Titolo unità didattica: Array e insiemi [08]

Titolo modulo : Algoritmi di base su insiemi – parte 2 [02-T]

Insiemi e array: inclusione, sottrazione e uguaglianza

Argomenti trattati:

- ✓ algoritmo per determinare l'inclusione di due insiemi
- ✓ algoritmo per la sottrazione di due insiemi
- ✓ algoritmo per determinare l'uguaglianza di due insiemi

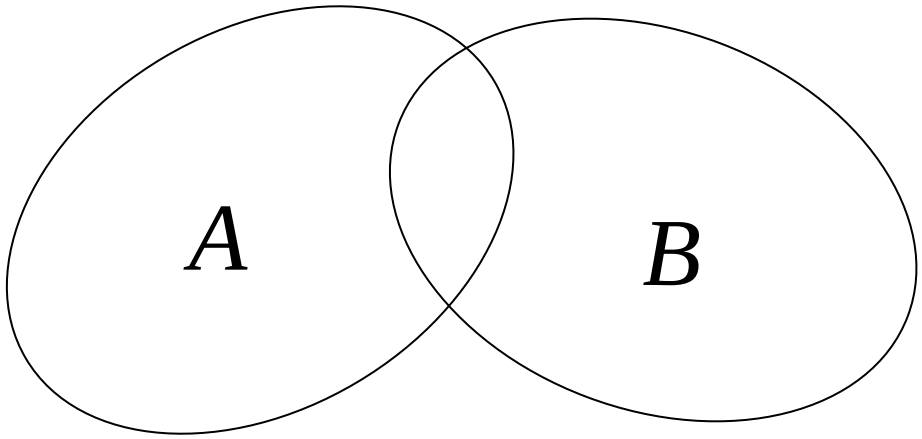
Prerequisiti richiesti: P1-07-03-T

problemi con insiemi
inclusione di due insiemi:

$$A = \{2, 4, 6, 3\} \qquad B = \{4, 3, 1\}$$

$$A \not\subset B \qquad B \not\subset A$$

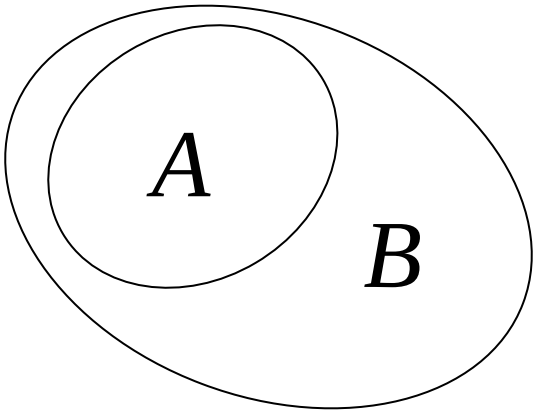
un insieme è incluso in un altro insieme se tutti i suoi oggetti sono oggetti dell'altro insieme



problemi con insiemi
inclusione di due insiemi:

$$A = \{25,12\} \qquad B = \{3,12,44,25,7\}$$

$$A \subseteq B \qquad B \not\subset A$$

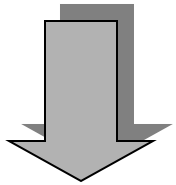


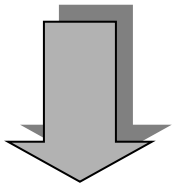
problemi con insiemi
inclusione di due insiemi:

dati di input: il primo insieme (variabile **a**), la sua cardinalità (variabile **n_a**), il secondo insieme (variabile **b**), la sua cardinalità (variabile **n_b**)
dato di output: **true** (incluso), **false** (non incluso) (variabile **incluso**)
costrutto ripetitivo: **do-while**
operazione ripetuta (al generico passo **i**):
verificare l'appartenenza di ogni **a[i]** a **b**
predicato di permanenza:
a[i] appartiene a **b** **and** **i < n_a**

