

# THE UNIVERSITY OF AUCKLAND

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SECOND SEMESTER, 2010  
Campus: City

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COMPUTER SCIENCE  
**TEST**  
Principles of Programming

(Time Allowed: 75 minutes)

**NOTE:**

You must answer **all** questions in this test.

**No** calculators are permitted

Answer in the space provided in this booklet.

There is space at the back for answers that overflow the allotted space.

<b>Surname</b>	
<b>Forenames</b>	
<b>Student ID</b>	
<b>Login (UPI)</b>	
<b>Lab Time</b>	

<b>Q1</b>  (/16)	<b>Q4</b>  (/8)	<b>Q7</b>  (/10)
<b>Q2</b>  (/15)	<b>Q5</b>  (/10)	<b>Q8</b>  (/20)
<b>Q3</b>  (/12)	<b>Q6</b>  (/9)	<b>Total</b>  /100

ID: .....

**Question 1 (16 marks)**

- a) What is the output produced by the following code?

```
System.out.println(3 + 2 + " + " + 2 + " * " + 6 + (2 + 1));
```

(2 marks)

- b) What is the output produced by the following code?

```
System.out.println("A\nB\nC\nZ");
```

(2 marks)

- c) Complete the output produced by the following code.

```
int num = Math.max(Math.min(Math.max(3, 6), 5), 4);  
System.out.println("num: " + num);
```

num:

(2 marks)

ID: .....

d) What is the output produced by the following code?

```
String a = new String("Hello World!");  
String b = new String("Hello World!");  
System.out.println(a == b);
```

(2 marks)

e) What is the output produced by the following code?

```
int number = 56;  
  
if (number % 2 > 0) {  
    System.out.println("First");  
} else {  
    System.out.println("Second");  
}
```

(2 marks)

ID: .....

f) What is the output produced by the following code?

```
String a = "45";  
int x = 1 + (Integer.parseInt(a) / 5 + 2) * 4 ;  
String b = "" + x;  
System.out.println(b.equals(a));
```

(2 marks)

g) Complete the Java statement which assigns a random number which is either 1, 2, 3, 4 or 5 to the `int` variable, `number`.

```
int number =
```

(2 marks)

h) Complete the output when the following code is executed.

```
int a = 6;  
int b = a + 2;  
a = b + 2;  
int c = a;  
c = c / 5;  
a = c / 2;  
System.out.println("a: " + a + " b: " + b + " c: " + c);
```

```
a:          b:          c:
```

(2 marks)

ID: .....

**Question 2 (15 marks)**

a) Complete the output produced by the following code.

```
String phrase = "LITTLE STAR";  
String part1 = phrase.substring(4, 6);  
String part2 = phrase.substring(9);  
String result = part1 + part2;  
System.out.println("Result: " + result);
```

Result:

(3 marks)

b) Complete the output produced by the following code.

```
String phrase = "RED BLUE YELLOW";  
char c1 = phrase.charAt(phrase.length() - 1);  
char c2 = phrase.charAt(1);  
String result = "" + c1 + c2;  
System.out.println("Result: " + result);
```

Result:

(3 marks)

ID: .....

- c) Complete the output produced by the following code.

```
String phrase = "OVER THE TOP";  
int position1 = phrase.indexOf("TH");  
int position2 = phrase.indexOf("ET");  
int sum = position1 + position2;  
System.out.println("Sum: " + sum);
```

Sum:

(3 marks)

- d) Why does the following code produce a runtime error?

```
String word = "fabulous";  
word = word.substring(9);
```

(3 marks)

ID: .....

e) Which of the following could NOT be the output of the UsesRandom program shown below? Circle your answer.

a) 678912345

b) 912345678

c) 123456789

d) None of the above

*(3 marks)*

```
public class UsesRandom {
    public void start() {
        aMethod("123456789");
    }
    private void aMethod(String word) {
        int length = word.length() - 1;

        int position = (int)(Math.random() * length) + 1;

        word = word.substring(position) +
                word.substring(0, position);
        System.out.println(word);
    }
}
```

**CONTINUED**

ID: .....

