1. In the list below, $i$ passes of the selection sort algorithm have been completed, and the double bar separates the sorted part of the list from the unsorted part.

<table>
<thead>
<tr>
<th>$i$</th>
<th>sorted</th>
<th>unsorted</th>
</tr>
</thead>
</table>

(a) $\text{get\_index\_of\_smallest}(L, i)$ works by comparing pairs of items from the unsorted section. If there are $n$ items in $L$, when $\text{get\_index\_of\_smallest}(L, i)$ is executed, how many pairs of items are compared? (Your answer should be a function involving $n$ and $i$.)

$$\text{how many times does the loop iterate?}$$

$$\text{start: } i+1 \quad \text{end: } n-1$$

$$(n-1) - (i+1) + 1 \rightarrow \frac{n-i-1}{2}$$

(b) For function $\text{get\_index\_of\_smallest}(L, i)$, is there a worst case and a best case number of comparisons?

No, same. (for comparisons)

But # of assignments can vary.

Best $\rightarrow 0$  Worst $\rightarrow n-i-1$

(c) In terms of the number of items in the unsorted section, does $\text{get\_index\_of\_smallest}$ have constant running time, linear running time, quadratic running time, or some other running time?

(a) constant  (b) linear  (c) quadratic  (d) something else

(d) In function $\text{selection\_sort}$, the first time that function $\text{get\_index\_of\_smallest}$ is called, $i$ is 0; the second time, $i$ is 1; and so on. What value does $i$ have the last time that function $\text{get\_index\_of\_smallest}$ is called?

$$n-1$$

(e) For the call $\text{selection\_sort}(L)$, write a formula expressing how many comparisons are made during all the calls to $\text{get\_index\_of\_smallest}$.

$$\begin{align*}
1 + 2 + \ldots + (n-1) \\
\frac{(n-1) \cdot n}{2} \\
\frac{n^2 - n}{2}
\end{align*}$$

(f) In terms of the length of the list, does $\text{selection\_sort}$ have constant running time, linear running time, quadratic running time, or some other running time?

(a) constant  (b) linear  (c) quadratic  (d) something else