



Algorithms

Iteration and Recursion

What is an Algorithm?

- Steps to follow to solve a problem

Different Approaches

- Iterative solutions
- Recursive solutions

What are Iterative Solutions?

- Looping, doing something ...
 - while or until a condition is met
 - a certain number of times
 - for each element in a collection

Iterative Counting on Fingers

```
SET sum to 0  
UNTIL all fingers down  
  INCREMENT sum by 1  
  PUT a finger down  
RETURN sum
```



Iterative Counting on Fingers



= ?

Iterative Counting on Fingers

sum =



0

Iterative Counting on Fingers

sum =



0



1

Iterative Counting on Fingers

sum =



0



1



2

Iterative Counting on Fingers

sum =



0



1



2



3

Iterative Counting on Fingers

sum =



0



1



2



3



4

Iterative Counting on Fingers



= 4

Palindromes

- Words that are spelled the same forward and backward

Palindromes

- Words that are spelled the same forward and backward

civic
deified
redder

Detect Palindromes Iteratively

- In your groups, write pseudocode for an iterative method `is_palindrome?`

```
def is_palindrome?(word)
end
```

```
is_palindrome?("ruby")
# => false
```

```
is_palindrome?("civic")
# => true
```

What are Recursive Solutions?

- Solve a problem by combining solutions to smaller instances of the same problem

Characteristics of Recursion

- Base case: the small instance whose solution is known

Characteristics of Recursion

- Base case: the small instance whose solution is known
- The method calls itself

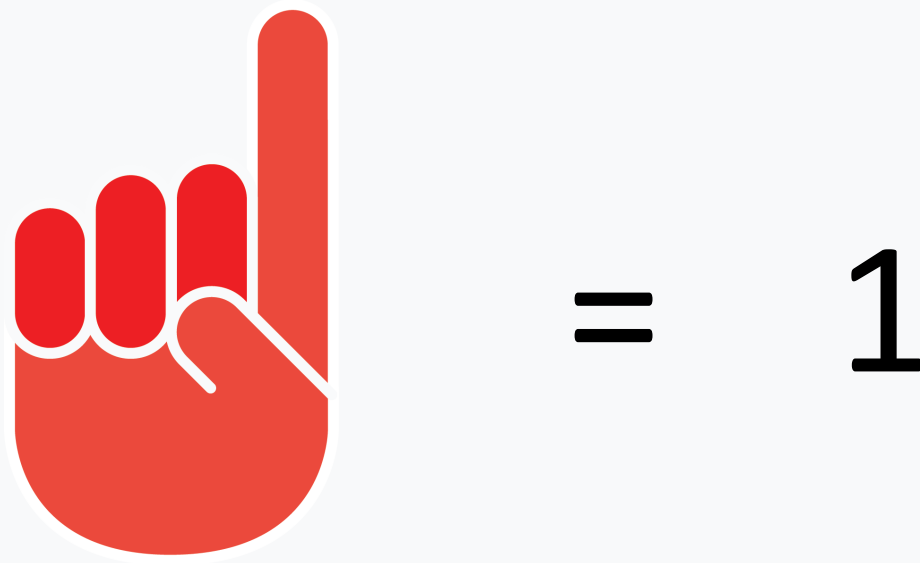
Recursive Counting on Fingers

```
IF one finger up  
  RETURN 1  
ELSE  
  RETURN 1 + one less finger
```

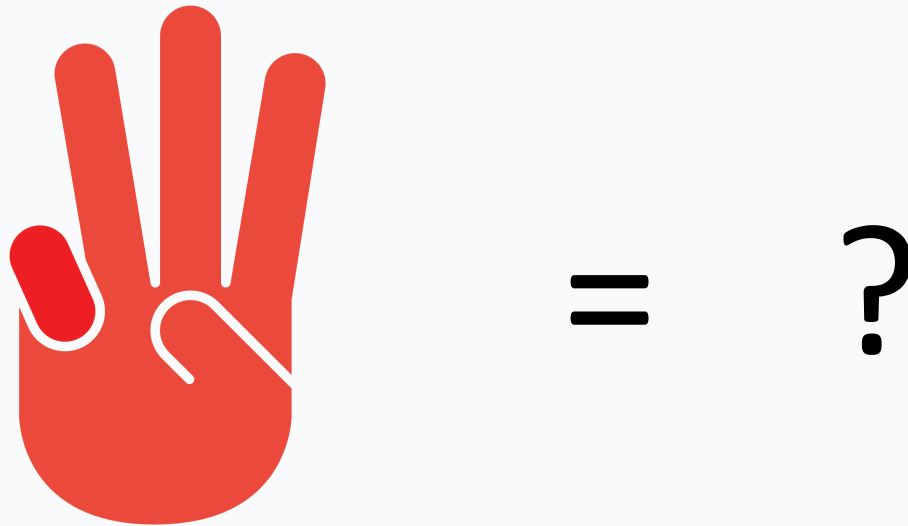


Recursive Counting on Fingers

- What is the base case?



