

THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2007

Campus: City

T E S T

COMPUTER SCIENCE

Principles of Programming

(Time Allowed: ONE hour and FIFTEEN minutes)

NOTE: Attempt ALL questions.
Answer the multiple choice questions in section A by circling the correct answer on the answer booklet.
Write the answers to the questions in section B in the space provided on the answer booklet.
Calculators are NOT permitted.

SECTION A: MULTIPLE CHOICE QUESTIONS

Each question in this section is worth 2 marks. Circle the letter corresponding to your choice on the attached answer sheet. There is only one correct answer for each question.

1. What is the output produced by the following code?

```
System.out.println( 3 * (5 - 1) + 4 - 3 * 2 + 1 );
```

- (a) 11
- (b) 15
- (c) 27
- (d) 9
- (e) none of the above

CONTINUED

2. What is the output produced by the following code?

```
System.out.println( 3 + 4 * 2 + "" + 10 / 5 + 3 + 1 );
```

- (a) 17
 - (b) 38231
 - (c) 11231
 - (d) 116
 - (e) none of the above
3. What is the output produced by the following code?

```
int a = 4;  
int b = 6;  
int c = a + 2;
```

```
b = c;  
a = b - 3;  
c = c + 1;
```

```
System.out.println("a: " + a + ", b: " + b + ", c: " + c);
```

- (a) a: 4, b: 6, c: 6
- (b) a: 3, b: 6, c: 7
- (c) a: 4, b: 5, c: 7
- (d) a: 3, b: 5, c: 6
- (e) none of the above

4. What is the output produced by the following code?

```
int a = 4;  
int b = 6;  
int c = 5;  
  
int d = Math.max(Math.min(a,b),Math.min(a,Math.min(c,b)));  
System.out.println("d: " + d);
```

- (a) d: 6
 - (b) d: 5
 - (c) d: 4
 - (d) d: 9
 - (e) none of the above
5. What is the **smallest** possible number which is printed by the following code?

```
int a = (int)(Math.random() * 4 + 1);  
int b = (int)(Math.random() * 4 - 1);  
  
int c = a + b;  
System.out.println("c: " + c);
```

- (a) c: -1
- (b) c: 0
- (c) c: 1
- (d) c: 2
- (e) none of the above

6. Which of the following could **NOT** have been printed by the following code?

```
int a = (int)(Math.random() * 5) + 2;  
int b = (int)(Math.random() * 2) - 1;  
  
int c = a + b;  
  
System.out.println("c: " + c);
```

- (a) c: 1
 - (b) c: 2
 - (c) c: 5
 - (d) c: 7
 - (e) none of the above
7. What is the output produced by the following code?

```
double b = 5.6;  
int a = (int)b;  
  
b = a/2;  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: 5, b: 2.5
- (b) a: 5, b: 2.0
- (c) a: 5.6, b: 2.5
- (d) a: 6.0, b: 3.0
- (e) none of the above

8. What is the output produced by the following code?

```
int a = 10 % 12;  
int b = 10 % 4;  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: 0, b: 2
 - (b) a: 10, b: 4
 - (c) a: 10, b: 2
 - (d) a: 2, b: 2
 - (e) none of the above
9. What is the output produced by the following code if the user enters the number 2 when prompted?

```
System.out.print("Enter b: ");  
  
String b = Keyboard.readInput();  
int a = Integer.parseInt(b + 1);  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: 3, b: 2
- (b) a: 21, b: 2
- (c) a: 201, b: 2
- (d) a: 3, b: 3
- (e) none of the above

10. If the output produced by the following code:

```
System.out.print("Enter a number: ");  
  
int a = Integer.parseInt(Keyboard.readInput());  
  
a = a / 2 - 1;  
System.out.println("result: " + a);
```

is

```
result: 0
```

which of the following numbers was entered by the user?

- (a) -1
- (b) 0
- (c) 1
- (d) 2
- (e) none of the above

11. What is the output produced by the following code?

