Tutorial 3

**True/False**

1. An example of a logical (Boolean) expression is an arithmetic expression followed by a relational operator followed by an arithmetic expression.

2. Boolean variables cannot store the result of a comparison of two variables.

3. The only logical expressions that can be assigned to boolean variables are the literal values true and false.

4. If ch1 contains the value 'C' and ch2 contains the value 'c', the value of the expression ch1 <= ch2 is true.

5. If ch1 contains the value 'C' and ch2 is a char variable then the assign expression ch2 = 'ch1' is valid.

6. If P and Q are logical expressions, the expression P AND Q is true if P is true or Q is true.

7. The expression ! (n < 5) is equivalent to the expression n >= 5.

8. To test whether someInt equals 25 or 30, the expression someInt == 25 || 30 has the correct semantics but produces a syntax (compile-time) error.

9. The expression ! (x <= y || s > t) is equivalent to ((x <= y) && (s > t))

10. The statement
    
    ```java
    if (grade == 'A' || grade == 'B' || grade == 'C')
        System.out.println("Fail");
    else System.out.println("Pass");
    ```
    prints Pass if grade is 'A', 'B', or 'C' and prints Fail otherwise.

11. An if statement begins with
    
    ```java
    if (age = 30)
    ```
    the if condition is an assignment expression, not a relational expression.

12. The code segment
    
    ```java
    if (speed <= 60)
        System.out.println("Too slow");
    if (speed > 60 && speed <= 100)
        System.out.println("Good speed");
    if (speed > 100)
        System.out.println("Too fast");
    ```
    could be written equivalently as
    
    ```java
    if (speed <= 60)
    ```
System.out.println("Too slow");
else if (speed <= 100)
    System.out.println("Good speed");
else
    System.out.println("Too fast");

13. If the code fragment

    if (a>= 10)
        if (a< 20)
            a = a + 2;
        else
            a = a + 1;
    is indented according to the manner in which it is executed, the correct indentation is

    if ( a >= 10)
        if (a < 20)
            a = a + 2;
        else
            a = a + 1;

Multiple Choice

14. Which of the following does not constitute a logical (Boolean) expression?
   a. an arithmetic expression followed by a relational operator followed by an arithmetic expression
   b. an arithmetic expression followed by a logical operator followed by an arithmetic expression
   c. a Boolean variable or constant
   d. a logical expression followed by a binary logical operator followed by a logical expression
   e. a unary logical operator followed by a logical expression

15. Which of the following is not a relational operator?
   a. ==
   b. <
   c. !=
   d. &&
   e. >=

16. If p is a Boolean variable, which of the following logical expressions always has the value FALSE?
   a. p && p
   b. p || p
   c. p && !p
   d. p || !p
   e. b and d above

17. To negate the expression  \((i < j) \&\& (k == 1)\)
    the result is:
   a.  \((i < j) || (k == 1)\)
   b.  \((i > j) \&\& (k != 1)\)
   c.  \((i > = j) || (k != 1)\)
   d.  \((i > j) || (k != 1)\)
   e.  \((i > = j) \&\& (k != 1)\)
18. Given a Boolean variable isEmpty, which of the following is a valid assignment statement?
   a. isEmpty = true;
   b. isEmpty = !isEmpty;
   c. isEmpty = m > n;
   d. a and b above
   e. a, b, and c above

19. Which logical operator (op) is defined by the following table? (T and F denote TRUE and FALSE.)

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>p op q</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
</tr>
<tr>
<td>T</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>F</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
</tbody>
</table>

   a. NOT
   b. AND
   c. OR
   d. none of the above

20. Which logical expression correctly determines whether the value of beta lies between 0 and 100?
   a. 0 < beta < 100
   b. 0 < beta && beta < 100
   c. (0 < beta) && (beta < 100)
   d. b and c above
   e. a, b, and c above

21. If the int variables i, j, and k contain the values 10, 3, and 20, respectively, what is the value of the following logical expression:

   j < 4 || j == 5 && i <= k

   a. 3
   b. false
   c. 20
   d. true

22. After execution of the following code, what will be the value of angle if the input value is 10?

   angle = in.nextInt();
   if (angle> 5)
      angle = angle + 5;
   else if (angle> 2)
      angle = angle + 10;

   a. 0
   b. 5
   c. 10
   d. 15
   e. 25

23. After execution of the following code, what will be the value of angle if the input value is 0?

   angle = in.nextInt();
if (angle > 5)  
    angle = angle + 5;
else if (angle > 2)  
    angle = angle + 10;
else  
    angle = angle + 15;

a. 0  
b. 5  
c. 10  
d. 15  
e. 25

24. What is the output of the following code fragment?

```java
int1 = 120;
int2 = in.nextInt();  // Assume user types 30
if ((int1 > 100) && (int2 = 50))  
    int3 = int1 + int2;
else int3 = int1 - int2;
System.out.println(int1 + " " + int2 + " " + int3);
```

a. 120 30 150  
b. 120 30 90  
c. 120 50 170  
d. 120 50 70  
e. 120 30 70

25. Consider the following If statement, which is syntactically correct but uses poor style and indentation:

```java
if (x >= y) if (y > 0) x = x * y; else if (y < 4) x = x - y;
```

Assume that x and y are int variables containing the values 9 and 3, respectively, before execution of the above statement. After execution of the statement, what value will x contain?

a. 9  
b. 1  
c. 6  
d. 27  
e. none of the above

26. What is the output of the following code fragment if the input value is 20?

```java
Soment = in.nextInt();
if (soment > 30)  
    System.out.println("Majed ");
    System.out.println("Ahmed ");
System.out.println("Abdullah");
```

a. Majed  
b. Majed Ahmed  
c. Majed Ahmed Abdullah  
d. no output; there is a compile-time error  
e. no output; there is a run-time error

27. Assuming alpha and beta are int variables, what is the output of the following code (which is indented poorly)?
alpha = 3;
beta = 2;
if (alpha < 2)
if (beta == 3)
cout « "Hello";
else cout « "There";

a. Nothing is output.
b. Hello
c. There
d. HelloThere

28. 34. What does the following statement print? (All variables are of type int.)
if (j < k)
    if (k < j)
        System.out.println(1);
    else
        System.out.println(2);
else if (j < k)
    System.out.println(3);
else
    System.out.println(4);

a. It prints nothing unless j equals k.
b. It always prints 4.
c. It prints 2 if j equals k and 4 otherwise.
d. It prints 2 if j < k and 1 if k <= j.
e. It prints 2 if j < k and 4 otherwise.

Fill-in

29. A(n) ........................................expression is an expression composed of logical 
   (Boolean) values and operations.
30. The operators <, ==, >=, and != are examples of ................................. operators.
31. In programming languages that use ........................................evaluation of a logical 
    expression, evaluation proceeds in left-to-right order and stops as soon as the final truth 
    value can be determined.
32. The operators &&, ||, and ! are known as .................................operators.
33. In programming languages that use ........................................evaluation of a logical 
    expression, all subexpressions are evaluated before applying any logical operators.
34. Write a logical expression that is TRUE if the variable testScore is greater than or equal to 
    90 and less than or equal to 100: .................................
35. Write a logical expression that is false if either x or y is equal to 5:
    .................................