Task1: We store the title, the author, and the publishing year about N books. The books are ordered by publishing years. List all books published before 1990.

1st idea: multiple item selection. However we know that the books are ordered by publishing years -> we can find the first book published in 1990, and copy all books published (and listed) before it.

Pattern: search + copy

Specification

Input: $n \in \mathbb{N}$, Tbook=(title×author×pyear), title,author∈ \mathbb{T} ,pyear∈ \mathbb{N} Books[1..n]∈Tbookⁿ,

Output: $cnt \in \mathbb{N}$, $OB[1..cnt] \in \mathbb{N}^{cnt}$,

Precondition: n>1, $\forall i (1 \le i < n)$: Books[i].pyear \le Books[i+1].pyear

Postcondition:

$$cnt = \sum_{i=1}^{n-1} 1 \text{ and } \forall i (1 \le i < cnt): Books[0B[i]]. pyear < 1990$$

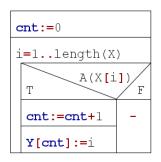
$$Books[i].pyear < 1990$$

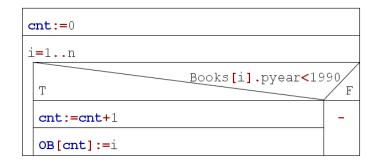
2nd version of postcondition: exists= \exists i(1 \le i \le n): Books[i].pyear=1990 and (exists and 1 \le cnt<n and Books[cnt+1].pyear=1990 or cnt=1) and \forall i(1 \le i \le cnt): Books[i].pyear<1990) and OB[i]=i

A attribute function: Books[i].pyear=1990 (the first book published in 1990)

Algorithm

1st version: multiple item selection





2nd version: search and copy separately

```
i:=1
i length(X) and not A(X[i])
i:=i+1
exists:=(i length(X))

rull
trul
exists
rull
ind:=i
val:=X[i]
```

```
i=1..length(X)

Y[i]:=f(X[i])
```

```
i:=1

i≤n and Books[i].pyear<1990

i:=i+1

exists:=(i≤n)

T

cnt:=i-1

j=1..cnt

OB[j]:=j</pre>
```

3rd version: combined search and copy

```
cnt:=0
i:=1

i≤length(X) and not A(X[i])

Y[i]:=X[i]
i:=i+1
cnt:=i-1
```

```
cnt:=0
i:=1
i≤n and Books[i].pyear<1990
OB[i]:=i
i:=i+1
cnt:=i-1</pre>
```