```
String words = "As you like it";  
  
int a = words.indexOf("y");  
int b = words.indexOf("?");  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: 3, b: 0
 - (b) a: 4, b: -1
 - (c) a: 3, b: -1
 - (d) a: 4, b: 0
 - (e) none of the above
12. What is the output produced by the following code?

```
String words = "Mystery";  
  
char a = words.charAt(0);  
char b = words.charAt(words.length() - 2);  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: M, b: y
- (b) a: y, b: e
- (c) a: , b: r
- (d) a: M, b: e
- (e) none of the above

13. What is the output produced by the following code?

```
String words = "As you like it";  
  
String a = words.substring(0, 2);  
String b = words.substring(10);  
  
System.out.println("a: " + a + ", b: " + b);
```

- (a) a: A, b: e it
 - (b) a: As, b: it
 - (c) a: As , b: e it
 - (d) a: As, b: e it
 - (e) none of the above
14. What is the output produced by the following code?

```
String word = "BE EP ";  
  
int length1 = word.length();  
  
word = word.trim();  
  
int length2 = length1 + word.length();  
  
System.out.println("length1: " + length1 +  
                    ", length2: " + length2);
```

- (a) length1: 6, length2: 12
- (b) length1: 6, length2: 11
- (c) length1: 7, length2: 12
- (d) length1: 6, length2: 10
- (e) none of the above

15. What is the output produced by the following code?

```
final String LOTS_OF_ONES = "1...1";

String some = LOTS_OF_ONES.substring(1, 2);
String many = "1" + some;
many = many + "1" + some;

System.out.println("BB" + some + many + "BB");
```

- (a) BB.11.BB
 - (b) BB.1.1.BB
 - (c) BB1.1.BB
 - (d) BB.1.1BB
 - (e) none of the above
16. Which of the following Java statements compiles without error?

- (a) `String word = "numbers" + 5 - 3;`
- (b) `int a = 4 + "5";`
- (c) `String b = Integer.parseInt(Keyboard.readInput());`
- (d) `char c = "M";`
- (e) none of the above

17. Explain what the following code does:

```
private int foo( int[] numbers ) {  
    int m = 0;  
    for (int i = 0; i < numbers.length; i++) {  
        if (numbers[m] < numbers[i]) {  
            m = i;  
        }  
    }  
    return m;  
}
```

- (a) The method `foo()` will return the **minimum value** from an array of integer values
- (b) The method `foo()` will return the **maximum value** from an array of integer values
- (c) The method `foo()` will return the **index** of the **minimum value** from an array of integer values
- (d) The method `foo()` will return the **index** of the **maximum value** from an array of integer values
- (e) none of the above
18. The following code is syntactically correct, and would compile, but does not follow the recommended style guidelines.

```
boolean b = false;  
  
if (b) if (b) System.out.println(1);  
else System.out.println(2);
```

What output would be produced by this code?

- (a) 1
- (b) 2
- (c) 1
2
- (d) an error occurs
- (e) nothing is printed

SECTION B

Question 19 (6 marks)

The `calculate()` method is shown below:

```
private int calculate (int value1, int value2) {  
    int result = value1 % 5 + value2;  
    return result;  
}
```

- a) What parameters should be passed to the `calculate()` method call so that the output when the `start()` method is executed is 5?

```
public void start() {  
    int number = calculate( _____ );  
    System.out.println(number);  
}
```

- b) What parameters should be passed to the `calculate()` method call so that the output when the `start()` method is executed is 2?

```
public void start() {  
    int number = calculate( _____ );  
    System.out.println(number);  
}
```

(6 marks)

Question 20 (6 marks)

What is the output produced by the following program?

