

Flip Flop

Suppose we have the `flip` function as defined below. Assume the method `unknown` returns a random integer between 1 and `N`, exclusive, and runs in constant time. For each definition of the `flop` method below, give the best and worst case runtime of `flip` in $\Theta(\cdot)$ notation as a function of `N`.

```
1 public static void flip(int N) {
2     if (N <= 100) {
3         return;
4     }
5     int stop = unknown(N);
6     for (int i = 1; i < N; i++) {
7         if (i == stop) {
8             flop(i, N);
9             return;
10        }
11    }
12 }
```

(a) `public static void flop(int i, int N) {`
 `flip(N - i);`
 `}`

Best Case: $\Theta(\quad)$, Worst Case: $\Theta(\quad)$

(b) `public static void flop(int i, int N) {`
 `int minimum = Math.min(i, N - i);`
 `flip(minimum);`
 `flip(minimum);`
 `}`

Best Case: $\Theta(\quad)$, Worst Case: $\Theta(\quad)$

(c) `public static void flop(int i, int N) {`
 `flip(i);`
 `flip(N - i);`
 `}`

Best Case: $\Theta(\quad)$, Worst Case: $\Theta(\quad)$