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C212/A592 ☪ 6W2 Summer 2016 ☪ Exam One: Fundamental Programming Structures in Java

Use `BigDecimal` to write and calculate in Java the following expressions:

1. `1 + 2`
2. `2 * 3`
3. `(1 - (2 - (3 - 4)))`
4. `1 - 2 - 3 - 4`
5. `2 * 3 + 4 * 5`

Evaluate the following Java expressions:

6. `"\n\t\\\".length()`
7. `"tomato".charAt(2) - 'n'`
8. `(char)('a' + 3)`
9. `13 % 7`
10. `5 % 7`
11. `13 / 7`
12. `5 / 7`
13. `false && false || true`
14. `false && (false || true)`
15. `2 / 3 * 3`
16. `3 * 2 / 3`

Simplify the following expressions in which `b` is a `boolean` variable and `n` is an `int`:

17. `b != false`
18. `b || true`
19. 

```
if (n == 0) {
    b = false;
} else {
    b = true;
}
```
20. 

```
if (n < 3) {
    b = true;
} else {
    b = n > 5;
}
```
21. `n == 0 ? b = false : b = true`
22. `! (b && true)`
23. `(n > 3) && (n < 5)`
24. `(n > 3) && (n > 5)`
25. `(n < 3) && (n > 5)`
26. `(n > 3) || (! (n <= 5))`

27. `b = ++n - n++;`

(Think about why the actual value of `n` is not relevant here)

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For each of the following code fragments determine the value of  $y$  at the end:

28. `int x = 18, y = 10; if (x < 10) { if (x > 5) y = 1; } else y = 2;`

29. `int x = 18, y = 10; if (x < 10) if (x > 5) y = 1; else y = 2;`

30. `int y = 6; y = --y + y--;`

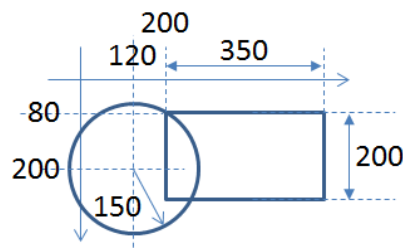
Consider the following program. What does it print?

```
public class One {
    public static int f(int n) { return 2 * n; }
    public static int g(int n) { return n - 1; }
    public static int h(int n) { return 3 * f(n) + 1; }
    public static void main(String[] args) {
        System.out.println( f(3) );           // 31.
        System.out.println( f(f(3)) );        // 32.
        System.out.println( f(h(3)) );        // 33.
        System.out.println( h(h(3)) );        // 34.
        System.out.println( g(g(g(3))) );     // 35.
    }
}
```

Please indicate if these loops are infinite or not:

36. <code>for (int i = 0; i != 10; i += 3) System.out.println(i);</code>	37. <code>for (int i = 0; i != 10; i = i++) System.out.println(i);</code>
38. <code>int i = 10; while (i &gt; 0) { i -= 3; }</code>	39. <code>int i = 10; while (i &gt; 0) ; { i -= 3; }</code>

40-41. Assume that a `Circle` can be represented by three numbers<sup>1</sup> ( $x$ ,  $y$ ,  $r$ ) and a `Rectangle` by four<sup>2</sup> ( $x$ ,  $y$ ,  $w$ ,  $h$ ). Assume further we have a referential that is upside down (top left corner is the origin and  $x$  is increasing as we advance east, while  $y$  is increasing as we move down (south)). Write boolean conditions that determine if (a) two circles overlap or not, (b) two rectangles<sup>3</sup> overlap or not.



For example the circle in the diagram on the left could be thought of as encoded in the following triplet: (120, 200, 150) since the center is located at (120, 200) and the radius is 150. Likewise the rectangle can be represented as (200, 80, 350, 200) since the top left corner is located at (200, 80), the width is 350 and the height is 200.

<sup>1</sup> Coordinates of the center and the radius.

<sup>2</sup> Coordinates of the top left corner plus width and height.

<sup>3</sup> We don't model tilted rectangles, as discussed in class, just rectangles with sides parallel to the referential's axes.