

Homework #1

Ryan English

2.1 -1

Using figure 2.2 as a model, illustrate the operation of insertion sort on the array $A = \{31, 41, 59, 26, 41, 58\}$

| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 31 | 41 | 59 | 26 | 41 | 58 |



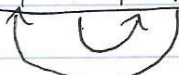
| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 31 | 41 | 59 | 26 | 41 | 58 |



| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 31 | 41 | 59 | 26 | 41 | 58 |



| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 26 | 31 | 41 | 59 | 41 | 58 |



| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 26 | 31 | 41 | 41 | 59 | 58 |



| 1 | 2 | 3 | 4 | 5 | 6 |
|----|----|----|----|----|----|
| 26 | 31 | 41 | 41 | 58 | 59 |

2.1-2 21-2

Rewrite the insertion sort procedure to be nondecreasing

for $j = 2$ to $A.length$

key = $A[j]$

$i = j - 1$

while $i > 0$ and $A[i] > key$

$A[i+1] = A[i]$

$i = i - 1$

$A[i+1] = key$

← just flip the
check

2.1-3

Consider the search problem

Input: A seq of n numbers $A = \{a_1, a_2, \dots, a_n\}$
and a value of v

Output: An index i such that $v = A[i]$ or the
special value Nil if v does not appear
in A

for $j = 0$ to $A.length$

test = $A[j]$

if test == value

return j

return Nil

Loop invariant

subset ~~of~~ $[0..j-1]$

does not include value

terminates when value
is found at $j = A.length - 1$

Maintenance

compare $A[i]$ to value

2.2 - 1

Express the function $n^3/1000 - 100n^2 - 100n + 3$
in terms of Θ -notation

input size: # of items in the input or # of bits

running time = steps executed

↳ sum each step

rate of growth $\rightarrow \Theta$

$$\frac{n^3}{1000} - 100n^2 - 100n + 3$$

$$\cancel{\Theta(n^3)}$$

$$\Theta(n^3)$$

↳ highest order of n