

(Downloaded from <https://cs.stanford.edu/~knuth/programs.html> and typeset on September 17, 2017)

1. Intro. This simple program calculates Schensted's Y function. Consider the array

```

      x
    x x      x
  x o o      x o      x
o o x x      o o x      o o      o
x o x x x    o o x x    o o x    o o      o

```

The first nine columns of these five rows were given as standard input; this array shows the standard output.

In general the standard input should consist of $n + 1$ lines of $2n + 1$ characters, for some n , using only spaces and x's and o's. (Otherwise who knows what might occur. I wrote this in a terrific hurry.)

```

#define maxn 100
#include <stdio.h>
char a[maxn + 1][maxn + 1][maxn + maxn + 1];
main()
{
  register int i, j, k, n, s;
  < Read the input into a[0], determining n 2>;
  for (k = 1; k ≤ n; k++) < Compute a[k] from a[k - 1] 3>;
  < Print the results 4>;
}

```

2. < Read the input into a[0], determining n 2> ≡

```

fgets(a[0][0], maxn + 2, stdin);
for (n = 0; a[0][0][n] ≠ '␣'; n++) ;
a[0][0][n + n + 1] = '\\0';
for (k = 1; k ≤ n; k++) {
  fgets(a[0][k], maxn + 2, stdin);
  a[0][k][n + n + 1] = 0;
}

```

This code is used in section 1.

3. < Compute a[k] from a[k - 1] 3> ≡

```

for (j = 0; j ≤ n - k; j++) {
  for (i = 0; i ≤ n + n - k - k; i++) a[k][j][i] = '␣';
  for (i = n - k - j; i ≤ n - k + j; i += 2) {
    s = 0;
    if (a[k - 1][j][i + 1] ≡ 'o') s++;
    if (a[k - 1][j + 1][i] ≡ 'o') s++;
    if (a[k - 1][j + 1][i + 2] ≡ 'o') s++;
    a[k][j][i] = (s > 1 ? 'o' : 'x');
  }
}

```

This code is used in section 1.

4. < Print the results 4> ≡

```

for (k = 0; k ≤ n; k++) {
  printf(a[0][k]);
  for (j = 1; j ≤ k; j++) printf("␣%s", a[j][k - j]);
  printf("\\n");
}

```

This code is used in section 1.

5. Index.

a: [1](#).

fgets: [2](#).

i: [1](#).

j: [1](#).

k: [1](#).

main: [1](#).

maxn: [1](#), [2](#).

n: [1](#).

printf: [4](#).

s: [1](#).

stdin: [2](#).

- ⟨ Compute $a[k]$ from $a[k-1]$ [3](#) ⟩ Used in section [1](#).
- ⟨ Print the results [4](#) ⟩ Used in section [1](#).
- ⟨ Read the input into $a[0]$, determining n [2](#) ⟩ Used in section [1](#).

YPLAY

	Section	Page
Intro	1	1
Index	5	2