# Java Software Development Exercise 1

1. Consider the following program:

```
class StrEqual {
  public static void main(String[] args) {
    String s1 = "hi";
    String s2 = new String("hi");
    String s3 = "hi";
    if (s1 == s2) {
      System.out.println("s1 and s2 equal");
    } else {
      System.out.println("s1 and s2 not equal");
    }
    if (s1 == s3) {
      System.out.println("s1 and s3 equal");
    } else {
      System.out.println("s1 and s3 not equal");
    }
  }
}
```

Which one of the following options provides the output of this program when executed?

(A) s1 and s2 equal
s1 and s3 equal

(B) s1 and s2 equal
s1 and s3 not equal

(C) s1 and s2 not equal s1 and s3 equal

(D) s1 and s2 not equal s1 and s3 not equal

2. Which of the following is not a legal identifier? Select the one correct answer.

(A) a2z
(B) ödipus
(C) 52pickup
(D) _class
(E) ca$h

3. Which of the following are reserved keywords? Select the three correct answers.

(A) public
(B) static
(C) void
(D) main
(E) String
(F) args

4. Given the following declaration:

```
char c = 'A';
```

What is the simplest way to convert the character value in `c` into an `int`?
Select the one correct answer.

(A) `int i = c;`
(B) `int i = (int) c;`
(C) `int i = Character.getNumericValue(c);`

5. Which of the following expressions will be evaluated using floating-point arithmetic? Select the three correct answers.

(A) `2.0 * 3.0`
(B) `2 * 3`

(C) `2/3 + 5/7`
(D) `2.4 + 1.6`
(E) `0x10 * 1L * 300.0`

6. What is the value of evaluating the following expression `(- -1-3 * 10 / 5-1)`? Select the one correct answer.
(A) –8
(B) –6
(C) 7
(D) 8
(E) 10
(F) None of the above.

7. Which statements are true? Select the three correct answers.
(A) The expression `(1 + 2 + "3")` evaluates to the string `"33"`.
(B) The expression `("1" + 2 + 3)` evaluates to the string `"15"`.
(C) The expression `(4 + 1.0f)` evaluates to the float value `5.0f`.
(D) The expression `(10/9)` evaluates to the int value `1`.
(E) The expression `('a' + 1)` evaluates to the char value `'b'`.

8. Which of the following expressions evaluate to true? Select the two correct answers.
(A) `(false | true)`
(B) `(null != null)`
(C) `(4 <= 4)`
(D) `(!true)`
(E) `(true & false)`

9. Which statements are true about the output from the following program?

```
public class Logic {
  public static void main(String[] args) {
    int i = 0;
    int j = 0;
    boolean t = true;
    boolean r;
    r = (t &  0 < (i+=1));
    r = (t && 0 < (i+=2));
    r = (t |  0 < (j+=1));
    r = (t || 0 < (j+=2));
    System.out.println(i + " " + j);
  }
}
```

Select the two correct answers.
(A) The first digit printed is 1.
(B) The first digit printed is 2.
(C) The first digit printed is 3.
(D) The second digit printed is 1.
(E) The second digit printed is 2.
(F) The second digit printed is 3.

10. What will be the result of attempting to compile and run the following class?

```
public class IfTest {
  public static void main(String[] args) {
    if (true)
      if (false)
        System.out.println("a");
      else
        System.out.println("b");
  }
```

```
}
```
Select the one correct answer.
(A) The code will fail to compile because the syntax of the if statement is incorrect.
(B) The code will fail to compile because the compiler will not be able to determine which if statement the else clause belongs to.
(C) The code will compile correctly and display the letter a, when run.
(D) The code will compile correctly and display the letter b, when run.
(E) The code will compile correctly, but will not display any output.

11. Which statements are true? Select the three correct answers.
(A) The conditional expression in an if statement can have method calls.
(B) If `a` and `b` are of type `boolean`, the expression `(a = b)` can be the conditional expression of an if statement.
(C) An if statement can have either an if clause or an else clause.
(D) The statement `if (false) ; else ;` is illegal.
(E) Only expressions which evaluate to a boolean value can be used as the condition in an if statement.