inclusione

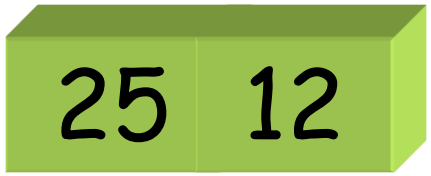
$A = \{25,12\}$ $B = \{3,12,44,25,7\}$





array **a**

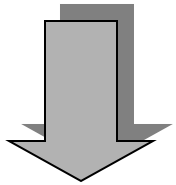
array **b**

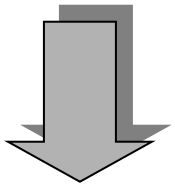


incluso

inclusione

$A = \{25,12\}$ $B = \{3,12,44,25,7\}$





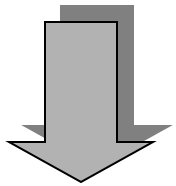
array **a**

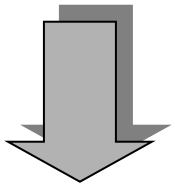
array **b**

incluso

inclusione

$A = \{25,12\}$ $B = \{3,12,44,25,7\}$





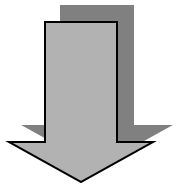
array a

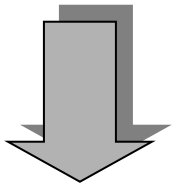
array b

incluso

inclusione

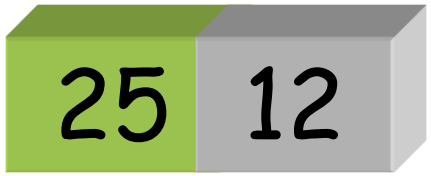
$A = \{25,12\}$ $B = \{3,12,44,25,7\}$





array a

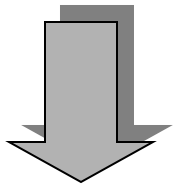
array b

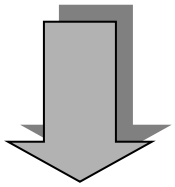


incluso

inclusione

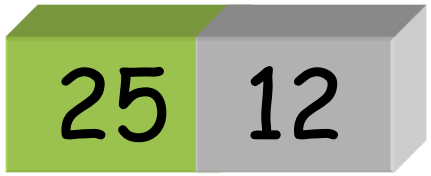
$A = \{25,12\}$ $B = \{3,12,44,25,7\}$

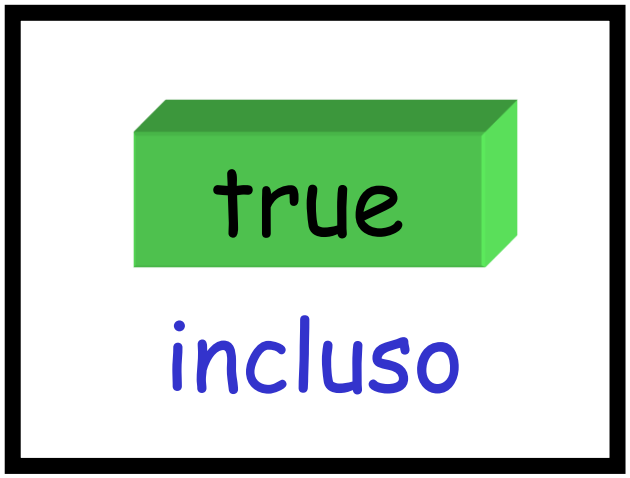




array a

array b





```
logical inclusione (float a[], int n_a, float b[],
                    int  n_b) {
 int i;
 logical incluso;
 i = 0 ;
  do {
        incluso = appartiene(a[i],b,n_b) ;
        i = i+1 ;
  } while ( incluso && i < n_a );
  return incluso ;
end
```

n_b*n_a

confronti tra elementi dei due array (al più)

```
logical appartiene(float chiave,float array[],int n)
```

logical inclusione (float a[], int n_a, float b[],int n_b)

