Algorithmic Complexity

Warm-Up

(a) What does the following code do?

(b) What is runtime?

(c) If a function runs in $O(n)$ time, that means that it runs...

- in linear time at worst
- in linear time on average
- in linear time at best

Understanding Runtimes

<table>
<thead>
<tr>
<th>Runtime</th>
<th>Notation (where input=n)</th>
<th>as input...</th>
<th># of steps...</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant</td>
<td>$O(1)$</td>
<td>+1</td>
<td></td>
</tr>
<tr>
<td>logarithmic</td>
<td>$O(\log(n))$</td>
<td>x2</td>
<td></td>
</tr>
<tr>
<td>linear</td>
<td>$O(n)$</td>
<td>+1</td>
<td></td>
</tr>
<tr>
<td>quadratic</td>
<td>$O(n^2)$</td>
<td>x2</td>
<td></td>
</tr>
<tr>
<td>exponential</td>
<td>$O(e^n)$</td>
<td>+1</td>
<td></td>
</tr>
</tbody>
</table>
What are the runtimes of the following blocks?

1. ____________________

2. ____________________

3. ____________________

4. ____________________

5. ____________________

Challenge Problem

(a) What is the runtime of the block to the left?