

THE UNIVERSITY OF AUCKLAND

FIRST SEMESTER, 2005
Campus: City

COMPUTER SCIENCE

Principles of Programming

(Time Allowed: ONE hour and FIFTEEN minutes)

Surname

Forenames

Student ID

Login name(UPI)

NOTE:

- Attempt **ALL** questions
- Answer the multiple choice questions in section A by circling the correct answer
- Write the answer to the questions in section B in the space provided
- No books or calculators are permitted

Examiner to complete:

Question	Mark
1 – 15	(/45)
16	(/20)
17	(/20)
18	(/10)
19	(/5)

Total	(/100)
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SECTION A: MULTIPLE CHOICE QUESTIONS

Each question in this section is worth 3 marks. Circle the letter corresponding to your choice. There is only one correct answer for each question.

1. Each of the following fragments of Java code use a variable x. Which code fragment is a variable declaration?

- (a) `x = 9;`
- (b) `if (x == y) {
 doSomething();
}`
- ☒ (c) `int x;`
- (d) `System.out.println(x);`
- (e) `private int doSomething(int x) {
 //do something here
}`

2. Which of the following variable identifiers follows the Java code conventions?

- ☒ (a) `sizeOfClass`
- (b) `length_of_box`
- (c) `HEIGHTOFBOX`
- (d) `2TimesTables`
- (e) `circleradius`

3. Which of the following identifiers will cause a **compile-time** error?

- (a) `_abc`
- (b) `abc_`
- ☒ (c) `2abc`
- (d) `abc2`
- (e) `A_B_C`

ID.....

4. What is the output of the following code fragment?

```
int x = 0;
int y = 1;
int z = 2;
x = y;
y = z;
System.out.println(x + " " + y + " " + z);
```

- (a) 0 1 2
 - (b) 1 1 1
 - (c) 1 1 2
 - ☒ (d) 1 2 2
 - (e) 2 2 2
5. Which of the following code fragments will cause a **runtime** error?
- (a) `int i = 0 / 5;`
 - (b) `int i = 5.0 / 0;`
 - (c) `int i = 0 / 5.0;`
 - (d) `int i = 0;`
 - ☒ (e) `int i = 5 / 0;`
6. Which of the following code fragments will compile successfully?
- (a) `int i = 3.5;`
 - (b) `double d = "3.5";`
 - (c) `String s = 3;`
 - ☒ (d) `double d = 3;`
 - (e) `int i = "3";`

ID.....

7. What is the output produced by the following code fragment?

```
double d = 5 / 10;  
double e = (double) 5 / 10;  
double f = (double) (5 / 10);  
System.out.println(d + " " + e + " " + f);
```

- (a) 0.0 0.0 0.0
- (b) 0.0 0.0 0.5
- ☒ (c) 0.0 0.5 0.0
- (d) 0.0 0.5 0.5
- (e) 0.5 0.5 0.5

8. Which code fragment will ensure that the statement:

```
System.out.println(a == b == c);
```

can be compiled and executed without causing an error?

- (a)

```
int a = 4;  
int b = 3;  
int c = 4;
```
- (b)

```
boolean a = true;  
boolean b = true;  
int c = 5;
```
- (c)

```
int a = 4;  
boolean b = false;  
boolean c = false;
```
- (d)

```
boolean a = true;  
int b = 4;  
int c = 4;
```
- ☒ (e)

```
int a = 5;  
int b = 6;  
boolean c = true;
```

ID.....

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

```
public void start() {
    int a = 1;
    int b = 0;
    test01();
    a = 2;
    test02();
    b = 1;
    System.out.println(a + " " + b);
}
private void test01() {
    int a = 5;
    int b = 2;
}
private void test02() {
    int a = 3;
    int b = 3;
}
```

- (a) 3 3
- (b) 5 2
- ☒ (c) 2 1
- (d) 1 0
- (e) 1 2

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

```
public void start() {
    int a = 1;
    int b = 0;
    test01(a);
    test02(b);
    System.out.println(a + " " + b);
}
private void test01(int a) {
    a = 5;
    int b = 2;
}
private void test02(int b) {
    int a = 3;
    b = 3;
}
```

ID.....

- (a) 1 0
- (b) 5 2
- (c) 3 3
- (d) 5 3
- (e) 3 2

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

```
public void start() {  
    int a = 1;  
    int b = 0;  
    a = test01(a);  
    b = test02(b);  
    System.out.println(a + " " + b);  
}  
  
private int test01(int a) {  
    a = 5;  
    int b = 2;  
    return 4;  
}  
  
private int test02(int b) {  
    int a = 8;  
    b = 3;  
    return a;  
}
```

- (a) 1 0
- (b) 5 3
- (c) 4 3
- (d) 8 3
- (e) 4 8

ID.....

12. The method called `reverse()` should reverse the letters in a given `String`. For example, if the method was called as follows:

```
System.out.println(reverse("Hello"));
```

then the output would be:

```
olleH
```

Which of the following method declarations will result in the correct implementation of the reverse method as described above?