**Question 3 (12 marks)**

Complete the method header for each of the following methods (i.e. complete the first line of each method definition).

a) The method, `methodA()`, is called in the following way:

```
int resultA = methodA(5, 32);
```

```
private _____ methodA ( _____  
                               _____ ) {  
  
    if (num2 > num1) {  
        return num1 + 1;  
    } else if (num2 < num1) {  
        return num1 - 1;  
    }  
  
    return num1;}  
}
```

(3 marks)

b) The method, `methodB()`, is called in the following way:

```
methodB("cat", "dog");
```

```
private _____ methodB ( _____  
                               _____ ) {  
  
    char letter1 = word1.charAt(0);  
    char letter2 = word2.charAt(0);  
    System.out.println(letter1 + " " + letter2);  
  
}
```

(3 marks)

ID: .....

c) The method, `methodC()`, is called in the following way:

```
boolean result = methodC(591, "5912");
```

```
private _____ methodC ( _____  
                             _____ ) {  
    String numDigits = num + "";  
    if (numDigits.equals(digits)) {  
        return true;  
    }  
    return false;  
}
```

(3 marks)

d) The method, `methodD()`, is called in the following way:

```
double result4 = methodD(3.5, true);
```

```
private _____ methodD ( _____  
                             _____ ) {  
    int number = (int)(Math.random() * 4);  
    if (isPositive) {  
        return num + number;  
    }  
    return num - number;  
}
```

(3 marks)

ID: .....

**Question 4 (8 marks)**

Complete the program below which reads in three `int` numbers and outputs the largest of the three numbers. A running example of the completed program is shown below. (The user input is shown in bold and in a larger font.)

```
C:>Java Example
Please enter the first number: 11
Please enter the second number: 15
Please enter the third number: 10
The largest of the three numbers: 15
```

Please note that your program should work for any three input numbers, not just the example showed above.

```
public class Example {
    public void start() {
```

```
        System.out.print("Please enter the first number: ");
```

```
        System.out.print("Please enter the second number: ");
```

```
        System.out.print("Please enter the third number: ");
```

**CONTINUED**

ID: .....

```
System.out.print("The largest of the three numbers: ");
```

```
}  
}
```

*(8 marks)*

ID: .....

**Question 5 (10 marks)**

a) Complete the output produced by the following code.

```
boolean result;  
boolean a = true;  
boolean b = false;  
boolean c = true;  
  
boolean d = (a && b) || (a && c);  
boolean e = a || (!c);  
boolean f = (c || b) && (c || a);  
  
System.out.println("d: " + d + " e: " + e + " f: " + f);  
  
result = (!a && !b) || ((c && !b) || (!e || f));  
  
System.out.println("Result: " + result);
```

d:            e:            f:

Result:

(5 marks)

ID: .....

- b) The following program does not compile. Give the line number of the statement which causes the compile error and state the reason for the compile error.

```
1 public class Example {
2     public void start() {
3         double cost = 53.0;
4         int age = 68;
5         final double GST = 0.125;
6
7         if (age <= 12 || age >= 65){
8             double discount = 0.15;
9             System.out.println("Eligible for discount");
10        }
11
12        double price = cost * (1 + GST) * (1 - discount);
13        System.out.println(price);
14
15        int limit = (int)(Math.random() * 999 + 1);
16
17        if (price / limit > 1) {
18            System.out.println("Too expensive");
19        } else {
20            System.out.println("Affordable");
21        }
22    }
23 }
```

line number:

Reason for the compile error:

(5 marks)

CONTINUED

ID: .....

**Question 6 (9 marks)**

Complete the definition of the `calculateDiscount()` method in the program below so that a String containing the appropriate percentage is returned by the method. The format of the String which is returned by the `calculateDiscount()` method is a number followed by the '%' symbol, e.g., "0%", "10%", "20%" or "30%".

