Exercise: write a function that takes an integer "target" x and a vector of integers V and answers the question: $¿\exists\, a,b \in V$ s.t. $a+b=x$?

(Translation to English: "Does there exist two elements a,b in V such that $a+b=x$?")

Idea: "brute force". We'll check, for each $a \in V$ if any $b = x-a$. (So that $a+b=x$)

Conceptually, look at the space $V \times V = \{(v_1,v_2) \mid v_1,v_2 \in V\}$:

Say V has 4 elements:

(Notation: write $V[i] = v_i$)

$V \times V$:

(v_0,v_0)	(v_0,v_1)	(v_0,v_2)	(v_0,v_3)
(v_1,v_0)	(v_1,v_1)	(v_1,v_2)	(v_1,v_3)
(v_2,v_0)	(v_2,v_1)	(v_2,v_2)	(v_2,v_3)
(v_3,v_0)	(v_3,v_1)	(v_3,v_2)	(v_3,v_3)

Print all ordered pairs:

```
for (i=0; i< V.size(); i++) {
    for (j=0; j<V.size(); j++) {
        cout << "(" << V[i] << "," << V[j] << ") ";
    }
    cout << "\n";
}
```

Note: for our problem, only need to go through $\approx 1/2$ the entries:

(v_0, v_0)	(v_0, v_1)	(v_0, v_2)	(v_0, v_3)
(v_1, v_0)	(v_1, v_1)	(v_1, v_2)	(v_1, v_3)
(v_2, v_0)	(v_2, v_1)	(v_2, v_2)	(v_2, v_3)
(v_3, v_0)	(v_3, v_1)	(v_3, v_2)	(v_3, v_3)

for this, just start $j = i$ for the inner for-loop!

Another exercise from last time: make a <u>sorted</u> vector to have unique elements, and do so "in-place".

V =

1	~~1~~	2	2	2	3	4	5	5

Say $n = V.\text{size}()$. This process would take

$$(n-1) + (n-2) + (n-3) + \dots + 1$$

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

last unique item

"next candidate"

1	1	2	2	2	3	4	5	5

$\approx n$ steps!