

Formalizing "like $f(n)$ "

- Let $f(n)$ be the function of n that our function "runs like"
- Use different notation to indicate whether something runs "like" $f(n)$
 - $O(f(n))$: runs in "at most" time proportional to $f(n)$
 - $\Omega(f(n))$: runs in "at least" time proportional to $f(n)$
 - $\Theta(f(n))$: runs in both $O(f(n))$ and $\Omega(f(n))$

Formalizing "like $f(n)$ " (cont.)

- Proportional means "within a constant factor"
- Examples:
 - $O(2n) = O(n)$, because 2 is a constant factor
 - $\Theta(\log_3(n)) = \Theta(\log_2(n)) = \Theta(\log(n)) = \Theta(\ln(n))$
 - $\log_a(x) = (\log(b) / \log(a)) * \log_b(x)$, and $\log(b) / \log(a)$ is a constant factor
 - $\Omega(\log(n^2)) = \Omega(\log(n))$, because $\log(n^2) = 2\log(n)$
- If something takes constant time, we say it is $O(1)$