a distinction between integer and real values, integers will be represented without a decimal point, whereas real values will have a decimal point, [1054 (integer), 1054.0 (real)].
- When you have completed the test, sign the pledge at the bottom of this page and turn in the test and your Opscan.
- This is a closed-book, closed-notes examination. No calculators or other electronic devices may be used during this examination. You may not discuss (in any form: written, verbal or electronic) the content of this examination with any student who has not taken it. You must return this test form when you complete the examination. Failure to adhere to any of these restrictions is an Honor Code violation.
- There are 25 multiple-choice questions.
- Mark your answers on the test form, future reference, and on the Opscan. The answers you mark on the Opscan will be considered your future answers.

Do not start the test until instructed to do so!

Name: ________________________________ (print: Last name, First)
VT PID: _______________________________ (print: campus email address)

Pledge: On my honor, I have neither given nor received unauthorized aid on this examination.

__________________________________________
signature
1. What is the root of the class hierarchy in Java?
   A. Object   E. Random
   B. Class   F. String
   C. java.util   G. int
   D. ArrayList   H. None of the above

2. In the Java language, how many classes can be instantiated from an object?
   A. 10   I. 1
   B. 9   J. 0
   C. 8   H. 2
   D. 7
   E. 6
   F. 4
   G. 3

3. In the Java programming language, what does any file with extension .java contain?
   A. Source code   D. Executable code
   B. Byte code   E. Unicode
   C. Java virtual machine   F. None of the above

4. In the Java programming language, what does any file with extension .class contain?
   A. Source code   D. Graphics code
   B. Byte code   E. Plain text
   C. Java virtual machine   F. None of the above

5. What is printed out when the following code is executed?
   ```java
   int a, b, c;
   a = 2; a = a + 4; b = 2; c = a - b;
   System.out.println(2+c+c);
   ```
   A. 2cc   D. 2+4+4
   B. 10   E. 8
   C. 244   F. None of the above

The next seven questions are based on the following code. Assume that this method is in a class called Calculator and value is a instance variable of type int declared earlier in the code.

```java
public void calcValue(int x, int y) {
    int val;
    val = x*x + y*y;
    value = val;
}
```

6. What type of method is calcValue?
   A. Mutator   E. Class method
   B. Accessor   F. A and E above
   C. Mutator and Accessor   G. A and D above
   D. Instance method   H. None of the above

7. How many formal parameters are present in the method signature?
   A. 0   C. 2   E. 4
   B. 1   D. 3   F. 5
8. Which is the correct way of invoking this method from within the same class?
   A. Calculator.calcValue(10, 20);  
   B. Calculator.calcValue();  
   C. calcValue(10,10);  
   D. .calcValue();  
   E. this.calcValue(10,10);  
   F. A and D above  
   G. C and E above  
   H. None of the above

9. Assume that a new object has been created of type Calculator as follows:
   
   ```java
   Calculator calc = new Calculator();
   ```

Which is the correct way of invoking the calcValue method in object calc?
   A. Calculator.calcValue(10, 20);  
   B. calc.calcValue();  
   C. calcValue(10,10);  
   D. .calcValue();  
   E. this.calcValue(10,10);  
   F. A and D above  
   G. C and E above  
   H. None of the above

10. What is the return type in the calcValue method?
    A. int  
    B. float  
    C. String  
    D. bool  
    E. void  
    F. public  
    G. private  
    H. None of the above

11. What is the lifetime of the variable val in the code above?
    A. The class definition of Calculator  
    B. The body of method calcValue  
    C. The class definition of calcValue  
    D. None of the above

12. What is the lifetime of the variable value in the code above?
    A. The class definition of Calculator  
    B. The body of method calcValue  
    C. The class definition of calcValue  
    D. None of the above

13. Which one of the following statements describing objects and classes is true?
    A. Classes are instances of objects.  
    B. Objects and classes are instances of structures.  
    C. Reference variables refer to classes.  
    D. Objects are instances of classes.  
    E. All of the above are true.

