Metaheuristic techniques:

The main objective of this optimization problem is to assign each vehicle i to a ride j and starting time s_i such that total profit(P) made by all the rides is maximum.
The value P is defined as total profit made by all the rides that is

Maximum P :

$$P = \sum_{i}^{N} (10.Di - Dki + B.\mu(fi - fj) - PN.(fj - fi).\mu(fj - fi))$$

Where, D_{ki} = excess distance to be covered before starting ith ride x (1 point per distance covered)

f_j = finish time for jth allocated vehicle in ith ride
= start time of jth vehicle + total time taken for the ride
B = bonus value
PN = penalty value

$$\mu(x) = \begin{bmatrix} 1; x > 0 \\ 0; x \leqslant 0 \end{bmatrix}$$

The decision variables of the solution structure are

1. N numbers of s_i that is the start time of ith ride and
2. N numbers of m_i that is the allotted vehicle for ith ride.

The constraints are: (3 +LB +UB)

A. If the start time for a ride is taken as S then S : $s_i \leq S \leq f_i$ - min($dur_{i,mj}$)

B. There should not be 2 rides i,j such that $m_i = m_j$ and $S_i \leq S_j$ but $S_i + dur_{i,mj} > S_j$

C. A ride should be completed continuously.

Here, A is bound constraint on start time and B provides the ride’s feasibility constraints.
Using those constraints, we made the **minimizing fitness function f = -P** where we take account of the penalties approach.