

Complexity Example *

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Sample Algorithms

- Determine Big O complexity for following algorithms in Python!
- Hints
 - This presentation embeds `klipse`, to enable live code execution.
 - * Thus, click into code on next slides, edit it, and have results immediately displayed.
 - If code does not execute, maybe reload without cache (Ctrl+F5 in Firefox)
 - Based on in-browser implementation of Python (`skulpt`), not complete.
 - To determine Big O complexity, focus on the number of plus operations.
 - * Maybe introduce a new variable to count plus operations; output the final number.
 - * What patterns emerge?

*This PDF document is an inferior version of an OER HTML page; free/libre Org mode source repository.

Naive Multiplication

```
def naive_mult(op1, op2):
    if op2 == 0: return 0
    result = op1
    while op2 > 1:
        result += op1
    op2 -= 1
    return result

print(naive_mult(2, 3))
```

- Some notes
 - Code on left is meant for non-negative integers
 - * Better code would test this
 - Python basics
 - * `def naive_mult(op1, op2)` declares function `naive_mult` with two operands
 - * `==` tests for equality, `=` is assignment to variable on left
 - * `result += op1` is short for `result = result + op1`
 - thus, `op1` is added to `result`
 - `-=` similarly

Naive Exponentiation

```
def naive_mult(op1, op2):
    if op2 == 0: return 0
    result = op1
    while op2 > 1:
        result += op1
    op2 -= 1
    return result

def naive_exp(op1, op2):
    if op2 == 0: return 1
    result = op1
    while op2 > 1:
        result = naive_mult(result, op1)
    op2 -= 1
    return result

print(naive_exp(2, 3))
```

- Some notes
 - `naive_mult` is copied from previous slide
 - `naive_exp` shares same basic structure
 - * But with invocation of `naive_mult` instead of plus operation

A “Small” Change

- What happens if the order of arguments to `naive_mult` on the previous slide was reversed, i.e., if `naive_mult(op1, result)` instead of `naive_mult(result, op1)` was executed?
 - Clearly, as multiplication is commutative, the result does not change.

– What about the resulting complexity?

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