```
public class Program {  
  
    private void start() {  
        System.out.print ("1: ");  
        doSomething1(10, 3);  
        System.out.println();  
  
        System.out.print ("2: ");  
        int result = doSomething2("WOW", 3);  
        System.out.println("Result: " + result);  
    }  
  
    private void doSomething1(int num1, int num2) {  
        int result1 = num1 + num2;  
        int result2 = num1 * num2 - result1;  
        System.out.println("Result: "  
                            + Math.max(result1, result2));  
    }  
  
    private int doSomething2(String word, int number) {  
        number = word.length() + 2 * number;  
        return number;  
    }  
}
```

(6 marks)

Question 21 (16 marks)

Complete each of the methods below according to the description:

- a) This method returns a random integer greater than or equal to 0 and less than the value passed to the method as a parameter.

- b) This method is passed a String parameter (the name) and an int parameter (the age). The method prints a statement made up of the name and the age. For example, if the following two calls were made to the completed `printDescription()` method:

```
printDescription("Jill", 10);  
printDescription("John", 19);
```

the output would be:

```
Jill is age: 10  
John is age: 19
```

- c) This method accepts two String parameters and returns a String. The method returns the longer of the two Strings passed in as parameters. For example, if the following two calls were made to the completed `getLonger()` method:

```
String word = getLonger("happy", "sad");  
System.out.println(word);  
word = getLonger("wonderful", "extraordinary");  
System.out.println(word);
```

the output would be:

```
happy  
extraordinary
```

Note: if the Strings passed in as parameters are equal in length, the method returns the first parameter.

- d) This method accepts one String parameter and returns a char. The method returns the first letter of the String passed in as a parameter. For example, if the following two calls were made to the completed `getFirstLetter()` method:

```
char letter = getFirstLetter("peppermint");  
System.out.println(letter);  
  
letter = getFirstLetter("detergent");  
System.out.println(letter);
```

the output would be:

```
p  
d
```

Note: you can assume that the String passed to the method as a parameter always has at least one letter.

(16 marks)

Question 22 (6 marks)

Consider the program below:

```
a. public class Program {  
b.     public void start() {  
c.         double x;  
d.         x = 0.1 + 0.1 + 0.1;  
e.         if (x == 0.3) {  
f.             String result = "yes";  
g.         } else {  
h.             String result = "no";  
i.         }  
j.         System.out.println(result);  
k.     }  
l. }
```

There is an error on line j.

State what the error is, and suggest how the error could be fixed. Once the error is fixed, what would the output of this program be?

(6 marks)

Question 23 (2 marks)

What is the output produced by the following program?

```
public class ProgramQ2 {  
    public void start() {  
        int x = 5;  
        timesTwo(x);  
        System.out.println(x);  
    }  
    private void timesTwo(int x) {  
        x = x * 2;  
    }  
}
```

(2 marks)

Question 24 (3 marks)

What is the output produced by the following program?

```
public class ProgramQ3 {  
    public void start() {  
  
        String s1 = "put";  
        String s2 = "putput";  
  
        System.out.println(s2.substring(3,6));  
  
        if (s1 == s2.substring(3,6)) {  
            System.out.println("yes");  
        } else {  
            System.out.println("no");  
        }  
    }  
}
```

(3 marks)

Question 25 (3 marks)

Consider the following three expressions. If they are valid, then what value will they evaluate to? If they are not valid, then state why they are not valid.

Assume the following variable declarations:

```
int a = 10;  
int b = 8;  
int c = 6;
```

- a) $(a == 10) \ || \ b < c$
- b) $(!(5 + - + - 6 > b))$
- c) $(5 < a < 12)$

(3 marks)

Question 26 (4 marks)

Consider the following "for" loop:

```
for (int a = 0; a < 10; a++) {  
    System.out.println(a);  
}
```

Rewrite this as a "while" loop.

(4 marks)

Question 27 (6 marks)

Consider the following method called `timesTwo()`:

```
a. private int timesTwo(int x) {  
b.     if (x = 5) {  
c.         return 10.0;  
d.     } else {  
e.         return x * 2;  
f.     }  
g. }
```

The code for this method definition will not compile, due to two syntax errors in the code. State the letter of the lines on which the errors occur, and give a correction for each error.

(6 marks)

Question 28 (12 marks)

Write a method called `duplicate()` that takes one parameter, an array of ints, and returns **another** array of ints, where each element of this second array is equal to its corresponding element in the first array.

(12 marks)
