THE UNIVERSITY OF AUCKLAND

SUMMER SEMESTER, 2007
Campus: City

COMPUTER SCIENCE

TEST

Principles of Programming

(Time allowed: 75 MINUTES)

NOTE: Attempt **ALL** questions
Write your answers in the space provided
There is space at the back for answers that overflow the allotted space
No calculators are permitted

Surname:	
Forenames:	
Student ID number:	
Login name:	

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

CompSci 101 Test Results

Question	Marks	Out of
Question 1		28
Question 2		6
Question 3		10
Question 4		5
Question 5		14
Question 6		6
Question 7		6
TOTAL		**75**

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

Question 1 (28 marks)

a) What output is produced by the following code?

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

3345

(2 marks)

b) What output is produced by the following code?

```
System.out.println("\"" + "\\nn");
```

"\nn

(2 marks)

c) Consider the following boolean expression:

```
(a && b) || (!a)
```

What values would need to be stored in the `boolean` variables `a` and `b` so that this expression evaluates to `false`?

```
a = true;

b = false;
```

(2 marks)

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

d) What output is produced by the following code?

```
int a = 1;
int b = 2;
int c = 3;
int d = Math.max(Math.min(a, b), Math.min(b, c));

System.out.println(d);
```

2

(2 marks)

e) What output is produced by the following code?

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

6

(2 marks)

f) What output is produced by the following code?

```
int x = 100;
int y = x;
x = 10;

System.out.print(y);

String s = "10";
String t = s.substring(0,1);

System.out.println(s + t);
```

100101

(2 marks)

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

g) What output is produced by the following code?

```
int a = 0;
int b = 7;

a = b;
b = a;

System.out.println(a + b);
```

14

(2 marks)

h) What output is produced by the following code?

```
int[] nums = { 1, 2, 3, 4, 5 };

nums[0] = nums[3];
nums[1] = nums[2] + nums[4];
nums[2] = nums.length;
nums[ nums[1] - nums[2] ] = 10;

System.out.print(nums[0] + " ");
System.out.print(nums[1] + " ");
System.out.print(nums[2] + " ");
System.out.print(nums[3] + " ");
System.out.print(nums[4] + " ");
```

4 8 5 10 5

(2 marks)

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

i) The `printOutput()` method is *called* in the following way:

```
printOutput(3.5, 'H', "Hello");
```

Complete the method header for the `printOutput()` method (i.e. complete the first line of the method definition).

```
private void printOutput(double a, char b, String c) {
    System.out.println(a + " " + b + " " + c);
}
```

(2 marks)

j) The `getLetter()` method is *called* in the following way:

```
char c = getLetter("Test", 3);
```

Complete the method header for the `getLetter()` method (i.e. complete the first line of the method definition).

```
private char getLetter(String a, int b) {
    return a.charAt(b);

}
```

(2 marks)

k) What is the **number of characters** in the String returned by the method call:

```
s.substring(4, 10)
```

6

(2 marks)

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

l) Consider the following class stored in a file called `MyApplication.java`:

```
public class MyApplication {
     public static void main(String[] args) {
          MyProgram p = new MyProgram();
          p.start();
     }
}
```

Also consider the following class stored in a file called `MyProgram.java`:

```
public class MyProgram {
     public void start() {
          System.out.println("Hello World");

     }
}
```

If `MyApplication.java` and `MyProgram.java` are both stored in the current directory, give the correct DOS commands required to compile and run this program so that the output "`Hello World`" is produced:

```
javac MyProgram.java
javac MyApplication.java
java MyApplication
```

or

```
javac *.java
java MyApplication
```

or

```
javac MyApplication.java
java MyApplication
```

(2 marks)

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

m) What output is produced by the following code?

```
String a = "c";
String b = "compsci";

String c = b.substring(0,1);

System.out.println(a + " " + c + " " + (a == c));
```

c c false

(2 marks)

n) What output is produced by the following code?

```
int[] a = {7, 6, 2, 0, 1};
int[] b;

b = a;

b[3] = 100;

System.out.println(a[3]);
```