12. What will be the result of attempting to compile and run the following program?
```
public class Switching {
  public static void main(String[] args) {
    final int iLoc = 3;
    switch (6) {
      case 1:
      case iLoc:
      case 2 * iLoc:
        System.out.println("I am not OK.");
      default:
        System.out.println("You are OK.");
      case 4:
        System.out.println("It's OK.");
    }
  }
}
```
Select the one correct answer.
(A) The code will fail to compile because of the case label value `2 * iLoc`.
(B) The code will fail to compile because the default label is not specified last in the switch statement.
(C) The code will compile correctly and will only print the following, when run:
```
I am not OK.
You are OK.
It's OK.
```
(D) The code will compile correctly and will only print the following, when run:
```
You are OK.
It's OK.
```
(E) The code will compile correctly and will only print the following, when run:
```
It's OK.
```

13. What will be the output when running the following program?
```
public class MyClass {
  public static void main(String[] args) {
    int i=0;
    int j;
    for (j=0; j<10; ++j) { i++; }
    System.out.println(i + " " + j);
  }
}
```
Select the two correct answers.
(A) The first number printed will be 9.
(B) The first number printed will be 10.

(C) The first number printed will be 11.
(D) The second number printed will be 9.
(E) The second number printed will be 10.
(F) The second number printed will be 11.

14. Which one of these for statements is valid? Select the one correct answer.
(A) `int j=10; for (int i=0, j+=90; i<j; i++) { j--; }`
(B) `for (int i=10; i=0; i--) {}`
(C) `for (int i=0, j=100; i<j; i++, --j) {;}`
(D) `int i, j; for (j=100; i<j; j--) { i += 2; }`
(E) `int i=100; for ((i>0); i--) {}`

15. Given the following code, which statement is true?
```
class MyClass {
  public static void main(String[] args) {
    int k=0;
    int l=0;
    for (int i=0; i <= 3; i++) {
      k++;
      if (i == 2) break;
      l++;
    }
    System.out.println(k + ", " + l);
  }
}
```
Select the one correct answer.
(A) The program will fail to compile.
(B) The program will print 3, 3, when run.
(C) The program will print 4, 3, when run, if break is replaced by continue.
(D) The program will fail to compile if break is replaced by return.
(E) The program will fail to compile if break is by an empty statement.

16. Which expression will evaluate to true? Select the one correct answer.
(A) `"hello: there!".equals("hello there")`
(B) `"HELLO THERE".equals("hello there")`
(C) `("hello".concat("there")).equals("hello there")`
(D) `"Hello There".compareTo("hello there") == 0`
(E) `"Hello there".toLowerCase().equals("hello there")`

17. What will the following program print when run?
```
public class Search {
  public static void main(String[] args) {
    String s = "Contentment!";
    int middle = s.length() / 2;
    String nt = s.substring(middle - 1, middle + 1);
    System.out.println(s.lastIndexOf(nt, middle));
  }
}
```
Select the one correct answer.
(A) 2
(B) 4
(C) 5
(D) 7
(E) 9
(F) 11

18. What will the following program print when run?
```
public class Uppity {
```

```
  public static void main(String[] args) {
    String str1 = "lower", str2 = "LOWER", str3 = "UPPER";
    str1.toUpperCase();
    str1.replace("LOWER","UPPER");
    System.out.println((str1.equals(str2)) + " " + (str1.equals(str3)));
  }
}
```

Select the one correct answer.

(A) The program will print false true.
(B) The program will print false false.
(C) The program will print true false.
(D) The program will print true true.
(E) The program will fail to compile.
(F) The program will compile, but throw an exception at runtime.

# Answer

1. (C)

2. (C)
   52pickup is not a legal identifier. The first character of an identifier cannot be a digit.

3. (A), (B), and (C)
   Neither main, String, nor args are reserved keywords, but they are legal identifiers. In the declaration `public static void main(String[] args)`, the identifier main denotes the method that is the entry point of a program. In all other contexts, the identifier main has no predefined meaning.

4. (A)
   A value of type `char` can be assigned to a variable of type `int`. An widening conversion will convert the value to an `int`.

5. (A), (D), and (E)
   A binary expression with any floating-point operand will be evaluated using floating-point arithmetic. Expressions such as 2/3, where both operands are integers, will use integer arithmetic and evaluate to an integer value. In (E), the result of (0x10 * 1L) is promoted to a floating-point value.