Esercizio:

main per determinare l'inclusione di $A = \{25,12\}$

in $B = \{3,12,44,25,7\}$

```
main() {



}
```

problemi con insiemi
sottrazione di due insiemi:

$$A = \{2, 4, 6, 3\} \qquad B = \{4, 3, 1\}$$

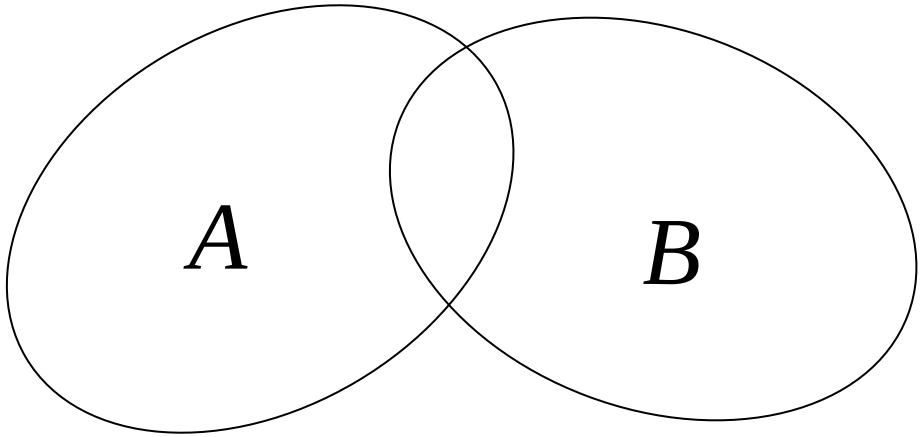
$$C = A - B = \{2, 6\}$$

l'insieme sottrazione ha per oggetti gli oggetti del primo insieme che non appartengono al secondo insieme

problemi con insiemi
sottrazione di due insiemi:

$$A = \{2, 4, 6, 3\} \qquad B = \{4, 3, 1\}$$

$$C = A - B = \{2, 6\}$$



problemi con insiemi
sottrazione di due insiemi:

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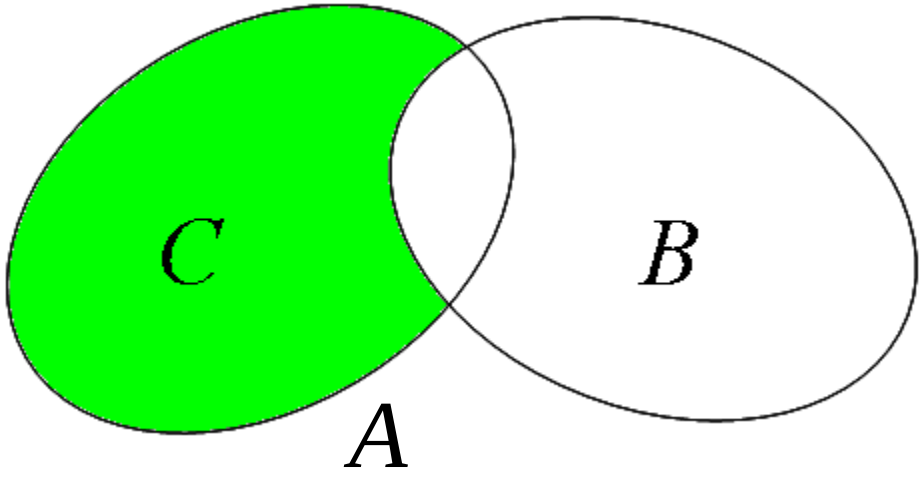


problemi con insiemi
sottrazione di due insiemi:

$$A = \{2, 4, 6, 3\} \qquad B = \{4, 3, 1\}$$

$$C = A - B = \{2, 6\}$$

il numero di elementi dell'insieme sottrazione è minore o al più uguale al numero degli elementi del primo insieme

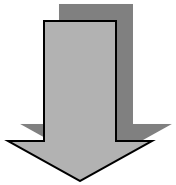
$$c_C \leq c_A$$

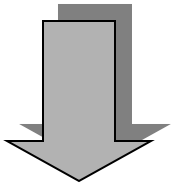
problemi con insiemi
sottrazione di due insiemi:

dati di input: il primo insieme (variabile **a**), la sua cardinalità (variabile **n_a**), il secondo insieme (variabile **b**), la sua cardinalità (variabile **n_b**)
dati di output: l'insieme sottrazione (variabile **c**), la sua cardinalità (variabile **n_c**)
costrutto ripetitivo: **for**
operazione ripetuta (al generico passo **i**):
verificare l'appartenenza di **a[i]** a **b**
se **non** appartiene, **a[i]** deve essere un elemento di **c**

sottrazione

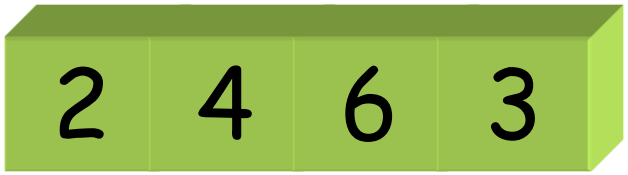
$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$