100

(2 marks)

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

Question 2 (6 marks)

What is the output of the following program:

```
public class MyProgram {

     public void start() {

          int a = 10;
          int b = 20;

          if (a < b) {
               System.out.println("one");
          }
          if (a == b) {
               System.out.println("two");
          }
          if ((a + b) > 0) {
               System.out.println("three");
          }

          if (a < b) {
               System.out.println("four");
          } else if (a == b) {
               System.out.println("five");
          } else if ((a + b) > 0) {
               System.out.println("six");
          } else {
               System.out.println("seven");
          }

     }
}
```

one
three
four

(6 marks)

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

Question 3 (10 marks)

Consider the following `start()` method:

```
public void start() {

     int c1 = (int)(Math.random()*13) + 1;
     int c2 = (int)(Math.random()*13) + 1;

     if (isBlackjack(c1, c2)) {
          System.out.println("A blackjack!");
     }
}
```

The `start()` method deals two cards, storing their numeric values in the variables `c1` and `c2`. It then calls the `isBlackjack()` method to test whether the two cards form a blackjack, and prints out "`A blackjack!`" if they do.

To answer this question, you need to define the following **TWO** methods:

```
... isBlackjack(...)
... cardValue(int cardNumber)
```

- The `cardValue()` method is passed the *number* of a card as a parameter. The *number* 1 represents an Ace, *numbers* 11, 12 and 13 represent the Jack, Queen and King picture cards respectively, and any *number* between 2 and 10 represents a card with that face value. The method should then calculate and return the *value* that the card represents in a game of blackjack. The *value* of an Ace is 11, the *value* of any picture card is 10, and the *values* of all other cards are their face values.

- The `isBlackjack()` method is passed the two cards that have been dealt, and must return `true` if those cards form a blackjack, and `false` if they do not (a blackjack is when the sum of the card values of the two cards equals 21). This method **must** call the `cardValue()` method to obtain the value of each card.

You will need to define appropriate return types for both methods, and appropriate parameters for the `isBlackjack()` method.

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

```
                    isBlackjack(                                    ) {




     private boolean isBlackjack(int c1, int c2) {
          int total = cardValue(c1) + cardValue(c2);
          return (total == 21);
     }









}
```

(5 marks)

```
                    cardValue( int cardNumber ) {




     private int cardValue(int cardNumber) {
          if (cardNumber == 1)
               return 11;
          if (cardNumber > 10)
               return 10;
          return cardNumber;
     }









}
```

(5 marks)

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

Question 4 (5 marks)

The formula for converting a temperature from Fahrenheit to Celsius is given below:

$$T_{cels} = \frac{5}{9} \times (T_{fahr} - 32)$$

Consider the following program which asks the user to enter a temperature in Fahrenheit, and prints out the result in Celsius:

```
public class MyProgram {

     public void start() {

          System.out.println("Temperature conversion");

          System.out.print("Enter temperature (F): ");

          int input = Keyboard.readInput();
          int input = Integer.parseInt(Keyboard.readInput());
          int result = convertFahrenheitToCelsius(input);

          System.out.println("Celsius = " + result);
     }

     private int convertFahrenheitToCelsius(int degF) {

          int degC = (int)((5/9)*(degF - 32));
          int degC = (int)((5.0/9)*(degF - 32));
          return degC;

     }


}
```

(5 marks)

There is exactly one *syntax error* and one *logic error* in the above code.

- The syntax error will be detected by the compiler, and in response the compiler will generate the following error message:

  `"incompatible types"`

- The logic error will not be detected by the compiler but will cause the output to be incorrect.

Circle the line of code that contains the syntax error, and circle the line of code that contains the logic error **and** provide corrections for both of these errors underneath the incorrect lines.

