Birkbeck
(University of London)
Software and Programming 1
In-class Test 1
4 Feb 2015

Student Name
Student Number

Answer all questions

1. Consider a set of Java statements:
   ```java
   int d = 3 * 4;
   d = -3 + d + d / 4;
   d = 72 / d + d / 2;
   ```
   What is the value of d after these statements are executed? (3 marks)

   Answer:
   Working:

2. Given a String colour, write an expression of type boolean, which is evaluated to true if the length of colour is either 7 or 4 and to false otherwise. (5 marks)

   Answer:
3. What is the default value for local variables?
   (a) null
   (b) 0
   (c) depends on the datatype
   (d) no default value for local variables

Answer:

4. Identify seven compile-time errors in the following Java code:

   public class test2 {
       public static int main(String args) {
           String s;
           String t = "tom";
           integer len = s.length();
           s = "tomato";
           s = s.substring(0,3);
           if (s = t) {
               System.out.println("result: " + (s == t));
               String args = s + "/" + len;
               System.out.println(args);
           }
       return "1";
   }
   }

How would you correct the errors you have found?

Answer:
5. Which of the following are valid Java identifiers (i.e., names of variables or methods)?

(a) DOUBLE
(b) constructor
(c) long
(d) 1stName
(e) big_int

(5 marks)

Answer:

6. Implement a method to determine the type of a radio station depending on its broadcast frequency:

- long wave AM 30 – 300 kHz,
- medium-wave AM 300 kHz – 3 MHz,
- short-wave AM 3 – 30 MHz,
- FM 30 – 300 MHz.

The method should take one argument of type int, the frequency in kHz, and return the type of the radio station, of type String.

(Remember that 1 kHz = 1000 Hz and 1 MHz = 1000 kHz.)

(10 marks)

Answer:
7. What is printed as a result of executing the following fragment of code?

```java
int v = 1;
while (v < 20) {
    v = v * 2;
    System.out.println(v - 1);
}
```

Answer:

Working:

8. Implement a method that returns true if its argument of type String is a valid colour reference in HTML (see the definition below); otherwise, the method should return false. A colour reference is a string that consists of '#' followed by 6 hexadecimal digits. Assume that there is a method

```java
public static boolean isHexadecimal(char ch) {
    // Method implementation
}
```

that returns true if ch is a hexadecimal digit ('0'–'9', 'a'–'f').

Answer:
9. What is the type and the value of the following expression
   \[ s.length() + b * 3.0 > 7 \&\& s.length() + b / 2 < 3 \]
   if \( s \) is "10" and \( b \) is 2. 
   \( (3 \text{ marks}) \)

   **Answer:**

10. Transform the following for loop into a while loop and explain its action.

```java
int n = 173;
String s = "";
for (int p = 256; p > 0; p = p / 2) {
    if (n / p == 0)
        s = s + "0";
    else
        s = s + "1";
    n = n % p;
}
System.out.println("result: "+s); 
(20 marks)
```

   **Answer:**
11. (a) Implement a method `sumOfDivisors` that takes a positive integer \( n \) and returns the sum of all its positive divisors excluding the number itself: for example, if \( n \) is 5 then the method returns 1; if \( n \) is 10 then the method returns 8 (= 1+2+5).

(b) Implement a method that takes a positive integer \( N \) and prints out all perfect numbers not exceeding \( N \).
A number is perfect if it is equal to the sum of its proper positive divisors (that is, to the sum of all positive divisors excluding the number itself).

*Hint:* use `sumOfDivisors` to check whether a number is perfect. (22 marks)

**Answer:**