A discount is given based on the purchase amount and the age of the customer as described below:

- 30% discount for a customer who is 65 years of age or over and whose purchase amount is over 250,
- 20% discount for a customer whose purchase amount is over 250 but whose age is younger than 65,
- 10% discount for any customer whose age is 65 or over, and whose purchase amount is not over 250,
- 0% discount in all other cases.

```
public class Program {  
  
    public void start() {  
  
        System.out.print("Enter amount of purchase:");  
        int amount = Integer.parseInt(Keyboard.readInput());  
  
        System.out.print("Enter age of customer:");  
        int age = Integer.parseInt(Keyboard.readInput());  
  
        String discount = calculateDiscount(age, amount);  
  
        System.out.println("You have a " + discount +  
                           " discount!");  
    }  
}
```

```
private _____ calculateDiscount(_____  
                                   _____) {
```

ID: .....

}

}

*(9 marks)*

ID: .....

**Question 7 (10 marks)**

Give the output when the following program is executed.

```
public class MyProgram {
    public void start() {
        System.out.print("1 ");
        methodOne();
        System.out.print("2 ");
        methodTwo();
        System.out.println("3 ");
    }
    private void methodOne() {
        methodTwo();
        System.out.print("4 ");
    }
    private void methodTwo() {
        System.out.print("5 ");
        methodThree();
    }
    private void methodThree() {
        System.out.print("6 ");
    }
}
```

//Show output here

(10 marks)

CONTINUED

ID: .....

**Question 8 (20 marks)**

- a) You are required to complete the following ATM program. The program code carries out two transactions based on an initial balance of \$200:

    first a deposit of \$55.50,  
and then  
    a withdrawal of \$35.50.

The output of the program should be:

    Balance = \$220.0

i.e. the balance after the above two transactions should be \$220.0

Complete the ATM program so that it produces **exactly** the same output as shown above.

**Note:** your code **MUST** make one call to the `deposit()` method and one call to the `withdraw()` method.

```
public class ATM {  
    public void start() {  
        double balance = 200;  
  
        System.out.println("Balance = $" + balance);  
    }  
    private double deposit(double balance, double amount) {  
        balance = balance + amount;  
        return balance;  
    }  
    private double withdraw(double balance, double amount) {  
        balance = balance - amount;  
        return balance;  
    }  
}
```

(7 marks)



ID: .....

- c) The `DiscountCalculation` program should print a message containing the original price, the discount rate, the discounted price and the saved amount. The output which the corrected `DiscountCalculation` program should print is:

```
Original price: $100.0   Discount rate: 0.1
Discounted price: $90.0
You save: $10.0
```

There are **3** mistakes in the `calculateAndPrintDiscount()` method. Locate and correct the 3 mistakes so that the program produces **exactly** the output shown above. **Circle** the errors where they appear in the code below and write the correction immediately below the circled error:

```
public class DiscountCalculation {
    public void start() {
        double price = 100;
        double discountRate = 0.1;
        calculateAndPrintDiscount(price, discountRate);
    }
    private void calculateAndPrintDiscount(int price,
                                           double discountRate){
        double discount = price * discountRate;
        double discountedPrice = price - discount;
        System.out.print("Original price: $" + price);
        System.out.println("\tDiscount rate: " + discountRate);
        System.out.println("Discounted price: $" + discount);
        System.out.println("You save: $" + discountedPrice);
    }
}
```

(6 marks)

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**OVERFLOW PAGE**

(If you have used this page, please indicate clearly under the relevant question that you have overflowed to this page)

ID: .....

**ROUGH WORKING (WILL NOT BE MARKED)**  
(You may detach this page from the answer booklet and use it for rough working)

ID: .....

**ROUGH WORKING (WILL NOT BE MARKED)**

(You may detach this page from the answer booklet and use it for rough working)



SURNAME: ..... FORENAMES: .....