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

Question 5 (14 marks)

The following class defines a playing card.

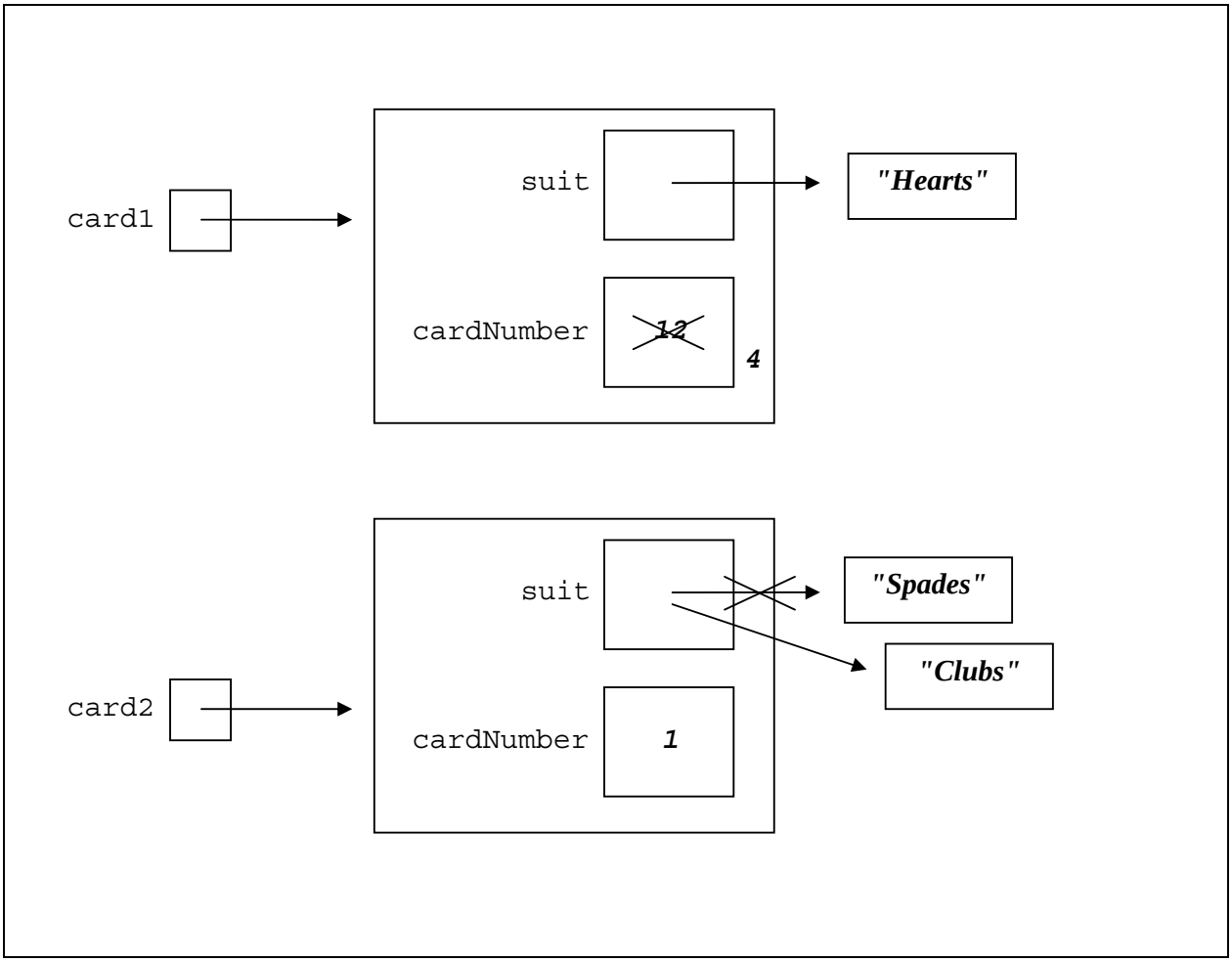
```
public class Card {

     private int cardNumber;
     private String suit;

     public Card(int num, String suit) {
          cardNumber = num;
          this.suit = suit;
     }

     public void setSuit(String suit) {
          this.suit = suit;
     }

     public String getSuit() {
          return suit;
     }

     public void setCardNumber(int num) {
          cardNumber = num;
     }

     public int getCardNumber() {
          return cardNumber;
     }

     public boolean isAPictureCard() {
          if(cardNumber > 10 && cardNumber < 14) {
               return true;
          }
          return false;
     }

     public String toString() {
          String cardDesc = "Playing card: ";
          if( cardNumber == 11) {
               cardDesc = cardDesc + "J";
          } else if( cardNumber == 12) {
               cardDesc = cardDesc + "Q";
          } else if( cardNumber == 13) {
               cardDesc = cardDesc + "K";
          } else if( cardNumber == 1) {
               cardDesc = cardDesc + "A";
          } else {
               cardDesc = cardDesc + cardNumber;
          }
          cardDesc = cardDesc + " of " + suit;
          return cardDesc;
     }
}
```

