Lecture 9: Conditionals Worksheet Solutions

1) What is the value returned by the following expressions?

\[(2 + 5) \times (6 - 4) \quad 14 \]  
\[2 + 5 \times 8 \quad 42 \]  
\[\max(1/2, \min(-1*3, 1-3)) \quad 0.5 \]  
\[9 / 3 > 1 + 2 \quad \text{false} \]  
\[0.5 \neq -0.5 \quad \text{true} \]  
\['h' == 'H' \quad \text{false} \]

2) What is the data type of the value returned by the following expressions? Assume the variables \(x\) and \(y\) are defined as float. Check the Processing Reference (online) for functions that you don’t know.

\[\sqrt{x} \quad \text{float} \]  
\[\text{abs}(x) \neq \text{sq}(y) \quad \text{boolean} \]  
\[!\text{false} \quad \text{boolean} \]  
\[\text{floor}(0.1 \times y) \quad \text{int} \]

3) The modulus operator \((x \% y)\) returns the remainder of \(x\) divided by \(y\). What value is returned by the following expressions?

\[0 \% 3 \quad 0 \]  
\[6 \% 3 \quad 0 \]  
\[-2 \% 3 \quad -2 \]  
\[2 \% 3 \quad 2 \]  
\[8 \% 3 \quad 2 \]  
\[-4 \% 3 \quad -1 \]  
\[4 \% 3 \quad 1 \]  
\[10 \% 3 \quad 1 \]  
\[-6 \% 3 \quad 0 \]

4) Type the following into Processing and press Play. Explain what you see.

```java
void draw() {
    background(0, frameCount \% 255, 0);
}
```

The frame count increments the green component of the background by 1 each time `draw()` is run (every 1/60 sec), but the modulus cycles it back from fully green to black.

5) Fill in the following truth tables for the logical operators given boolean \(x\) and \(y\):

| NOT (!) | OR (||) | AND (&&) |
|--------|--------|----------|
| \(x\)  | \(!x\) | \(x\ | | y\ | \(x\ | | y\ | \(x\ & \& \ y\) |
| false  | true   | false    | false | false | false |
| true   | false  | false    | true  | false | false |
|        | true   | true     | true  | false | false |
|        | true   | true     | true  | true  | true  |

6) What is the value returned by the following expressions?

\[true \ | | false \quad \text{true} \]  
\[true \ & \& true \ & \& false \quad \text{false} \]  
\[!(true \ == \ false) \quad \text{true} \]  
\[(3 \ >= \ 1) \ & \& (3 < 10)) \quad \text{true} \]
For the following questions, we will use static Processing code (i.e. no `setup()` or `draw()`). Start a new Processing file and add the following code. Make sure that the canvas is blue when you press Play.

```java
int x = 120;
if ( x > 0 ) {
    background(0, 0, 255);
}
```

7) Change the initial value of \( x \) in your code so that the canvas no longer turns blue. What value of \( x \) did you use and what color is the canvas now?

\( x: \) _anything negative_  
\( \text{canvas color: light gray (the default color)}_ 

8) Now add an `else` clause after the `if` clause so that the canvas turns red instead of the color you saw in Question 7. Press Play to verify that it works now (changing \( x \) back to 120 should revert the canvas to blue).

```java
if ( x > 0 ) {
    background(0, 0, 255);
} else {
    background(255, 0, 0);
}
```

9) Now add an `else if` clause in-between the `if` and `else` clauses that turns the canvas green if \( x \) is less than or equal to \(-2\). Predict what color the canvas will be for the following values of \( x \) and then verify in Processing:

```java
if ( x > 0 ) {
    background(0, 0, 255);
} else if ( x <= -2 ) {
    background(0, 255, 0);
} else {
    background(255, 0, 0);
}
```

<table>
<thead>
<tr>
<th>( x )</th>
<th>canvas color</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>green</td>
</tr>
<tr>
<td>-2</td>
<td>green</td>
</tr>
<tr>
<td>-1</td>
<td>red</td>
</tr>
<tr>
<td>0</td>
<td>red</td>
</tr>
<tr>
<td>1</td>
<td>blue</td>
</tr>
</tbody>
</table>