

Birkbeck
(University of London)
Software and Programming 1
In-class Test 1.1
14 Feb 2019

Student Name _____
Student Number _____

Answer all questions

1. Consider the following sequence of Java statements:

```
int p = 10;  
int q = 43 % p;  
p = 16 + p / q * 2 - q * 2;  
q = 32 / p - p * 2;
```

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

Answer: -30

Workings: (a) $q = 3$

(b) $p = 16 + 10 / 3 * 2 - 3 * 2 = 16$

(c) $q = 32 / 16 - 16 * 2 = -30$

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 between 14 and 23 (inclusive) and `direction` is either "SW" or "W", and to `false` otherwise. (7 marks)

Answer: `speed >= 14 && speed <= 23`
`&& (direction.equals("SW") || direction.equals("W"))`

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 = 100; i > 0; i--) ...`

(b) `for (int i = -100; i <= 100; i += 2) ...`

(4 marks)

Answer: (a) 100 (b) 101

4. Which of the following are valid Java identifiers (i.e., possible names of variables/methods)?

- (a) `DOUBLE`
- (b) `for_each`
- (c) `length`
- (d) `007`
- (e) `var`
- (f) `byte`
- (g) `return`

(7 marks)

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

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

```
public Class foo.bar {
    public static int print_intervals(int[] starts, int[] ends) {
        int min = starts[0], max = ends[0];
        for (int i = 1; i < starts.length(); i++) {
            if (ends[i] > max + 1, starts[i] > max + 1) {
                System.out.println("new interval: " + min + ", " + max);
                min = starts[i];
            }
            max = max > ends[i] ? (max : ends[i]);
        }
    }
}
```

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

(10 marks)

Answer:

```
public class foo.bar { // Class -> class
    public static void print_intervals(int[] starts, int[] ends) {
        // return type
        int min = starts[0], max = ends[0];
        for (int i = 1; i < starts.length; i++) { // no brackets
            if (ends[i] > max + 1 && starts[i] > max + 1) { // , -> &&
                System.out.println("new interval: " + min + ", " + max);
                min = starts[i];
            }
            max = max > ends[i] ? max : ends[i]; // no brackets
        }
    }
}
```

6. Implement a method `getWindDirection` to determine the cardinal direction of the wind given the azimuth degrees. The method should take one argument of type `int`, the azimuth, and return a `String`, the cardinal direction, according to the following table:

0–44	North
45–134	East
135–224	South
225–314	West
315–359	North

If the argument is not covered by the table, the method should return the empty `String`.

(10 marks)

Answer:

```
public static String getWindDirection(int azimuth) {
    if (azimuth < 0)
        return "";
    if (azimuth < 45)
        return "North";
    if (azimuth < 135)
        return "East";
    if (azimuth < 225)
        return "South";
    if (azimuth < 315)
        return "West";
    if (azimuth < 360)
        return "North";
    return "";
}
// alternatively
public static String getWindDirection(int azimuth) {
    if (azimuth >= 0 && azimuth <= 44)
        return "North";
    if (azimuth >= 45 && azimuth <= 134)
        return "East";
    if (azimuth >= 135 && azimuth <= 224)
        return "South";
    if (azimuth >= 225 && azimuth <= 314)
        return "West";
    if (azimuth >= 315 && azimuth <= 359)
        return "North";
    return "";
}
```

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

```
int i = 2;
int k = i + 1;
while (k < 14) {
    i = i + 2;
    System.out.println(k - 3);
    k = i + 3;
}
```

Show your workings.

(10 marks)

Answer: 0
4
6
8
10

Workings:

i	k	k < 14	new i	printout k - 3	new k
2	3	true	4	0	7
4	7	true	6	4	9
6	9	true	8	6	11
8	11	true	10	8	13
10	13	true	12	10	15
12	15	false			

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

```
type.equals("iPhone") && v >= 6 ||
type.equals("Mac") && v / 100.0 >= 10.9 ? "iMessage" : "none"
```

with the following declarations: String type = "Mac"; int v = 1080;? (5 marks)

Answer:

String and "none" (because the first argument of the first logical AND and the second argument of the second logical AND are both false — see sp1-03-20.pdf / p. 27 on operation precedence)

9. Implement a method that returns true if its argument of type String is a sequence of letters W, L and D that contains at least one occurrence of L. For example, it should return false on "WXL", "T", "" and "WWW", but true on "WLD" and "WLLLD". (20 marks)

Answer:

```
public static boolean match(String s) {
    boolean foundL = false;
    for (int i = 0; i < s.length(); i++) {
        char c = s.charAt(i);
        if (c == 'L')
            foundL = true;
        if (c != 'L' && c != 'W' && c != 'D')
            return false;
    }
    return foundL;
}
```

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

```
String r = "";
for (int c = 0; c < s.length; c += 2)
    if (s[c + 1] > s[c])
        r += "W";
    else if (s[c + 1] < s[c])
        r += "L";
    else
        r += "D";
System.out.println("result: " + r);
```

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

(c) Explain the action of this fragment of code (for an array `s` of integers of even length).

(20 marks)

Answer:

```
(a) String r = "";
int c = 0; // first argument of the for loop
while (c < s.length) { // second argument of the for loop turns into
    // the while condition
    if (s[c + 1] > s[c])
        r += "W";
    else if (s[c + 1] < s[c])
        r += "L";
    else
        r += "D";
    c += 2; // do not forget the third argument of the for loop
    // and the curly brackets
}
System.out.println("result: " + r);
```

(b) The output is: `result: WLD`

(c) For each pair of consecutive elements, the program prints `W` if the second element is greater than the first, `L` if the second element is less than the first, and `D` if they are equal.