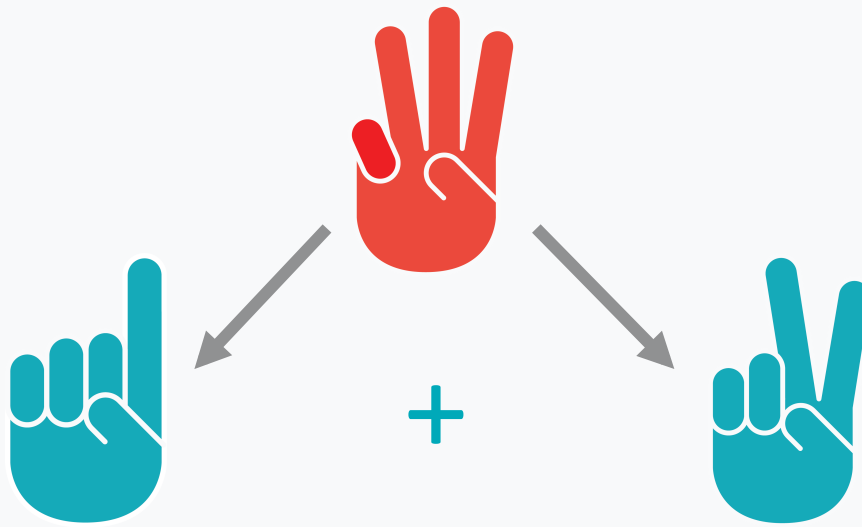
Recursive Counting on Fingers



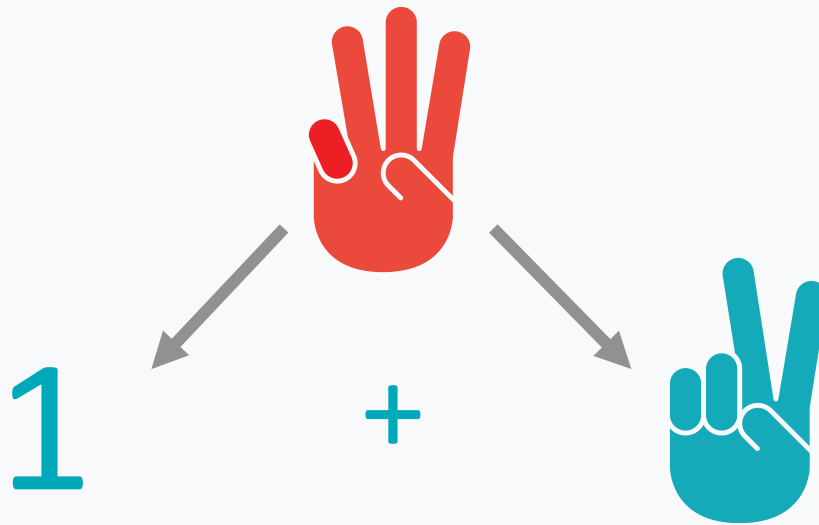
Recursive Counting on Fingers



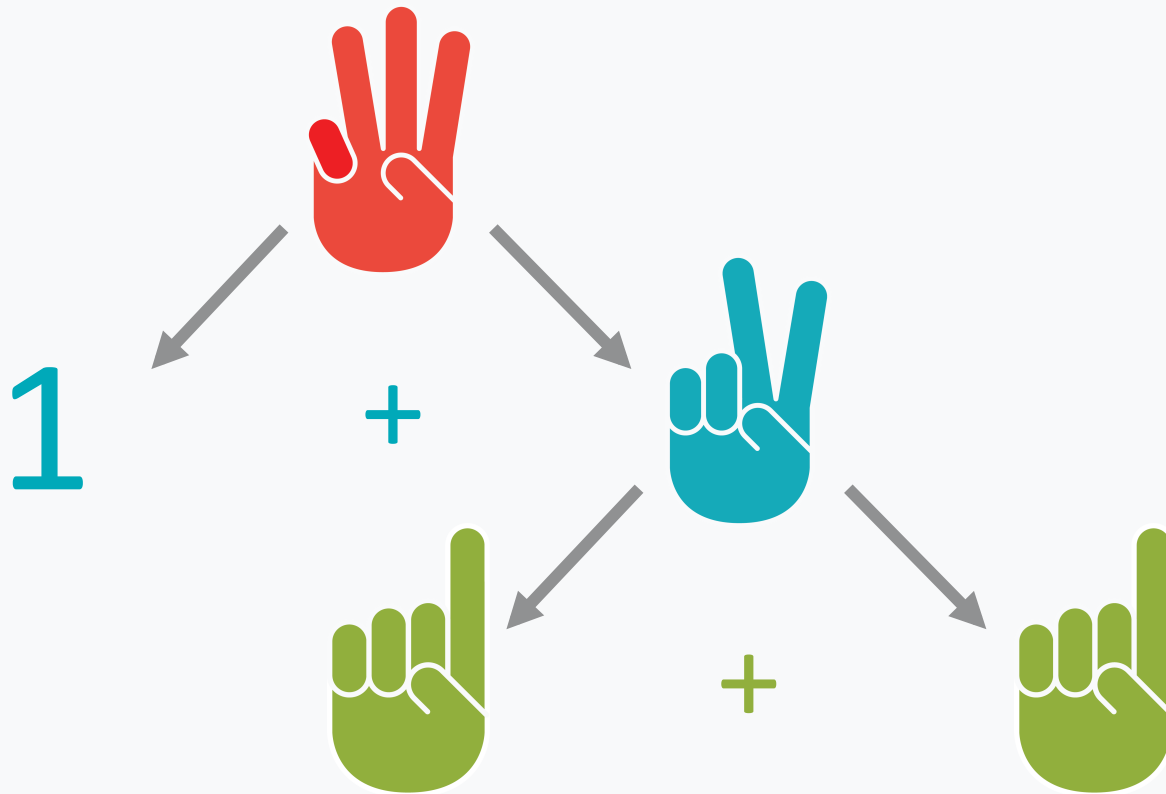
Recursive Counting on Fingers



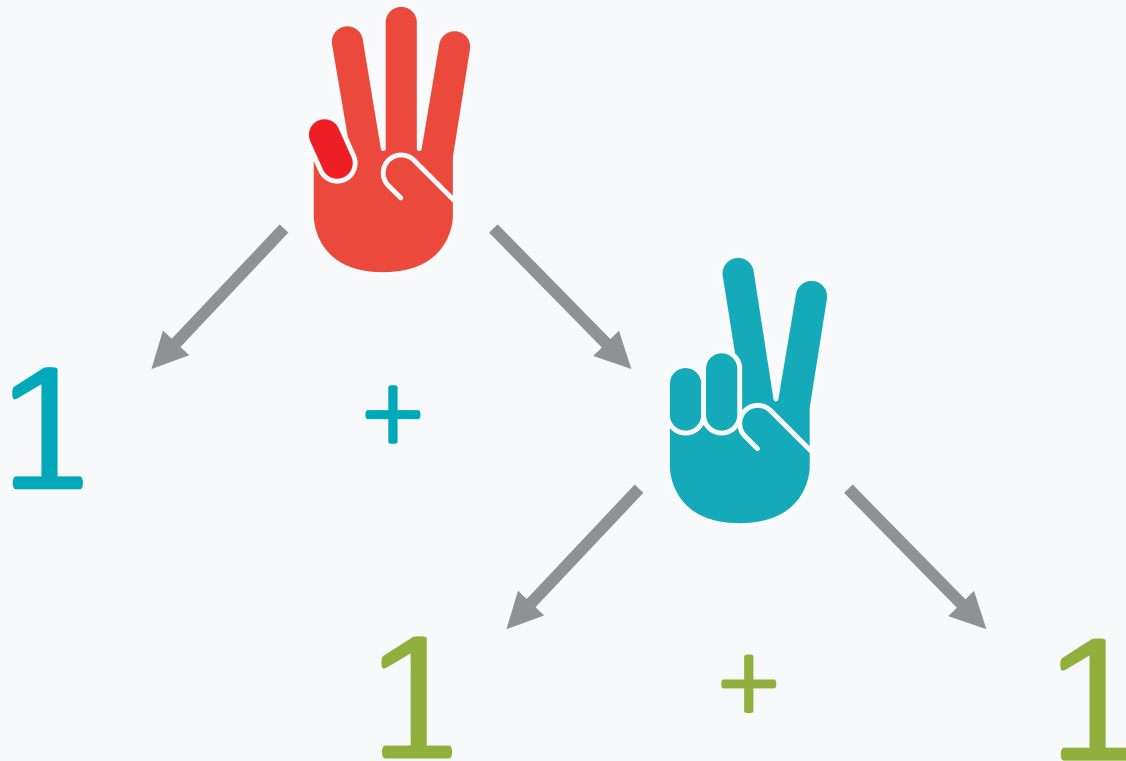
