NATIONAL UNIVERSITY OF SINGAPORE

SCHOOL OF COMPUTING

TERM TEST #1
Semester 1 AY2006/2007

CS1101X/Y/Z — PROGRAMMING METHODOLOGY

16 September 2006 Time Allowed: **60 Minutes**

INSTRUCTIONS

1. This question paper contains **THRITY (30)** questions and comprises **ELEVEN (11)** printed pages, including this page.
2. An **ANSWER SHEET** is provided for you to write the answers. It comprises **TWO (2)** printed pages.
3. Answer **ALL** questions within the space provided on the **Answer Sheet**.
4. Maximum score is **35 marks**.
5. This is an **OPEN BOOK** test.
6. Write legibly with a pen or pencil.
7. Calculators are allowed, but not laptops, PDAs or other computing devices.
8. Submit only the **Answer Sheet** at the end of the test. You may keep the question paper.
9. Write your **MATRICULATION NUMBER** on the **Answer Sheet** using **A PEN**.

——— END OF INSTRUCTIONS ———

SECTION A (25 Multiple Choice Questions. 25 Marks)

Each question has one correct answer. Write your answer in the space provided on the Answer Sheet. 1 mark for each correct answer and no penalty for wrong answer.

1. What is the difference between a method and a message?

A. A method is a sequence of instructions that a class or object uses to perform a task, and a message is a signal that tells the object to perform a task.

B. A method is strictly concerned with programming and a message is strictly concerned with e-mail.

C. A method is a prototype of how a computer should carry out a task, and a message implements the method.

D. A method is a set of instructions to tell the object what to do, and a message is a packet of information used to communicate between two users on a network.

E. A message is a sequence of instructions that a class or object uses to perform a task, and a method is a signal that tells the object to perform a task.

2. What are the four kinds of data members?

A. Class variables, class constants, class method variables, and instance variables.

B. Class variables, class constants, instance variables, and instance constants.

C. Class variables, method variables, data variables, and instance variables.

D. There are actually only two kinds: class constants, and instance variables.

E. There are actually only three kinds: class variables, class constants, and instance variables.

3. What is the merit of inheritance? Pick the best answer.

A. Inheritance makes a Java program more efficient and thus run faster.

B. Inheritance makes a program more portable across different platforms.

C. Inheritance allows information hiding so that internal details of objects are protected from unauthorized access.

D. Inheritance can be used to efficiently design two or more entities that are different but share many common features.

E. Inheritance allows objects to share common data values and therefore reduces computer memory usage.

4. Which of the followings would be the best choice to make a class constant of the class `Tortoise`?

A. weight
B. number of legs
C. age
D. average age
E. longest recorded oldest age

5. Jacky has a set of integer data values ranging from –128 to 128. Which of the following Java primitive types is the most suitable and most space-efficient for storing each data value in the computer memory.

A. `byte`
B. `short`
C. `int`
D. `long`
E. `double`

6. Which of the following Boolean expressions is equivalent to the Boolean expression `!(x < 0 && y < 0)`?

A. `!(x < 0) && !(y < 0)`
B. `!(x >= 0) || !(y >= 0)`
C. `x >= 0 && y >= 0`
D. `x > 0 && y > 0`
E. `x >= 0 || y >= 0`

7. How many of the followings are valid Java identifiers?

`78class`	`Class87`	`sixDogs`
`User$ID`	`Jump_Up_`	`DEFAULT_VAL`
`False`	`Private`	`Average-Age`
`Hello!`	`First One`	`String`

A. 5
B. 6
C. 7
D. 8
E. 9

8. Which of the following three `if` statements are equivalent?

I.
```
if (a == b)
   { if (c == d) a = 1; }
        else b = 1;
```

II.
```
if (a == b) {
   if (c == d) a = 1;
      else b = 1; }
```

III.
```
if (a == b)
    if (c == d) a = 1;
else { b = 1; }
```

A. None

B. `I` and `II`

C. `II` and `III`

D. `I` and `III`

E. `I`, `II` and `III`

9. What is the output of the following program fragment?

```
int a = 2, b = 4, c = 6;
if ( (++a) > 2  ||  (b++) > 3 ) c++;
System.out.println( a + ", " + b + ", " + c );
```

