

# The Train Marshalling Problem

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## Abstract

The train marshalling problem is a real-life problem dealing with rearranging cars of trains. A train consists of several cars arriving at a station in a given order. Each car belongs to a certain destination. At the station we want to rearrange their order such that all cars belonging to the same destination appear consecutively in the final order. The train is sorted on the marshalling yard where the rail splits into several tracks, also called “classification” tracks. To sort the train each single car is put onto one of the “classification” tracks. Past the assignment, the cars are pulled out track-wise in order to form the final train in which all cars belonging to the same destination appear consecutively.

In general there may be several trains at the station to be rearranged at the same time, so the goal is to use as less “classification” tracks as possible for each train. Unfortunately the train marshalling problem is a NP-hard problem and the computation of an optimal solution takes long.

I present you a new lower bound which turns out in most cases to be better than previously known ones. Also I show how the analysis of an easier problem delivers very good lower and upper bounds. Furthermore I show how the solution of the easier problem can be used in most cases to calculate an optimal solution to the train marshalling problem.