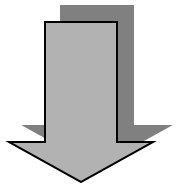


array **a**

array **b**



$$C = A - B = \{2,6\}$$

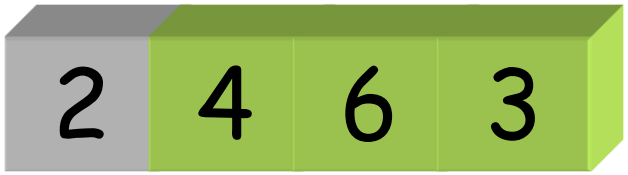


array **c**

sottrazione

$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$

array **a**



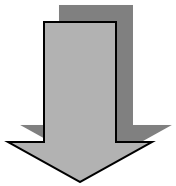
array **b**

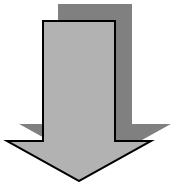
$$C = A - B = \{2, 6\}$$

array **c**

sottrazione

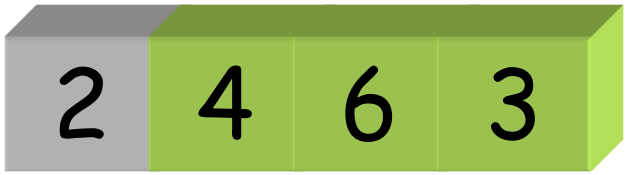
$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$



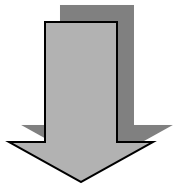


array **a**

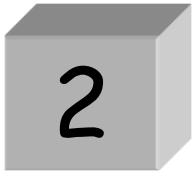
array **b**



$$C = A - B = \{2, 6\}$$

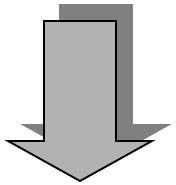


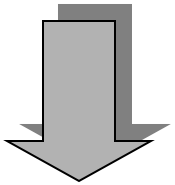
array **c**



sottrazione

$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$

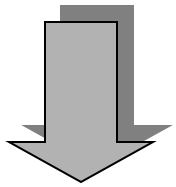




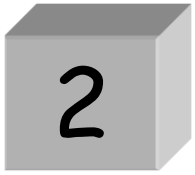
array **a**

array **b**

$$C = A - B = \{2, 6\}$$

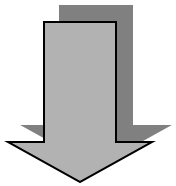


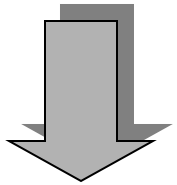
array **c**



sottrazione

$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$

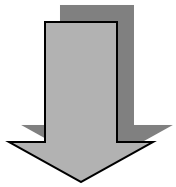




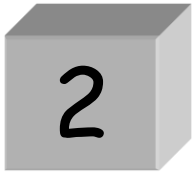
array **a**

array **b**

$$C = A - B = \{2, 6\}$$

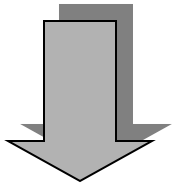


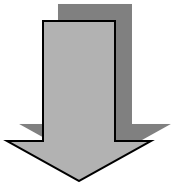
array **c**



sottrazione

$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$

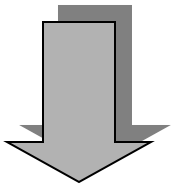




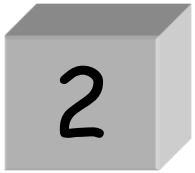
array **a**

array **b**

$$C = A - B = \{2, 6\}$$



array **c**



sottrazione

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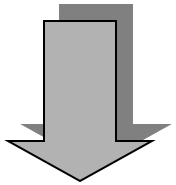
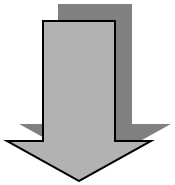
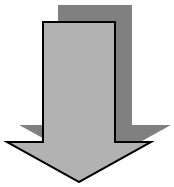