The next two questions are based on the following code.

```java
int index;
int sum = 0;
for (index = 0; index < 5; index++) {
    sum += index;
}
System.out.println("The value of sum = " + sum);
```
14. What is printed out at the end of the for loop?
   A. The value of sum = 3
   B. The value of sum = 6
   C. The value of sum = 10
   D. The value of sum = 20
   E. None of the above

15. What is the value of variable index at the end of the for loop?
   A. 0    E. 4
   B. 1    F. 5
   C. 2    G. 6
   D. 3    H. None of the above

16. Which keyword in Java identifies a variable to be a class variable?
   A. void    F. static
   B. public  G. class
   C. private H. interface
   D. int     I. None of the above
   E. import

The next two questions are based on the following piece of code

```java
int[] num = {10, 20, 30, 40, 50};
ArrayList al = new ArrayList();
for (int index = 1; index <= 5; index++) {
    al.add(new Integer(num[index-1]*num[index-1]));
}
Iterator it = al.iterator();
System.out.print("Numbers = ");
while (it.hasNext()) {
    System.out.print(" " + it.next());
}
System.out.println();
```

17. What is printed out when the code above is executed?
   A. Numbers =  1 2 3 4 5
   B. Numbers =  100 400 900 1600 2500
   C. Numbers =  0 1 2 3 4 5
   D. Numbers =  100 400 900 1600
   E. Numbers =  10 20 30 40 50
   F. The code will not compile
   G. The code will give a runtime error.
   H. None of the above

18. What will be printed out if you change the line inside the for loop to the following and execute the code?

   ```java
   al.add(new Integer(num[index]*num[index]));
   ```

   A. Numbers =  100 400 900 1600 2500
   B. Numbers =  1 2 3 4 5
C. Numbers = 0 1 2 3 4 5  
D. Numbers = 100 400 900 1600  
E. Numbers = 10 20 30 40 50  
F. The code will not compile  
G. The code will give a runtime error.  
H. None of the above  

19. How many constructor methods can a class definition have, provided each constructor method has different parameters?  
A. 0  
B. 1  
C. 2  
D. 3  
E. 4  
F. All of the above  
G. None of the above  

20. What keyword in Java is used for utilizing classes from some external package?  
A. include  
B. library  
C. package  
D. extends  
E. interface  
F. import  
G. None of the above  

The next three questions are based on the following code.

```java
class mySquare {  
    private int size = 0; // size of the square  
    // Square is positioned at (xPosition, yPosition)  
    private int xPosition = 0;  
    private int yPosition = 0;  
    public mySquare() {  
        size = 30; // default size  
        xPosition = 10; // default x coordinate of position  
        yPosition = 10; // default y coordinate of position  
    }  
    public mySquare(int s, int x, int y) {  
        size = s;   xPosition = x;    yPosition = y;  
    }  
    public void changeSize(int s) {  
        size = s;  
    }  
    public void changexPosition(int x) {  
        xPosition = x;  
    }  
    public void changeyPosition(int y) {  
        yPosition = y;  
    }  
}
```

21. What does the following statement accomplish?

```java
mySquare square = new mySquare();
```

A. Define an instance named `mySquare` of type `square`  
B. Define an instance named `square` of type `mySquare` with size 30 and positioned at (10,10)  
C. Define an instance named `square` of type `mySquare` with size 30 and positioned at (0,0)  
D. Define an instance of type `square` of type `Square` with size 30 and positioned at (10,10)  
E. All of the above  
F. None of the above
22. What do the following statements accomplish?

```java
mySquare square = new mySquare(20,30,30);
```

A. Define an instance named `mySquare` of type `square`
B. Define an instance named `square` of type `mySquare` with size 30 and positioned at (10,10)
C. Define an instance of type `square` of type `Square` with size 20 and positioned at (30,30)
D. Define an instance named `square` of type `mySquare` with size 20 and positioned at (30,30)
E. All of the above
F. None of the above

23. What are the values of `size`, `xPosition` and `yPosition` when the following code is executed?

```java
mySquare square = new mySquare();
square.changeSize(40);
square.changexPosition(30);
```

A. 30, 10 and 10
B. 10, 20 and 20
C. 20, 20 and 20
D. 30, 30 and 30
E. 40, 30 and 10
F. None of the above
G. There is a syntax error in the above code.

24. Which of the following statements is **false**?

A. Field variables should be made public
B. Local variables exist only within the scope of a method
C. Private variables are accessible only within the same class
D. Only methods that are intended for other classes should be made public
E. All the above statements are false.
F. All the above statements are true.

25. Which of the following statements is **false**?

A. Class variables reside in each object instance
B. Class variables reside only in the class itself
C. Class variables are defined using the keyword `static`
D. Class variables are used if the variable has the same value in each object
E. All the above statements are false.
F. All the above statements are true.