

S O T N R I G

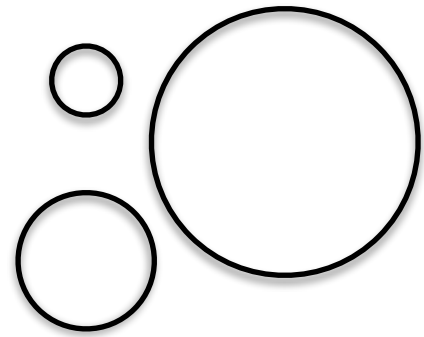
Fullstack Academy of Code

why?

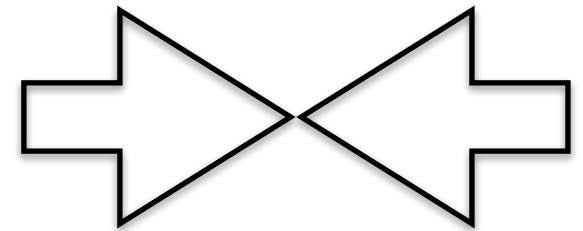
Recursion practice

Introduce basic algorithmics

which?



bubble sort



merge sort

(both are “comparison sorts”)

bubble sort

6 5 3 1 8 7 2 4

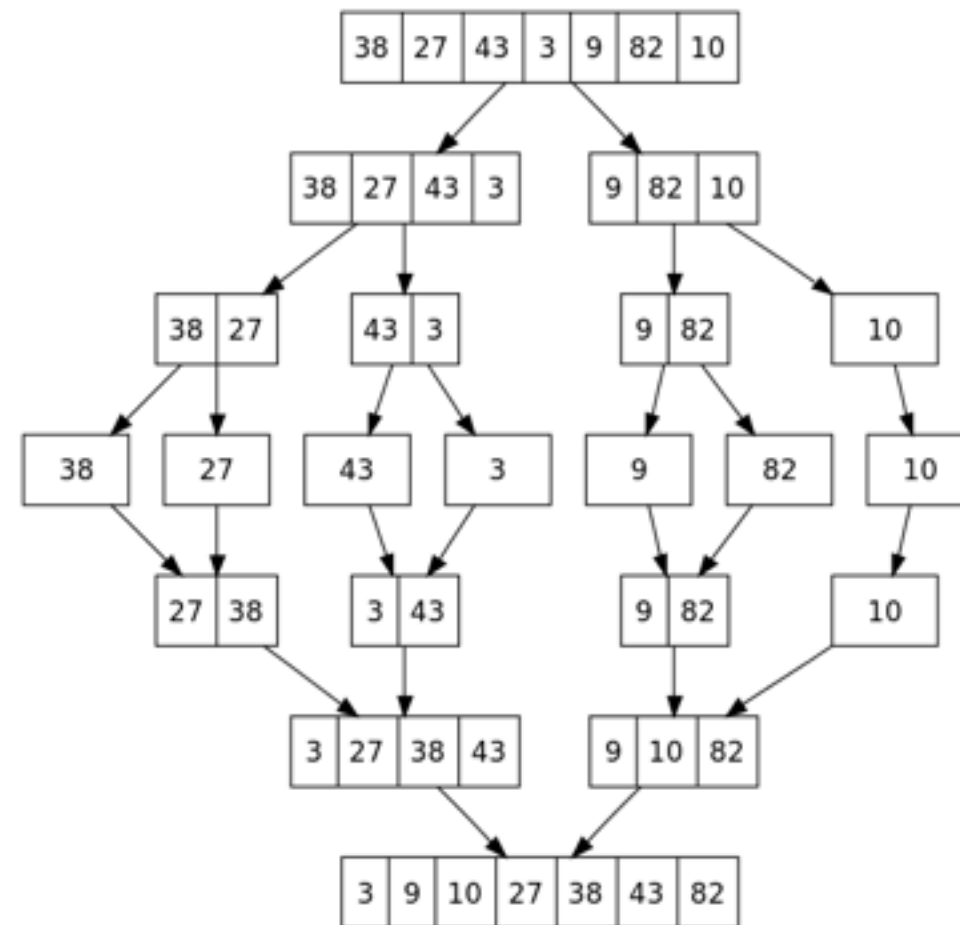
bubble sort

1. Loop over elements
2. Swap anything that's out of order
3. Repeat until there were no swaps

merge sort

6 5 3 1 8 7 2 4

merge sort



merge sort

1. Divide array of n elements into n arrays of 1 element
2. Merge neighboring arrays
3. Make sure to merge in sorted order
4. Repeat until there's only one array

merge sort

```
function merge_sort(list m)
  // Base case
  if length(m) <= 1
    return m

  // Recursive case. First, *divide* the list.
  var list left, right
  var integer middle = length(m) / 2
  for each x in m before middle
    add x to left
  for each x in m after or equal middle
    add x to right

  // Recursively sort both sublists.
  left = merge_sort(left)
  right = merge_sort(right)

  // *Conquer*: merge the now-sorted sublists.
  return merge(left, right)
```

visualize

bubble sort

loop & swap

merge sort

“stitch”

(workshop time)

complexity

The resources an algorithm needs

As a function of the input size

complexity

What does an algorithm need?

complexity

space

time

big O

Ignore the constants

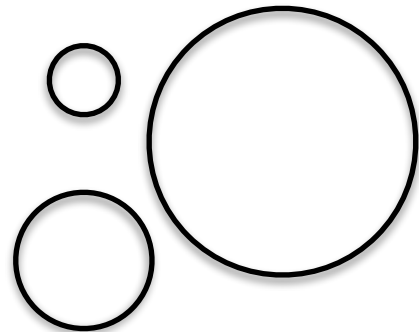
big O = big picture

big O

$$f(n) = 5n^2 + 10$$

$$O(n^2)$$

complexity

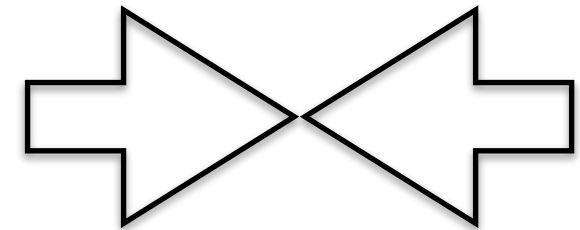


bubble sort

	average	worst case
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space	$O(1)$	$O(1)$
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time	$O(n^2)$	$O(n^2)$
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merge sort

	average	worst case
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space	$O(n)$	$O(n)$
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time	$O(n \cdot \log(n))$	$O(n \cdot \log(n))$
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merge sort speedup

...why?

merge sort speedup

1. Combining two lists, that are each already sorted, into one list that is sorted is a linear time operation
2. There are $\log(n)$ steps needed to go from n lists of one item each to one list of n items