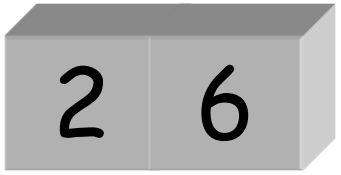
array **a**

array **b**

$C = A - B = \{2, 6\}$

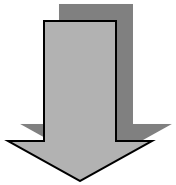


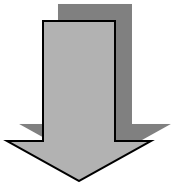
array **c**



sottrazione

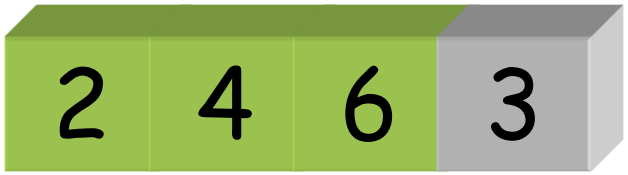
$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$



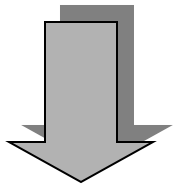


array **a**

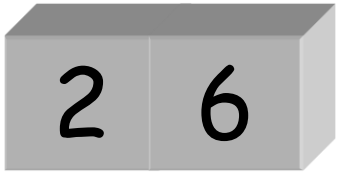
array **b**



$C = A - B = \{2, 6\}$

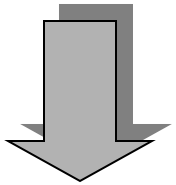


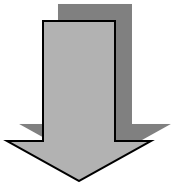
array **c**



sottrazione

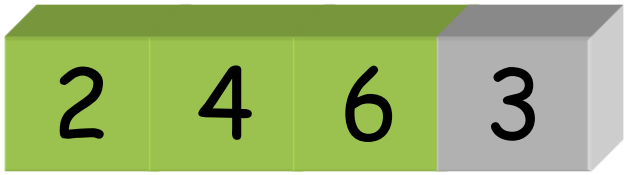
$A = \{2, 4, 6, 3\}$ $B = \{4, 3, 1\}$



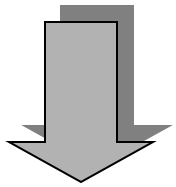


array **a**

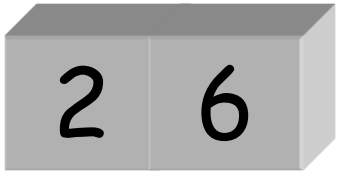
array **b**



$C = A - B = \{2, 6\}$



array **c**



problemi con insiemi
sottrazione di due insiemi:

```
void sottrazione( in: float a[], int n_a, float b[],
                  int n_b; out: float c[], int n_c) {
 int i ;
 n_c = 0 ;
  for (i=0; i < n_a; i++) {
        if ( ! appartiene(a[i],b,n_b) )
            {
              c[n_c] = a[i] ;
              n_c = n_c+1;
            }
   }
}
```

n_b*n_a
confronti tra elementi degli array (al più)

ATTENZIONE: da modificare in C

```
logical appartiene(float chiave,float array[],int n)
```

problemi con insiemi
uguaglianza di due insiemi:

$$A = \{25,7,12\} \qquad B = \{12,25,7\}$$

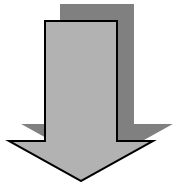
due insiemi sono uguali se hanno lo stesso numero di oggetti e se ogni oggetto di un insieme è anche oggetto dell'altro insieme

