

1. Running time:  $O(n)$

Explanation: This loop runs  $2n-1$  times. Each time the loop runs, 2 instructions are executed (header + body). The total number of instructions is  $2*(2n-1) + 2 = O(n)$ .

2. Running time:  $O(n^2)$

Explanation: This loop runs  $n^2 - 1$  times. Each time the loop runs, 2 instructions are executed (header + body). The total number of instructions is  $2*(n^2 - 1) + 2 = O(n^2)$ .

3. Running time:  $O(n)$

Explanation: This loop runs  $2n-1$  times. Each time the loop runs, 2 instructions are executed (header + body). The total number of instructions is  $2*(2n-1) + 2 = O(n)$ .

4. Running time:  $O(n^2)$

Explanation: This nested loop incorporates two linear searches that both depend on  $n$  (the inner loop depends on  $i$  which depends on  $n$ ). This creates a compound growth. Ignoring all the constants and factors, the result is  $O(n^2)$ .

5. Running time:  $O(n)$

Explanation: The outer loop runs 99 times. The inner loop runs  $n-1$  times. The total number of instructions is  $99(n-1) + 3$ . This simplifies to  $O(n)$ .

6. Running time:  $O(n*\log(n))$

Explanation: The inner loop executes  $\log(n)$  times. The outer loop executes the  $\log(n)$  script  $n$  times. The result runtime is therefore  $n*\log(n)$ .

7. Running time:  $O(n)$

Explanation: There are two independent loops which means the total runtime is the sum of the two terms. For Big-O notation, only the fastest growing term is accounted for. Both algorithms are linear, the bound is therefore  $O(n)$ .

8. Running time:  $O(1)$

Explanation: There is a constant (499) number of executions of this loop. The Big-O interprets that as a constant input. The answer is, therefore,  $O(1)$ .

9. Running time:  $O(n)$

Explanation: The while executes  $n$  times. It is simply a while form of a linear for loop. The Big-O bound is therefore  $O(n)$ .

10. Running time:  $O(n^2)$

Explanation: There are two separate terms. The first term is a nested loop while the second is a linear loop. Since Big-O notation only takes account for the fastest growing term. Only the quadratic term is considered in this case. The Big-O bound is therefore  $O(n^2)$ .