A. `2, 5, 7`

B. `3, 5, 6`

C. `3, 4, 6`

D. `3, 5, 7`

E. `3, 4, 7`

10. What is the output of the following program fragment?

```
int a = (int) Math.floor( 2.6 );
int b = (int) ( 2.6 );
int c = (int) Math.floor( -1.7 );
int d = (int) ( -1.7 );
System.out.println( a + ", " + b + ", " + c + ", " + d );
```

A. `2, 2, -2, -1`

B. `2, 2, -1, -1`

C. `2, 2, -1, -2`

D. `3, 2, -2, -1`

E. `2, 3, -1, -1`

11. What is the number of distinct values that can be represented with 14 bits?

A. 10^{14}
B. 32768
C. 16384
D. 8192
E. 14^2

12. Which of the following statements is true?

A. All methods defined in a class must be declared public.
B. A public instance method of a class cannot access private instance data members of the same class.
C. A local variable in a method can be declared as private but not public.
D. Class constants must always be declared public.
E. None of the above.

13. Given the following class definitions, what is the output of the main method?

```
class CX {
   public int x = 0;
}
```

```
class A {
   public static void f1( int x ) {
      x = 1;
   }

   public static void f2( CX cx ) {
      cx.x = 2;
   }

   public static void main( String[] args ) {
      int x = 0;
      CX c1 = new CX();
      CX c2 = new CX();
      f1(x);
      f2(c1);
      f1(c2.x);
      System.out.println( x + ", " + c1.x + ", " + c2.x );
   } // main
} // A
```

A. 0, 2, 0
B. 1, 2, 1
C. 0, 0, 0
D. 0, 2, 1
E. 1, 0, 1

14. What is the output of the following program fragment?

```
String s1 = new String( "Hello" );
String s2 = new String( "Hello" );
String s3 = s1;
System.out.print( (s1 == s2) + ", " );
System.out.print( (s1 == s3) + ", " );
System.out.print( s1.equals(s2) + ", " );
System.out.print( s1.equals(s3) );
```

A. `true, true, true, true`
B. `false, true, false, true`
C. `false, true, true, false`
D. `false, true, true, true`
E. `false, false, true, true`

15. What is the output of the following program fragment?

```
int x;
x = (int)( 3 * 3 + (int) 3.5 / 0.5 );
System.out.println( "x + 2 = " + x + 2 );
```

A. `x + 2 = 17`
B. `x + 2 = 152`
C. `x + 2 = 16`
D. `x + 2 = 18`
E. `x + 2 = 162`

16. Given the `mystery` method:

```
public static boolean mystery( String s ) {
   int i = s.indexOf( "XX" );
   if ( i < 0 ) return false;
   s = s.substring( i + 2, s.length() );
   return ( s.indexOf( "X" ) != 0 );
}
```

Which of the followings evaluates to `false`?

A. `mystery( "abXX" );`
B. `mystery( "abXXXdX" );`
C. `mystery( "abXXdX" );`
D. `mystery( "abXXdeX" );`
E. `mystery( "abXdeXX" );`

17. What is the output of this program?

```
class Kool {

   public static int foo( int x ) {
      System.out.print( "A" );
      return x;
      System.out.print( "B" );
      return x + 1;
      System.out.print( "C" );
   }

   public static void main( String[] args ) {
      System.out.println( foo(3) );
   } // main

} // Kool
```

A. `ABC4`
B. `AB4`
C. `A3`
D. `3A`
E. `4ABC`

Note: Question 17 voided as it contains compilation error.

18. What is the decimal value of the binary number `100101.011`?

A. `37.375`
B. `37.03`
C. `37.3`
D. `21.03`
E. `21.375`

19. Assuming that all variables that appear in the following have not been declared before. Which of the following will generate a compile-time error?

A. `double x = (int) 20.5;`
B. `int a = 1, b;`
C. `double y = 0; z = 1.0;`
D. `final int C = 12 * 34 – 99;`
E. None of the above.