6. (B)
   The expression evaluates to –6. The whole expression is evaluated as `(((-(-1)) - ((3 * 10) / 5)) - 1)` according to the precedence and associativity rules.

7. (A), (C), and (D)
   The left associativity of the + operator makes the evaluation of `(1 + 2 + "3")` proceed as follows: `(1 + 2) + "3"` to `3 + "3"` to `"33"`. Evaluation of the expression `("1"+ 2 + 3)`, however, will proceed as follows: `("1" + 2) + 3` to `"12" + 3` to `"123"`. `(4 +1.0f)` evaluates as `4.0f + 1.0f` to `5.0f` and `(10/9)` performs integer division, resulting in the value 1. The operand `'a'` in the expression `('a' + 1)` will be promoted to `int`, and the resulting value will be of type `int`.

8. (A) and (C)
   The expression `(4 <= 4)` is true. The null literal can be compared, so `(null != null)` yields false.

9. (C) and (D)
   Unlike the `&` and `|` operators, the `&&` and `||` operators short-circuit the evaluation of their operands if the result of the operation can be determined from the value of the first operand. The second operand of the `||` operator in the program is never evaluated because of short-circuiting. All the operands of the other operators are evaluated. Variable `i` ends up with the value 3, which is the first digit printed, and `j` ends up with the value 1, which is the second digit printed.

10. (D)
    The program will display the letter b when run. The second if statement is evaluated since the boolean expression of the first if statement is true. The else clause belongs to the second if statement. Since the boolean expression of the second if statement is false, the if block is skipped and the else clause is executed.

11. (A), (B), and (E)
    The conditional expression of an if statement can have any subexpressions, including method calls, as long as the whole expression evaluates to a value of type boolean. The expression `(a = b)` does not compare the variables `a` and `b`, but assigns the value of `b` to the variable `a`. The result of the expression is the value being assigned. Since `a` and `b` are boolean variables, the value returned by the expression is also boolean. This allows the expression to be used as the condition for an if statement. An if statement must always have an if block, but the else clause is optional. The expression `if (false) ; else ;` is legal. In this case, both the if block and the else block are simply the empty statement.

12. (C)
The case label value `2 * iLoc` is a constant expression whose value is 6, the same as the switch expression. Fall through results in the printout shown in (C).

13. (B) and (E)
Both the first and the second number printed will be 10. Both the loop body and the increment expression will be executed exactly 10 times. Each execution of the loop body will be directly followed by an execution of the increment expression. Afterwards, the condition j<10 is evaluated to see whether the loop body should be executed again.

14. (C)
Only (C) contains a valid for loop. The initializer in a `for` statement can contain either declarations or a list of expression statements, but not both as attempted in (A). The loop condition must be of type `boolean`. (B) tries to use an assignment of an `int` value (notice the use of = rather than ==) as a loop condition and is, therefore, not valid. The loop condition in the for loop (D) tries to use the uninitialized variable `i`, and the `for` loop in (E) is syntactically invalid, as there is only one semicolon.

15. (C)
As it stands, the program will compile correctly and will print `"3, 2"` when run. If the `break` statement is replaced with a `continue` statement, the loop will perform all four iterations and will print `"4, 3"`. If the `break` statement is replaced with a `return` statement, the whole method will end when `i` equals 2, before anything is printed. If the `break` statement is simply removed, leaving the empty statement (`;`), the loop will complete all four iterations and will print `"4, 4"`.

16. (E)
The expression `"Hello there".toLowerCase().equals("hello there")` will evaluate to true. The `equals()` method in the `String` class will only return true if the two strings have the same sequence of characters.

17. (C)
The variable `middle` is assigned the value 6. The variable `nt` is assigned the string `"nt"`. The substring `"nt"` occurs three times in the string `"Contentment!"`, starting at indices 2, 5, and 9. The call `s.lastIndexOf(nt, middle)` returns the start index of the last occurrence of `"nt"`, searching backwards from position 6.

18. (B)
The reference value in the reference `str1` never changes and it refers to the string literal `"lower"` all the time. The calls to `toUpperCase()` and `replace()` return a new String object whose reference value is ignored.