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**CS 2401 Elementary Data Structures**

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**Performance of Selection Sort**

*for (int i = 0; i < n - 1; ++i) {*

*int indexSmallest = i;*

*for (int j = i + 1; j < n; ++j) {*

*if (arr[j] < arr[indexSmallest]) {*

*indexSmallest = j;*

*}*

*}*

*int temp = arr[i];*

*arr[i] = arr[indexSmallest];*

*arr[indexSmallest] = temp;*

*}*

The total time complexity for the nested for loop, where the first loop iterates for n – 1 times, and the second loop iterates for n – i – 1 times, is:

Where k1 is the constant time complexity before the nested for loop, k­­2 is the constant time complexity between the outer and inner loop, and k3 is the constant time complexity inside the inner loop. We have that:

T(K1) = 1

1. *int i = 0*

T(K2) = 7

1. *i < n – 1*
2. *i++*
3. *int indexSmallest = i*
4. *int j = i + 1*
5. *int temp = arr[i]*
6. *arr[i] = arr[indexSmallest]*
7. *arr[indexSmallest] = temp*

T(K3) best = 3

T(K3) worst = 4

T(K3) average = 3.5

1. *j < n*
2. *j++*
3. *if(arr[j] < arr[indexSmallest])*
   1. *worst case: if statement always true, T = 2*

*indexSmallest = j*

* 1. *best case: if statement always false, T = 1*
  2. *average case: T = 1.5*

So for T(n) best, T(n) worst, T(n) average, we have