

Birkbeck
(University of London)
Software and Programming 1
In-class Test 1.2
13 Feb 2020

Student Name _____
Student Number _____

Answer all questions

1. Consider the following sequence of Java statements:

```
int i = 2;  
int k = 11 % i;  
i = -i + 20 * -k + i * k * 21;  
k = 42 / i + i * 2;
```

What is the value of k after these statements are executed? Show your workings. (7 marks)

Answer: 42

Workings: (a) $k = 1$

(b) $i = -2 + 20 * (-1) + 2 * 1 * 21 = 20$

(c) $k = 42 / 20 + 20 * 2 = 42$

2. Given variables `speed` of type `int` and `direction` of type `String`, write an expression of type `boolean`, which is evaluated to `true` if the speed is below 20 and `direction` is "S", "SE" or "SW", and to `false` otherwise. (7 marks)

Answer: `speed < 20 && (direction.equals("S") || direction.equals("SE") || direction.equals("SW"))`

sp1-02-20.pdf / p. 22 and p. 26

note that the brackets around `||` with arguments are required — see sp1-03-20.pdf / p. 27

3. How many iterations do the following loops carry out? Assume that `i` is not changed in the loop body.

(a) `for (int i = 0; i <= 100; i += 4) ...`

(b) `for (int i = 100; i > 0; i -= 3) ...`

(4 marks)

Answer: (a) 26 (b) 34

4. Which of the following are valid Java identifiers (i.e., possible names of variables/methods)? Note that `0` is a digit (zero) and `O` is a letter.

(a) `scanner`

(b) `until`

(c) `Int`

(d) `type`

(e) `main`

(f) `0x00`

(g) `x00`

(7 marks)

Answer: (a), (b), (c), (d), (e), (f), (g) sp1-01-20.pdf / p. 21

5. Identify and explain five compile-time errors in the following Java code:

```
1 import java.util.Scanner;
2 public class foo_bar {
3     public static int main(String[] args) {
4         double sum = 0;
5         Scanner s = new Scanner(System.in);
6         boolean done = False;
7         while (not done) {
8             System.out.println("Input a number: ");
9             double num = s.nextDouble();
10            int count = 0;
11            if (num != 0)
12                sum += num;
13                count++;
14            }
15            else
16                done = true;
17        }
18        System.out.println("Average: " + sum / count);
19    }
20 }
```

How would you correct the errors you have found (with as few changes as possible)?

(10 marks)

Answer:

line 3: replace the return type with void (or insert, e.g., return 0; below line 18)

line 6: replace False with false

line 7: replace not with !

line 10: move the declaration to line 5

line 11: { is missing

6. Implement a method `getState` to determine whether water is liquid, solid (ice) or gaseous at the sea level given the temperature value and the string "C" for Celsius and "F" for Fahrenheit. The method should take one argument of type `double` and one argument of type `String` and return a `String` according to the following table:

Celsius	Fahrenheit	
below 0	below 32	solid
0–100	32–212	liquid
above 100	above 212	gaseous

If the second argument is different from "C" and "F", then the method should return the empty `String`.

(15 marks)

Answer:

```
public static String getState(double t, String s) {
    if (s.equals("C")) {
        if (t < 0)
            return "solid";
        if (t < 100)
            return "liquid";
        return "gaseous";
    }
    if (s.equals("F")) {
        if (t < 32)
            return "solid";
        if (t < 212)
            return "liquid";
        return "gaseous";
    }
    return "";
}

public static String getState2(double t, String s) {
    if (!s.equals("C") && !s.equals("F"))
        return "";
    if (s.equals("C") && t < 0 || s.equals("F") && t < 32)
        return "solid";
    if (s.equals("C") && t < 100 || s.equals("F") && t < 212)
        return "liquid";
    return "gaseous";
}
```

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

```
int i = 2;
int k = i + 7;
while (k < 18) {
    i = i + 2;
    System.out.println(k - 7);
    k = i + 7;
}
```

Show your workings.

(10 marks)

Answer: 2
4
6
8
10

Workings:

i	k	k < 18	new i	printout k - 7	new k
2	9	true	4	2	11
4	11	true	6	4	13
6	13	true	8	6	15
8	15	true	10	8	17
10	17	true	12	10	19
12	19	false			

8. What are the type and the value of the following expression

```
scale.equals("C") && t * 9 / 5.0 + 32 > 212 ||
scale.equals("F") && t > 212 ? "steam" : "no steam"
```

with the following declarations: String scale = "F"; int t = 200;? (5 marks)

Answer:

String and "no steam" (because the first argument of the first logical AND is false, the first argument of the second logical AND is true, but t > 212 is false — see sp1-03-20.pdf / p. 27 on operation precedence)

9. Implement a method that returns true if its argument of type `int[]` (array of integers) is a sequence of numbers 0, 1 and 3 that contains at least one occurrence of 0. For example, it should return false on {1, -1, 1}, {1, 2}, {}, {1, 0, 2}, and {3, 1}, but true on {1, 0, 3} and {0}. (15 marks)

Answer:

```
public static boolean match(int[] s) {
    boolean found0 = false;
    for (int i = 0; i < s.length; i++) {
        if (s[i] == 0)
            found0 = true;
        if (s[i] != 0 && s[i] != 1 && s[i] != 3)
            return false;
    }
    return found0;
}

public static boolean match2(int[] s) {
    boolean found0 = false;
    for (int e : s) {
        if (e == 0)
            found0 = true;
        if (e != 0 && e != 1 && e != 3)
            return false;
    }
    return found0;
}
```

10. (a) Transform the for loop in the following fragment of code into a while loop.

```
int points = 0;
for (int d = 0; d < g.length/2; d++)
    if (g[d*2 + 1] > g[d*2])
        points += 3;
    else if (g[d*2 + 1] < g[d*2])
        points += 1;
System.out.println("points: " + points);
```

(b) Suppose that `g` is declared as follows: `int[] g = { 0, 2, 3, 1, 1, 1 };`. What is printed out as a result of executing this fragment of code? Show your workings. (20 marks)

Answer:

(a)

```
int points = 0;
int d = 0; // first argument of the for loop
while (d < g.length/2) { // second argument of the for loop turns into
    if (g[d*2 + 1] > g[d*2])
        points += 3;
    else if (g[d*2 + 1] < g[d*2])
        points += 1;
    d++; // do not forget the third argument of the for loop
} // and curly brackets
System.out.println("points: " + points);
```

(b) The output is: `points: 4`