20. Given the following program:

```
import java.util.*;

class Inputs {

   public static void main( String[] args ) {
      Scanner sc = new Scanner( System.in );

      System.out.print( "Enter two numbers: " );
      int a = sc.nextInt();
      double b = sc.nextDouble();

      System.out.print( "Enter two more numbers: " );
      int c = sc.nextInt();
      double d = sc.nextDouble();

      System.out.println( a + ", " + b + ", " +
                          c + ", " + d );
   } // main
} // Inputs
```

What is the output produced by the last statement if the user's inputs are

```
12 45 87<ENTER>
76 99<ENTER>
```

where *<ENTER>* indicates where the user presses the Enter key on the keyboard?

A. Program causes run-time error because there are too many inputs.

B. Program causes run-time error because some inputs are of the wrong numerical data type.

C. `45, 87.0, 76, 99.0`

D. `12, 45.0, 87, 76.0`

E. `12, 45.0, 76, 99.0`

21. Which of the following statements is true?

A. A default constructor can accept any number of arguments.

B. A constructor can be called directly in a client class like calling any other ordinary instance methods.

C. A class can have at most one constructor.

D. A constructor can call any public or private method in the same class.

E. If a constructor is defined, it must be defined before any other methods in the class, otherwise it will be a compile-time error.

22. Which of the following expressions generates a random *odd* integer in the range [7, 21] (inclusive of 7 and 21)?

A. `(int)( Math.random()*(21-7+1) ) + 7`
B. `(int)( Math.random()*(10-3+1) ) * 2 + 7`
C. `(int)Math.random()*(10-3+1) * 2 + 7`
D. `(int)( Math.random()* 2 ) * (10-3+1) + 7`
E. None of the above.

23. Given the following class definition:

```
class ABC {

   public int kool;

   public ABC() {
      kool = 5;
   }

   public void foo( int kool ) {
      System.out.print( kool + ", " );
      kool = kool;
      System.out.print( kool + ", " );
   }
} // ABC
```

What is the output of the following code fragment?

```
ABC abc = new ABC();
System.out.print( abc.kool + ", " );
abc.foo( 10 );
System.out.println( abc.kool );
```

A. `5, 5, 10, 10`
B. `5, 10, 10, 10`
C. `5, 10, 10, 5`
D. The class definition causes run-time error because there is a name conflict.
E. The class definition causes compile-time error because there is a name conflict.

24. Given the following method:

```
public static void foo( int x ) {
   switch( x ) {
      case 1: System.out.print( "A" );
      case 2: System.out.print( "B" );
              break;
      case 3: System.out.print( "C" );
              System.out.print( "D" );
      case 4: break;
      default: System.out.print( "E" );
   }
}
```

What is the output of the following code fragment?

```
foo(0); foo(1); foo(2); foo(3); foo(4);
```

A. `ABCD`
B. `EABCD`
C. `EABCDE`
D. `EABBCDE`
E. `EABBCD`

25. Given the following expression, what is the order of evaluation of the operations (from first to last)?

```
x || !a == b > c && y
```

A. `&&, ||, ==, ! , >`
B. `! , ==, >, ||, &&`
C. `==, ! , >, &&, ||`
D. `! , >, ==, &&, ||`
E. The expression always causes compile-time error.

SECTION B (5 Questions. 10 Marks)

Write your answer in the space provided on the Answer Sheet. 2 marks for each correct answer.

26. Draw a class hierarchy for the classes Insect, Mammal, Animal, Human, Fish, Rat and Mosquito.

27. Write a public instance method, `isMultiple`, that returns `true` if and only if the first integer parameter is a multiple of the second integer parameter.

28. Write a public instance method, `headTail`, that returns a string made up of the first and last character of the string parameter. You may assume that the length of the input string is at least 2.

29. Write a public instance method, `someMethod`, that returns the product of the two positive integer parameters if they are both even or both odd, otherwise it returns the sum of the parameters. **You must use the `?:` operator, and the method body must have only one statement. You must not use any `if` or `if-else` statement**.

30. Complete the given program fragment (on Answer Sheet) so that the values of variables `a` and `b` are exchanged after your code is executed.

——— END OF PAPER ———