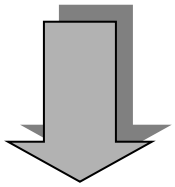
problemi con insiemi
uguaglianza di due insiemi:

dati di input: il primo insieme (variabile **a**), il secondo insieme (variabile **b**), le loro cardinalità (variabile **n**)
dato di output: **true** (uguali), **false** (diversi) (variabile **uguale**)
costrutto ripetitivo: **do-while**
operazione ripetuta (al generico passo **i**):
verificare l'appartenenza di ogni **a[i]** a **b**
predicato di permanenza:
a[i] appartiene a **b and i < n_a**

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





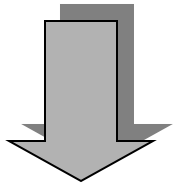
array **a**

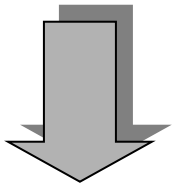
array **b**

uguale

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





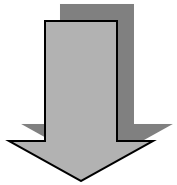
array a

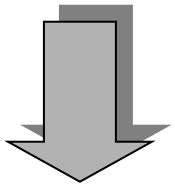
array b

uguale

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





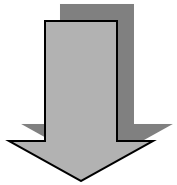
array a

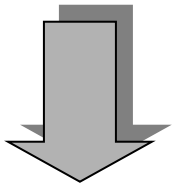
array b

uguale

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





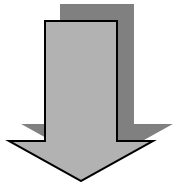
array **a**

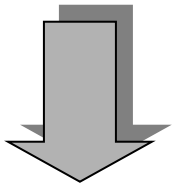
array **b**

uguale

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





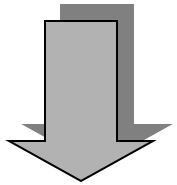
array **a**

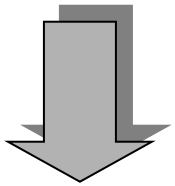
array **b**

uguale

uguaglianza

$A = \{25,7,12\}$ $B = \{12,25,7\}$





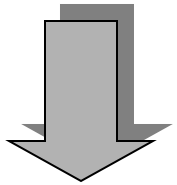
array **a**

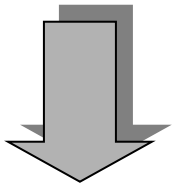
array **b**

uguale

uguaglianza

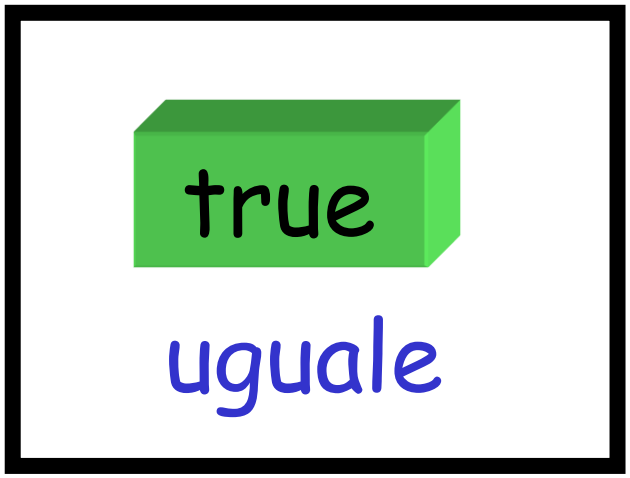
$A = \{25,7,12\}$ $B = \{12,25,7\}$





array **a**

array **b**



```
logical appartiene(float chiave,float array[],int n)
```

```
logical uguaglianza_insiemi(float a[], float b[],
                            int n) {
 int i;
 logical uguale ;
 i = 0 ;
  do {
        uguale = appartiene(a[i],b,n) ;
        i = i+1 ;
  } while ( uguale && i < n );
  return uguale ;
}
```

n^2

confronti tra elementi dei due array (al più)

logical uguaglianza insiemi (float a[], float b[],int n)

Esercizio:
main per determinare l'uguaglianza di $A = \{25,7,12\}$

e $B = \{12,25,7\}$

```
main() {



}
```