

# QuickCheck 02: Algorithm Analysis

Due: 8:00 am on Thursday, Jan 16, 2020

QuickChecks must be scanned and submitted online via Gradescope. If you have a smartphone, you can follow these steps to scan using an app: <https://www.gradescope.com/help#help-center-item-student-scanning>. Otherwise, there are scanners located at various libraries on campus which can be found here: <https://finance.uw.edu/c2/printing-copying/dwg-prints-copy-locations>. Make sure that the gray border around the edge of this page is visible in your scanned document.

## 1. Algorithm Analysis

### 1.1. True or false?

Fill in the bubble to indicate True or False for the following statements.

(a) If a function is in  $\Omega(n)$ , then it could also be in  $O(n^2)$ .

True

False

(b) If a function is in  $O(n)$ , then it could also be in  $O(n^2)$ .

True

False

(c) If a function is in  $\Omega(n)$ , then it is always in  $O(n)$ .

True

False

### 1.2. Runtime Bounds

Give a tight asymptotic runtime bound for mystery as a function of  $N$ , the length of the array, in the **best case**, **worst case**, and **overall**. Give a  $\Theta(\cdot)$  bound if it exists. Otherwise, give both an  $O(\cdot)$  and  $\Omega(\cdot)$  bound.

```
public static boolean mystery(int[] a, int target) {
    int N = a.length;
    for (int i = 0; i < N; i += 1) {
        if (a[i] == target) {
            return true;
        }
    }
    return false;
}
```

(a) Best case:

$\Theta(1)$

(b) Worst case:

$\Theta(N)$

(c) Overall:

$\Omega(1)$  and  $O(N)$

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(b) Worst case:

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(c) Overall:

$\Omega(1)$  and  $O(N)$