

Exercise 1

Bubble sort

Part 1

- ① 9, -12, -43, 20, -2, 3, 7, 28, 19
- ② 9, -43, 12, 20, -2, 3, 7, 28, 19
- ③ 9, -43, 12, -2, 20, 3, 7, 28, 19
- ④ 9, -43, 12, -2, 3, 20, 7, 28, 19
- ⑤ 9, -43, 12, -2, 3, 7, 20, 28, 19
- ⑥ 9, -43, 12, -2, 3, 7, 20, 19, 28

Part 2

$$\textcircled{1} -43, 9, 12, -2, 3, 7, 20, 19, 28$$

$$\textcircled{2} -43, 9, -2, 12, 3, 7, 20, 19, 28$$

$$\textcircled{3} -43, 9, -2, 3, 12, 7, 20, 19, 28$$

$$\textcircled{4} -43, 9, -2, 3, 7, 12, 20, 19, 28$$

$$\textcircled{5} -43, 9, -2, 3, 7, 12, 19, 20, 28$$

Para 3

$$\textcircled{1} -43, -2, 9, 3, 7, 12, 19, 20, 28$$

$$\textcircled{2} -43, -2, 3, 9, 7, 12, 19, 20, 28$$

$$\textcircled{3} -43, -2, 3, 7, 9, 12, 19, 20, 28$$

Selection sort

① 9, 12, -43, 20, -2, 3, 7, 28, 19

② -43, 9, 12, 20, -2, 3, 7, 28, 19

③ -43, -2, 9, 12, 20, 3, 7, 28, 19

④ -43, -2, 3, 9, 12, 20, 7, 28, 19

⑤ -43, -2, 3, 7, 9, 12, 20, 28, 19

⑥ -43, -2, 3, 7, 9, 12, 19, 20, 28

Insertion Sort

- ① 9, 12, -43, 20, -2, 3, 7, 28, 19
- ② -43, 9, 12, 20, -2, 3, 7, 28, 19
- ③ -43, -2, 9, 12, 20, 3, 7, 28, 19
- ④ -43, -2, 3, 9, 12, 20, 7, 28, 19
- ⑤ -43, -2, 3, 7, 9, 12, 20, 28, 19
- ⑥ -43, -2, 3, 7, 9, 12, 19, 20, 28

Exercise 2

procedure bubble_sort($a_1 \dots a_n$):

do:

for $i = 1$ to $n - 1$ do:

has_updated = false

for $j = 1$ to $n - i$ do

if $a_j > a_{j+1}$ then:

has_updated = true

swap a_j and a_{j+1}

while (has_updated).

Metti i colori p, u, p, a = b al
p, 'u' grande



Exercise 3

procedure are_anagrams (str_1, str_2):

- ~~recupérer l'index dans l'alphabet de~~
~~chaque lettre du mot~~
- mer la liste
- comparer les résultats des 2 strings

$O(n+1)$ simpler

$O(n^2)$ kni

$O(n)$ for i —
 $L[i] = G[i]$

$s_1 = \text{"cawcaw"}$

$s_2 = \text{"heek"}$

$n = 0$

do :

$deriver_1 = s_1[n]$

$deriver_2 = s_2[n]$

if $deriver_1 \neq deriver_2$:

$n += 1$ return false

while ($deriver_1$ and $deriver_2$)

Exercise 4

procedure is_injective (f):

results = []

~~is_injective~~ := true

for x in def_domain(f):

result := $f(x)$

if (result in results):

is_injective := false

return False

results \leftarrow results \cup result

return true

Exercise 5

$$M = \emptyset$$

$$x_1 \heartsuit y_3 ?$$

$$M = \{(x_1, y_3)\}$$

$$x_2 \heartsuit y_2 ?$$

$$M = \{(x_1, y_3), (x_2, y_2)\}$$

$$x_3 \heartsuit y_1 ?$$

$$M = \{(x_1, y_3), (x_2, y_2), (x_3, y_1)\}$$

Exercise 6

$$\textcircled{1} \quad 3 \cdot 25 = 75$$

$$3 \cdot 25 + 10 = 85$$

$$3 \cdot 25 + 10 + 2 \cdot 1 = 87$$

$$\textcircled{2} \quad 1 \cdot 25 + 2 \cdot 10 + 4 \cdot 1 = 49$$

$$\textcircled{3} \quad 3 \cdot 25 + 2 \cdot 10 + 1 \cdot 5 + 4 \cdot 1 = 93$$

$$\textcircled{4} \quad 1 \cdot 25 + 5 \cdot 1 + 3 \cdot 1 = 33$$

Exercice 7

①

(A, c)

(B, d)

(C, a)

(D, b)

②

~~(a, D)~~

~~(b, C)~~

(c, C)

(d, D)

(a, A)

(b, B)

③

$D?$

Exercise 8

$$\begin{aligned} & |a_n x^n + a_{n-1} x^{n-1} + \dots| \\ & \leq |a_n x^n| + |a_{n-1} x^{n-1}| + \dots \\ & \leq a_n x^n \end{aligned}$$

$$|f(x)| \leq C |g(x)|$$

$$\leq n |a_n x^n|$$

Exercice 9

$$\text{op_count} = 60 \cdot 10^{-12}$$

(a) $\log_2(n)$

$$\log_2(n) \leq 60 \cdot 10^{-12}$$

$$\Leftrightarrow n \leq 2^{60 \cdot 10^{-12}}$$

(b) ~~1000000~~ $n \leq 60 \cdot 10^{-12}$

$$\Rightarrow n \leq \frac{60 \cdot 10^{-12}}{1,000,000}$$

(c) $n^2 \leq 60 \cdot 10^{-12}$

$$\Rightarrow n \leq \sqrt{60 \cdot 10^{-12}}$$

Exercise 10

Bubble

$$9 + 8 + 7 + \dots + 0$$

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

① ②