Algorithms and Data Structures for Data Science
lab_recursion

CS 277

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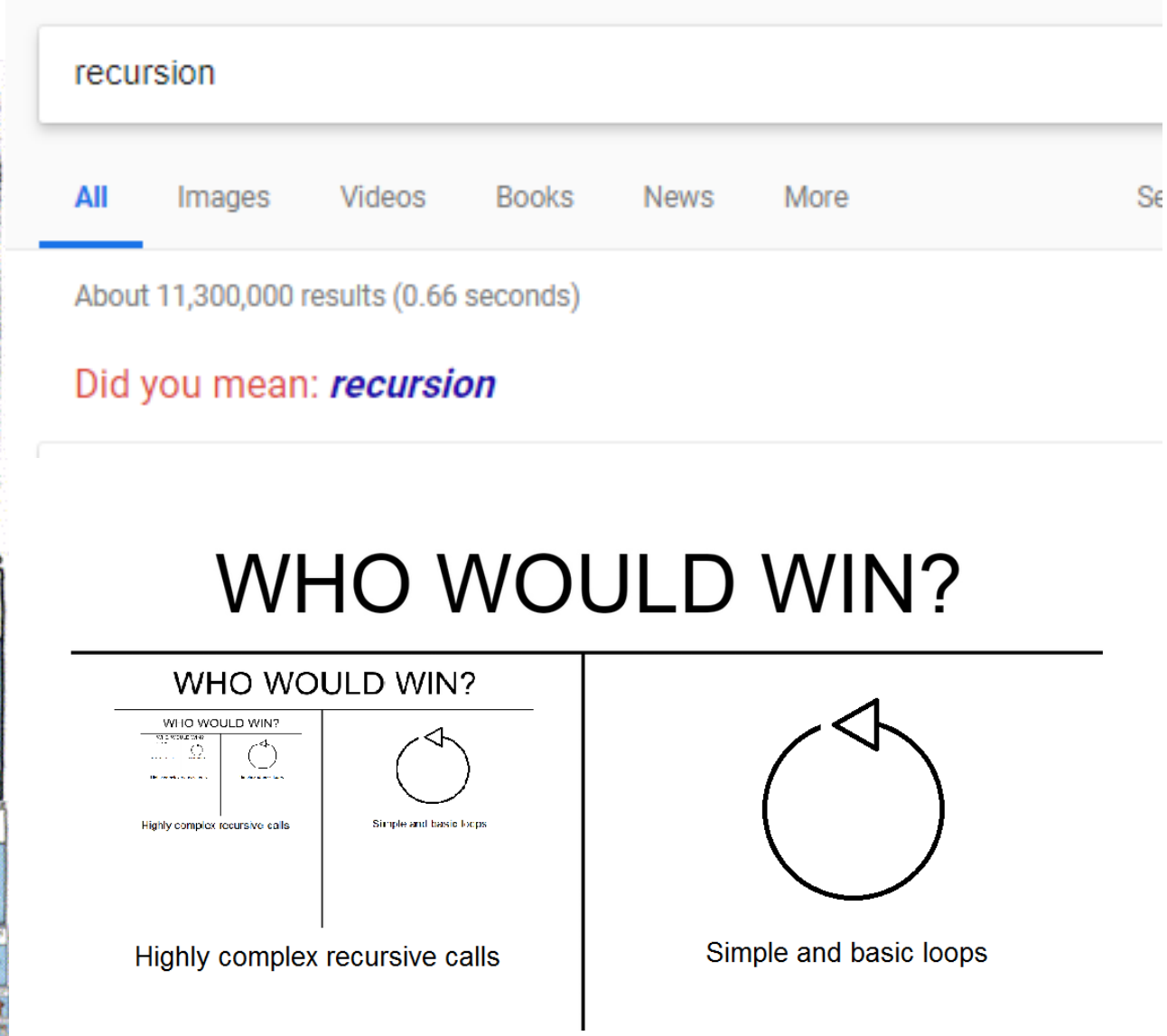
Learning Objectives