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

a) Two objects of type `Card` are created as follows:

```
Card card1 = new Card(12, "Hearts");
Card card2 = new Card(1, "Spades");
```

Complete the diagram below illustrating the values that are stored in the instance variables for each of these objects. You should write very clearly on the diagram, as you are required to change the diagram when you complete part (b) of this question.



(6 marks)

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

b) Given the two `Card` objects created and initialised as in the diagram on the previous page, what would be the output after the following statements are executed? Note: you **MUST** also mark any changes to any instance variables clearly on the diagram on the previous page.

```
card2.setSuit("Clubs");
card1.setCardNumber(4);

if (card1.isAPictureCard()) {
     System.out.println("1. Picture card");
} else {
     System.out.println("2. Not a picture card");
}

System.out.println("3. " + card2.getSuit());
System.out.println("4. " + card1.toString());
System.out.println("5. " + card2.toString());
```

The output would be:

2. Not a picture card
3. Clubs
4. Playing card: 4 of Hearts
5. Playing card: A of Clubs

(8 marks)

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

Question 6 (6 marks)

What is the output of the following program:

```
public class MyProgram {

     public void start() {
          int a = 10;
          methodOne(a);
          System.out.println(a);
     }

     private void methodOne(int a) {
          a = a + 1;
          a = methodTwo(a);
          System.out.println(a);
     }

     private int methodTwo(int x) {
          System.out.println(x);
          return x + x;
     }
}
```

Show the output here:

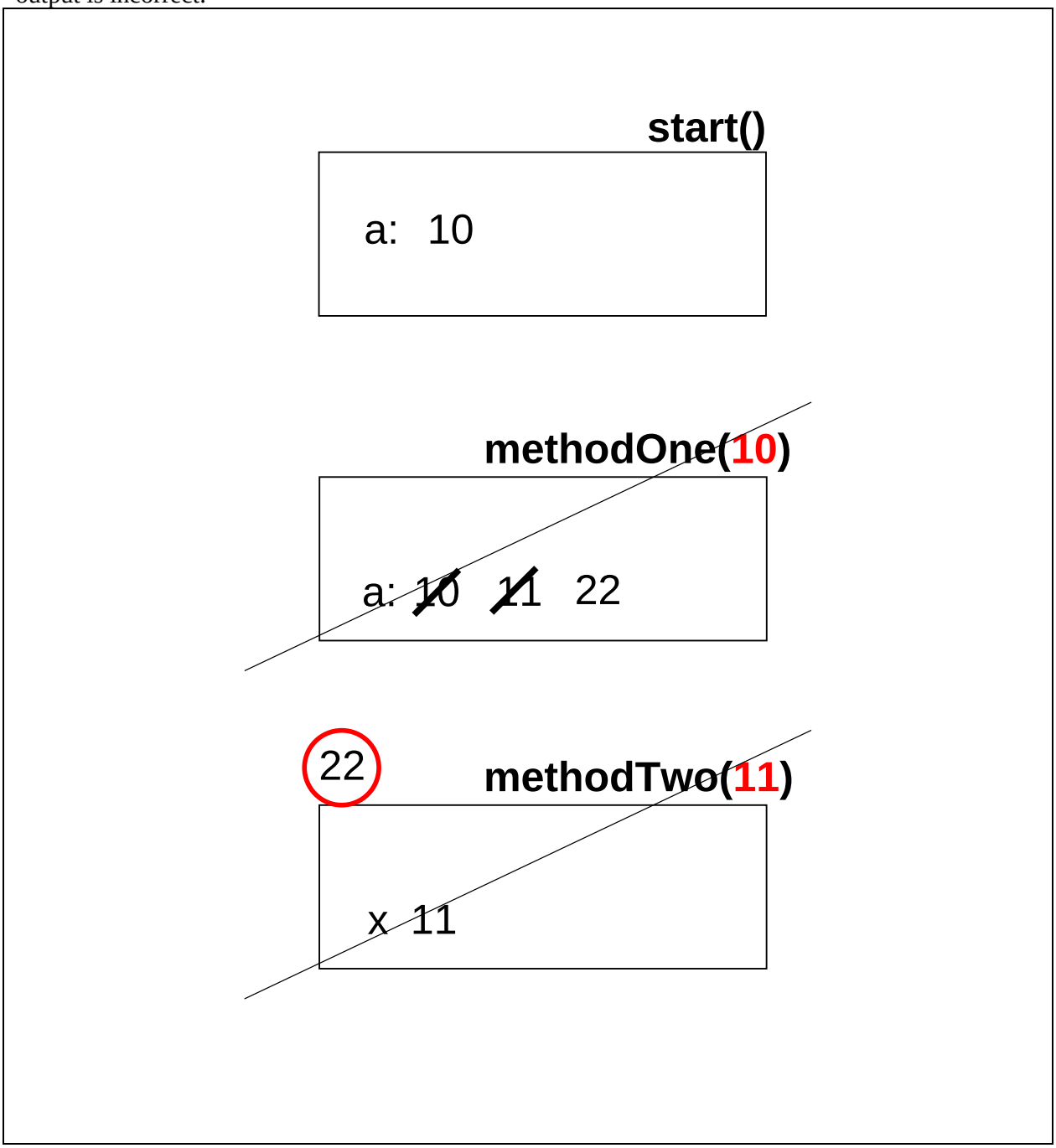
11
22
10

(6 marks)

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

Working for Question 6:

Diagrams of the method calls are not required but partial credit may be given for working if the output is incorrect.



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

Question 7 (6 marks)

What is the output of the following program:

```
public class MyProgram {

     public void start() {

          int[] x = {1, 2, 3, 4, 5, 6};

          int[] y = process(x);

          for (int i = 0; i < y.length; i++) {
               System.out.print(y[i] + " ");
          }
     }

     private int[] process(int[] a) {

          int[] result = new int[a.length / 2];

          for (int i = 0; i < result.length; i++) {
               result[i] = a[i*2] + 1;
          }

          return result;
     }

}
```

2 4 6

(6 marks)

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

OVERFLOW PAGE

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

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

ROUGH WORKING (WILL NOT BE MARKED)

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

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

ROUGH WORKING (WILL NOT BE MARKED)

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

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

APPENDIX:

Useful methods and variables:

String

```
public int indexOf(char c)
public int indexOf(String string)
public char charAt(int index)
public String substring(int beginIndex, int endIndex)
public int length()
public boolean equals(String comparison)
```

StringTokenizer

```
public boolean hasMoreTokens()
public String nextToken()
```

Math

```
public static double random()
```