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)**

ID.....

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`

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";`

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;
```

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;
}
```

(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`

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

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)`

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`

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









     }
     return shuffledString;
}
```

(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                wordEnds(                    ) {









}
```

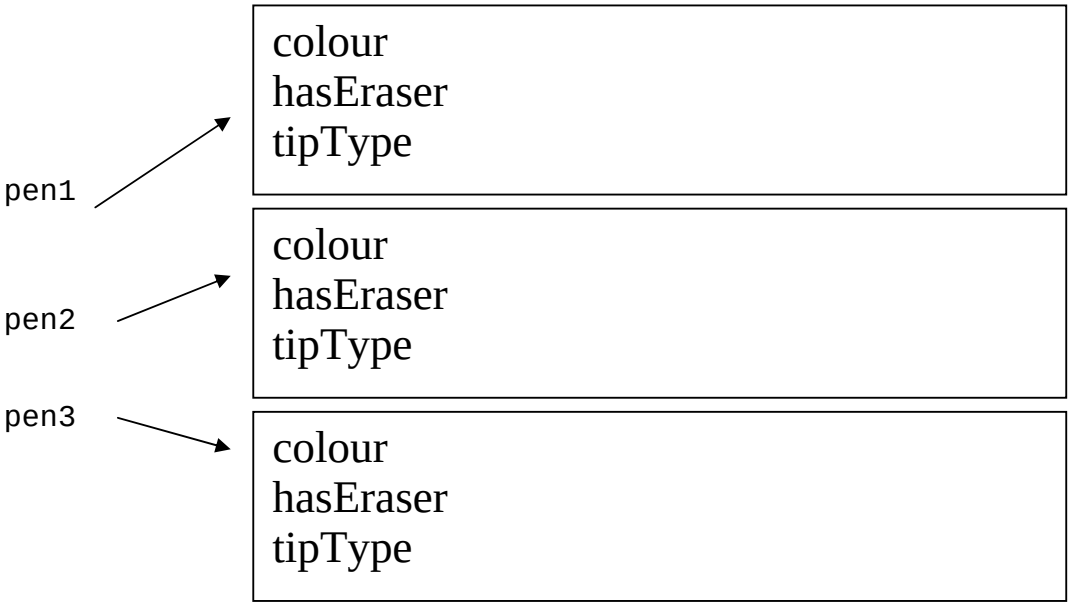
(20 marks)

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;
     }
```

```
}
```

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");
```

```
     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());
}
```

(10 marks)

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;
    }
}
```

(5 marks)

ID.....

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