## Question 3

Suppose the problem set of music festivals is as follows: $P = \{(1, 5), (4, 7), (6, 10)\}$. Where $A = (1, 5)$, $B = (4, 7)$, and $C = (6, 10)$.

The lengths of the concerts can be determined by subtracting their start time from their end time. So we get:

The length of $A$ is $5 - 1 = 4$. The length of $B$ is $7 - 4 = 3$. The length of $C$ is $10 - 6 = 4$.

The provided greedy algorithm's greedy choice property states that there exists an optimal solution $S \subset P$ so that the shortest concert is in $S$. In this case, the greedy choice states that $B \in S$, since $B$ is the shortest concert.

With $B \in S$, it follows that neither $A$ nor $C$ can be in the solution $S$, since both $A$ and $C$ overlap with $B$. Thus, in this case, $|S| = 1$. However, $S$ is not an optimal solution to $P$, since the set $T = \{A, C\}$ has no overlaps and $|T| > |S|$, showing that $|S|$ is not maximal.

In general, choosing the shortest concert may conflict with multiple other concerts, rendering the the concerts invalid from further choosing.