Recursive Counting on Fingers



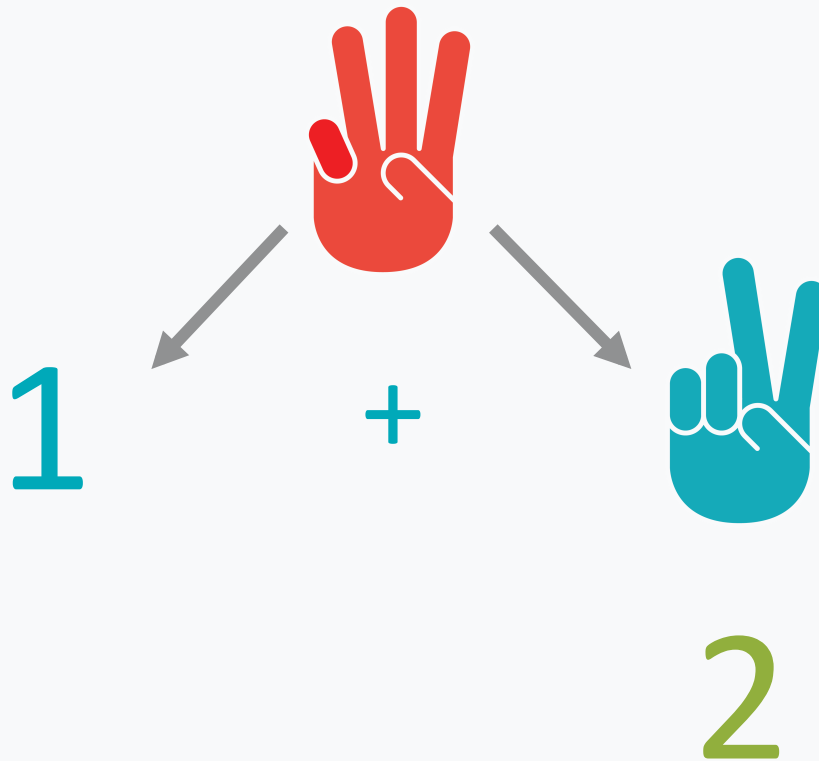
Recursive Counting on Fingers



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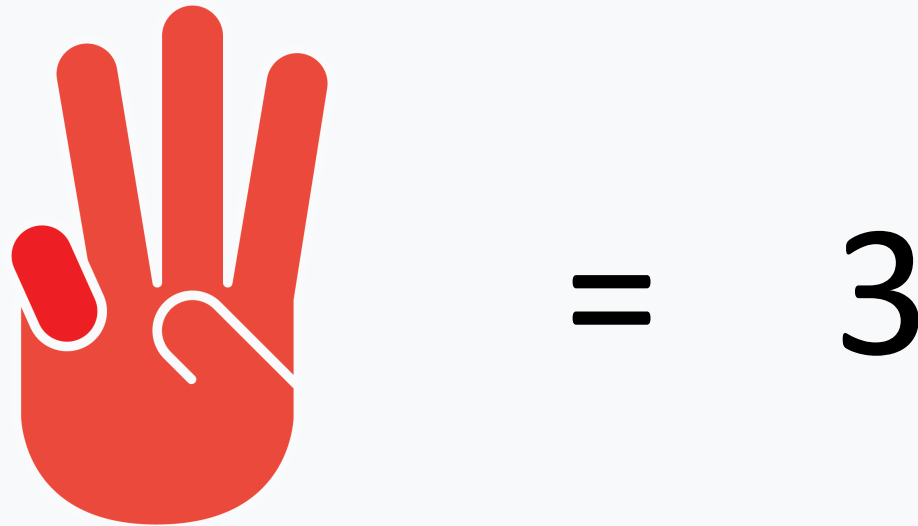


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Recursive Counting on Fingers

3

Recursive Counting on Fingers



Detect Palindromes Recursively

- In your groups, write pseudocode for a recursive method `is_palindrome?`

```
def is_palindrome?(word)
end
```

```
is_palindrome?("ruby")
# => false
```

```
is_palindrome?("civic")
# => true
```