CMPS 10 10-13-08

SEQ. SEARCH

```
1.) get n, a_1 ... a_n, target
2.) i ← 1
3.) found ← false
4.) while i ≤ n and not found
5.)     if (a_i = target)        ← BASIC OP. COMPARISON
6.)         found ← true
7.)     else
8.)         i ← i+1
9.) if not found
10.)    i ← 0
11.) print i
12.) stop
```

= # COMPARISONS

BEST CASE = 1

WORST CASE = n

AVG. CASE = $\frac{1+2+3+\cdots+n}{n} = \frac{1}{n} \cdot \frac{n(n+1)}{2} = \frac{1}{2}n + \frac{1}{2}$

- Assume target is in list.
- Assume target is EQUALLY likely to be in ANY position $i = 1, 2, \ldots, n$.

Exercise: Find AVG. case # of comp. in case target is EQUALLY likely to be in/not in list, AND when in the list is EQUALLY likely to be in ANY pos. Answer: $\frac{3n+1}{4}$

SELECTION SORT

INPUT: $n \geq 1$, $a_1, \ldots, a_n$

OUTPUT: MODIFIED LIST IN INCREASING ORDER

1.) $R \leftarrow n$
2.) while $R \geq 2$
3.) find index i of max value in UNSORTED SECTION
4.) swap a_i with a_R
5.) $R \leftarrow R-1$
6.) stop

(3.1) max $\leftarrow a_1$
(3.2) $i \leftarrow 1$
(3.3) $j \leftarrow 2$
(3.4) while $j \leq R$
(3.5) if $a_j > max$
(3.6) max $\leftarrow a_j$
(3.7) $i \leftarrow j$
(3.8) $j \leftarrow j+1$

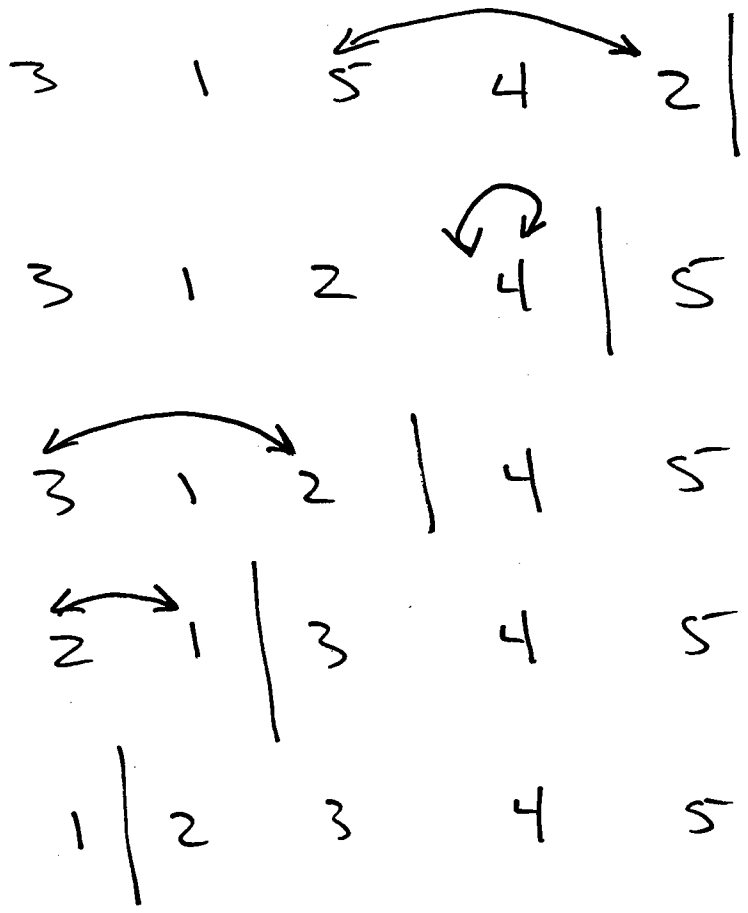
REFINEMENT OF (3)

(4.1) temp $\leftarrow a_i$
(4.2) $a_i \leftarrow a_R$
(4.3) $a_R \leftarrow$ temp

REFINEMENT OF (4)

$n = 5$

Ex.



	R
3 1 5 4 2	5
3 1 2 4 5	4
3 1 2 4 5	3
2 1 3 4 5	2
1 2 3 4 5	1

RUN TIME

BASIC OPERATION : COMPARISONS OF LIST VALUES.

			# COMP
$R = n$	$\Rightarrow$	$2 \le j \le n$	$n-1$
$R = n-1$	$\Rightarrow$	$2 \le j \le n-1$	$n-2$
$R = n-2$	$\Rightarrow$	$2 \le j \le n-2$	$n-3$
$\vdots$			$\vdots$
$R = 2$	$\Rightarrow$	$2 \le j \le 2$	1

TOTAL # OF COMP $= 1 + 2 + \cdots + (n-3) + (n-2) + (n-1)$

$$1 + 2 + \cdots + \text{☺} = \frac{\text{☺}(\text{☺}+1)}{2}$$

$$= \frac{(n-1)((n-1)+1)}{2}$$

$$= \frac{n(n-1)}{2} = \boxed{\frac{1}{2}n^2 - \frac{1}{2}n}$$

BEST, WORST, AVG.

Bubble Sort

```
1.) R ← n
2.) while R ≥ 2
3.)     j ← 2
4.)     while j ≤ R                    ← BASIC OP.
5.)         if (a_j < a_{j-1})
6.)             swap a_j with a_{j-1}
7.)         j ← j+1
8.)     R ← R-1
9.) stop
```

$n = 5$

							R
Ex.	3	1	5	4	2 |		5
	1	3	5	4	2		
	1	3	4	5	2		
	1	3	4	2 |	5		4
	1	3	2 |	4	5		3
	1	2 |	3	4	5		2
	1 |	2	3	4	5		1