

Background:

As part of a transportation infrastructure team, you are tasked with designing a logic-based safety system to control the operation of gates at a railway level crossing. This system must ensure that gates are lowered when a train is approaching or a vehicle is still on the tracks and only raised when it is completely safe. Your design will rely entirely on simple intuitive logic (Boolean logics, digital logic gates, and truth tables will be taught soon, so don't have to use any of these for this assignment), and will be implemented using an algorithm in plain English.

You are to complete the following steps:

Step 1: Exploring the Problem

1. Restate the problem in your own words.

The problem is to design a safe and reliable railway level crossing system. The system needs to make sure the gates go down whenever a train is coming or if a vehicle is still on the tracks. The gates should only go up once it is completely safe, meaning there is no train near the crossing and no car stuck on the track.

2. Identify and describe all inputs and outputs of the system.

Type	Name	Description
Input	Train sensor	Detects if a train is approaching the crossing.
Input	Vehicle sensor	Checks if a car is still on the tracks.
Input	Manual override button	Allows operators to manually control the gate in emergencies.
Input	Emergency stop	Used by drivers or staff to stop the system in case of danger.
Output	Gate position	Controls whether the gate is up (open) or down (closed).
Output	Warning lights	Flashes red lights to warn when a train is coming.
Output	Alarm	Sounds an alert to warn drivers and pedestrians.

3. Describe the context, constraints (technical, economic, social, environmental, legal), and stakeholders you can think about.

Category	Details
Context	The system is installed at a road–rail intersection to prevent accidents between trains and vehicles.
Constraints – Technical	Must be reliable and respond quickly to approaching trains.
Constraints – Economic	Should be cost-effective and affordable to install and maintain.
Constraints – Social	Must be simple and easy for drivers and pedestrians to understand.
Constraints – Environmental	Needs to operate correctly in all weather conditions (rain, fog, heat, etc.).
Constraints – Legal	Must follow railway and road safety regulations in Australia.
Stakeholders – Train Operators	Need safe passage through crossings.
Stakeholders – Drivers & Pedestrians	Require safety when crossing.
Stakeholders – Local Community	Concerned with overall safety and convenience.
Stakeholders – Railway Authorities	Ensure the system meets safety standards.
Stakeholders – Government/Regulators	Responsible for legal compliance and public safety.