Review fundamentals of recursion

Implement recursive functions to handle a variety of tasks

Recursion


SAFELY ENDANGERED
SWEET JESUS, POOH! THAT'S NOT HONEY
YOU'RE EATING RECURSION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Did you mean: recursion
WHO WOULD WIN?
WHO WOULD WIN?
Highly complex recursive calls
Simple and basic loops
Highly complex recursive calls
Simple and basic loops

Recursion

The success or failure of this lab (and the time it takes you) depends on your ability to answer the following:

Base Case: What is the smallest sub-problem? What is the trivial solution?

Recursive Step: How can I reduce my problem to an easier one?

Combining: How can I build my solution from recursive pieces?

Lets work together to brainstorm some of the following functions!

Each exercise a fun new twist!

Sum of Digits:

Triangle:

Palindrome:

Fibonacci:

Bonus List Partitiong:

Recursion Practice: Sum of Digits

Given a number, return the numerical value of summing each digit.

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Recursion Practice: Sum of Digits

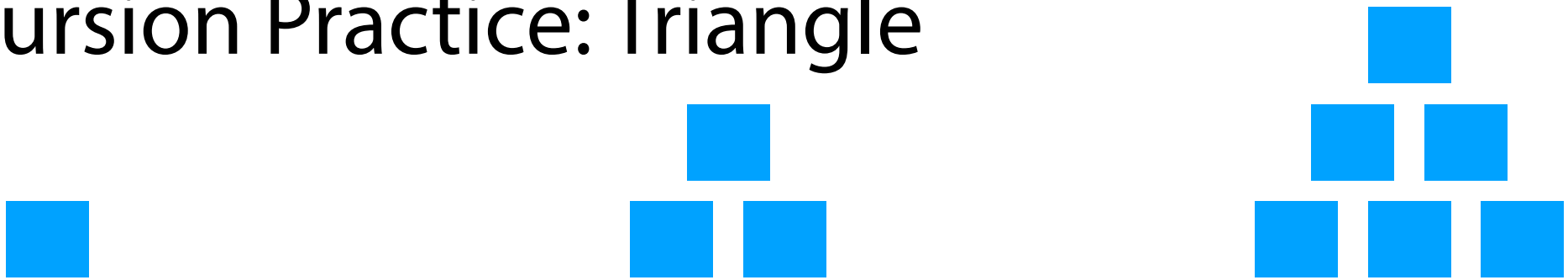
Given a number, return the numerical value of summing each digit.

Base Case:

Recursive Step:

Combining:

Recursion Practice: Triangle



Given the height of a triangle, how many total blocks were used to make it?

Base Case:

Recursive Step:

Combination Step:

Recursion Practice: String Palindrome

Given a string, return whether it is a palindrome or not (True or False)

AAA

racecar

racetrack

Recursion Practice: String Palindrome

Given a string, return whether it is a palindrome or not (True or False)

Base Case:

Recursive Step:

Combining:

Recursion Practice: Recursive Fibonacci

Given a number *n*, return the *nth* Fibonacci number:

$$Fib(n) = Fib(n-1) + Fib(n-2), \quad n > 1$$

Base Case:

Recursive Step:

Combining:

Using all elements in a list, can we make two lists which have equal sums?

Input

```
[4, 3, 1]                    ([], [])

[3, 1]        ([4], [])                    ([], [4])

[1]  ([3, 4], [])  ([4], [3])      ([3], [4])    ([], [3, 4])

[]
([1, 3, 4], [])  ([1, 4], [3])   ([1, 3], [4])  ([1], [3, 4])
([3, 4], [1])    ([4], [1, 3])   ([3], [1, 4])  ([], [1, 3, 4])
```

Recursive List Partitioning

Base Case: When my input list is empty, I have tried every permutation

Recursive Step: Given list L, pop() L[0] to left ***and*** right and recurse on both

Combination Step: If either partition recursion is True, return True