- (a)

```
private String reverse(String word) {  
    String backwards = "";  
    int counter = 0;  
    while (counter < word.length()) {  
        backwards = backwards.charAt(counter) + backwards;  
        counter++;  
    }  
    System.out.println(backwards);  
}
```
- (b)

```
private String reverse(String word) {  
    String backwards = "";  
    int counter = 0;  
    while (counter < word.length()) {  
        backwards = backwards.charAt(counter) + backwards;  
        counter++;  
    }  
    return backwards;  
}
```
- (c)

```
private String reverse(String word) {  
    String backwards = "";  
    int counter = 0;  
    while (counter < word.length()) {  
        backwards = backwards + backwards.charAt(counter);  
        counter++;  
    }  
    return backwards;  
}
```
- (d)

```
private String reverse(String word) {  
    String backwards = "";  
    int counter = 0;  
    while (counter < word.length()) {  
        backwards = backwards + backwards.charAt(counter);  
        counter++;  
    }  
    System.out.println(backwards);  
}
```

(e) None of the above

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ID.....

13. What is the output from the following code fragment?

```
int a = 5;
int b = 6;
int c = 7;
int d = 8;

if (a == b || c < d) {
    if (b > a && d < b) {
        System.out.print("A");
    } else {
        System.out.print("B");
    }
    if (a == b && c < d) {
        System.out.print("C");
    } else {
        System.out.print("D");
    }
} else {
    if (b > a && d > b) {
        System.out.print("E");
    } else {
        System.out.print("F");
    }
}
```

- (a) E
 - (b) AC
 - (c) BC
 - (d) B
 - ☒ (e) BD
14. Which of the following expressions is equivalent to the expression: $!(a < b)$

- (a) $(a == b) || (a < b)$
- (b) $(a != b) \&\& !(a < b)$
- ☒ (c) $(a == b) || (a > b)$
- (d) $(a == b) \&\& (a > b)$
- (e) $(a == b) \&\& (a < b)$

ID.....

15. What is the output of the following code?

```
String s = new String("Hello");
String t = new String("Hello");
if (s == t) {
    System.out.print(1);
} else {
    System.out.print(2);
}
if (s.equals(t)) {
    System.out.print(3);
} else {
    System.out.print(4);
}
```

Choose the correct output from the list below:

- (a) 13
- (b) 24
- (c) 14
- ☒ (d) 23
- (e) None of the above

ID.....

16. Complete the method called `shuffleLetters()` which takes a `String` as a parameter and returns a `String` containing the same letters, but arranged in a random order. If the method was called multiple times as shown below:

```
System.out.println(shuffleLetters("Andrew"));
System.out.println(shuffleLetters("Andrew"));
System.out.println(shuffleLetters("Andrew"));
System.out.println(shuffleLetters("Andrew"));
System.out.println(shuffleLetters("Andrew"));
```

then the output might be:

```
Adrenw
dAwern
newAdr
ndrAew
wArnde
```

The method should follow the algorithm:

- While there are still letters remaining in the original `String`
 - generate a random number between 0 and length of the `String`
 - get the character at the index specified by the random number
 - add the character to the shuffled `String`
 - remove the character from the original `String`

The method to remove a character at a given position is given below. You may call this method from your own code.

```
private String removeCharacter(String word, int index) {
    return word.substring(0, index) + word.substring(index + 1);
}
```

Complete the `shuffleLetters()` method below:

```
private String shuffleLetters( String original ) {
    String shuffledString = "";
    while(original.length() > 0) {

        int n = (int)(Math.random()*original.length());
        char chosenChar = original.charAt(n);
        shuffledString = shuffledString + chosenChar;
        original = removeCharacter(original, n);

    }
    return shuffledString;
}
```

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ID.....

(20 marks)

17. Write a method call `wordEnds()` which returns the first and last letters of a given `String`. If the `String` is empty, then the method should return an empty `String`. If the `String` contains a single letter, then the method should return that letter twice. Otherwise, the method should return the first letter of the given `String` concatenated to the last letter of the given `String`.

For example, calling the method as follows:

```
System.out.println(wordEnds("x"));
System.out.println(wordEnds(""));
System.out.println(wordEnds("hello"));
System.out.println(wordEnds("world"));
```

would result in the output:

xx

ho

wd

Write the method in the space below:

```
private String wordEnds( String word ) {
    if (word == null) {
        return null;
    }
    if (word.length == 0) {
        return "";
    }
    if (word.length == 1) {
        return word;
    }
    String firstLetter = "" + word.charAt(0);
    String lastLetter = "" + word.charAt(word.length() - 1);

    return firstLetter + lastLetter;
}
```

(20 marks)

ID.....

18. Below is the definition of the Pen class:

```
public class Pen{
    private String colour;
    private boolean hasEraser;
    private int tipType;
    public Pen(String colour, int tipType, boolean hasEraser){
        this.colour = colour.toUpperCase();
        this.tipType = tipType;
        this.hasEraser = hasEraser;
    }

    public void setHasEraser(boolean hasEraser){
        this.hasEraser = hasEraser;
    }

    public String getTipType(){
        if (tipType == 1)
            return "FINE TIP";
        return "MEDIUM TIP";
    }

    public double getPrice(){
        double price = 1.5;
        if (hasEraser)
            price = price + 0.5;
        return price;
    }

    public boolean isColour(String testColour){
        if ( colour.equals(testColour) )
            return true;
        return false;
    }

    public boolean equals(Pen other){
        if ( colour.equals(other.colour) &&
            hasEraser == other.hasEraser &&
            tipType == other.tipType)
            return true;
        return false;
    }

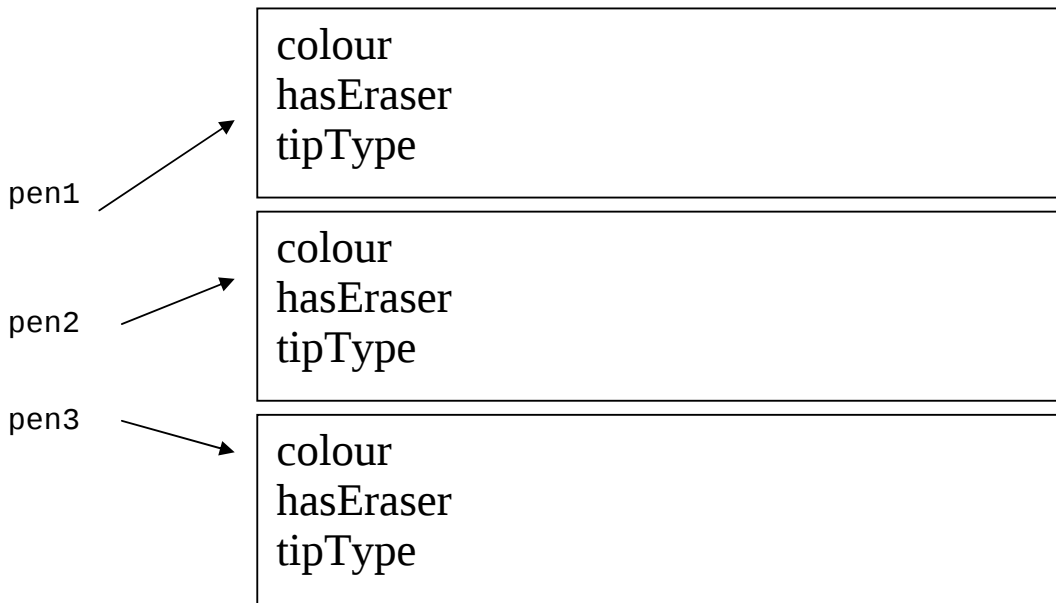
    public String toString(){
        String info = colour;
        if (tipType == 1)
            info += " FINE TIP PEN";
        else
            info += " MEDIUM TIP PEN";
        if (hasEraser)
            info += " WITH ERASER ";
        return info;
    }
}
```

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ID.....

}

In the space provided on the next page write the output when the following `start()` method below is executed. (Although no marks are allocated for completing the diagram correctly, you may find it helpful to use the diagram below -.)



```
public void start() {  
    Pen pen1, pen2, pen3;  
    pen1 = new Pen("Red", 1, true);  
    pen2 = new Pen("Green", 2, false);  
    pen3 = new Pen("GREEN", 2, true);  
    System.out.println("1 " + pen1.toString());  
    System.out.println("2 " + pen2.toString());  
  
    System.out.println("3 " + pen1.getTipType());  
    System.out.println("4 " + pen2.getTipType());  
  
    System.out.println("5 $" + pen2.getPrice());  
    pen1.setHasEraser(true);  
    pen2.setHasEraser(true);  
    System.out.println("6 $" + pen2.getPrice());  
  
    if ( pen1.isColour( "RED" ) )  
        System.out.println("7");  
    else  
        System.out.println("8");  
}
```

ID.....

```
if ( pen2.equals( pen3 ) )
    System.out.println("9");
else
    System.out.println("10");

System.out.println("11 " + pen1.toString());
System.out.println("12 " + pen2.toString());
}
```

1 RED FINE TIP PEN WITH ERASER
2 GREEN MEDIUM TIP PEN
3 FINE TIP PEN
4 MEDIUM TIP PEN
5 \$1.5
6 \$2.0
7
9
11 RED FINE TIP PEN WITH ERASER
12 GREEN FINE TIP PEN WITH ERASER

(10 marks)

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ID.....

19. What is the output when the `start()` method below is executed?

```
public void start(){
    String stars = "";
    int i = 65;
    while (i > 60 && i < 75) {
        System.out.println(stars + i + stars);
        stars = stars + "*";
        i = i + 2;
    }
}
```

```
65
*67*
**69**
***71***
****73****
```

(5 marks)

ID.....

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