# Activity 9

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# ÍNDICE

## Objective

Identify strong and weak entities in a case study from the service sector, and represent   them in an Entity–Relationship Diagram (ERD) including their relationships and  cardinalities.

## Case Study: AutoFix Mechanical Workshop

The AutoFix workshop wants to computerize the management of the repairs it performs for its customers.

Each customer is registered in the system with their basic information and may bring  one or several vehicles to the workshop.

For each vehicle, the system stores the necessary data for its identification and tracking.

Each time a vehicle enters the workshop, a repair order is created to record the main  repair information and its current status.

Within a repair order, several work lines are recorded, corresponding to the specific  tasks that are carried out.

The workshop employs several mechanics, each with their personal information and  area of specialization.

A repair order may be handled by more than one mechanic, and a mechanic may work  on several repair orders.

## Tasks to complete

• Identify the **entities** and their **attributes**.

ENTITY:
      CUSTOMER
      VEHICLE
      REPAIR_ORDER
      WORK_LINE
      MECHANIC

ATTRIBUTES:
      **CUSTOMER:** #customerID, name, phone, address.
      **VEHICLE:** #vehicleID, brand, model.
      **REPAIR_ORDER:** #repair_orderID, date, total_cost.
      **WORK_LINE:** #work_lineID, description, hours_worked.
      **MECHANIC:** #mechanicID, name, phone, specialization.

• Determine the **primary keys** for each entity.

CUSTOMER = #customerID.

VEHICLE = #vehicleID.

REPAIR_ORDER = #repair_orderID.

WORK_LINE = #work_lineID.

MECHANIC = #mechanicID.

• Indicate which entities are **strong** and which are **weak**, and explain why.

- CUSTOMER is a strong entity, because it can exist on its own.
- VEHICLE is a weak entity because dents with the customer entity.
- REPAIR_ORDER is a weak entity because it only exists if it's associated with the Vehicle entity.
- WORK_LINE is a weak entity because it only exists in a repair_order.
- MECHANIC is a strong entity because it is an independent entity.

• If an entity is weak, specify the **type of weakness**: **existence**, **identification**,

    or  **both**.

VEHICLE = identification.

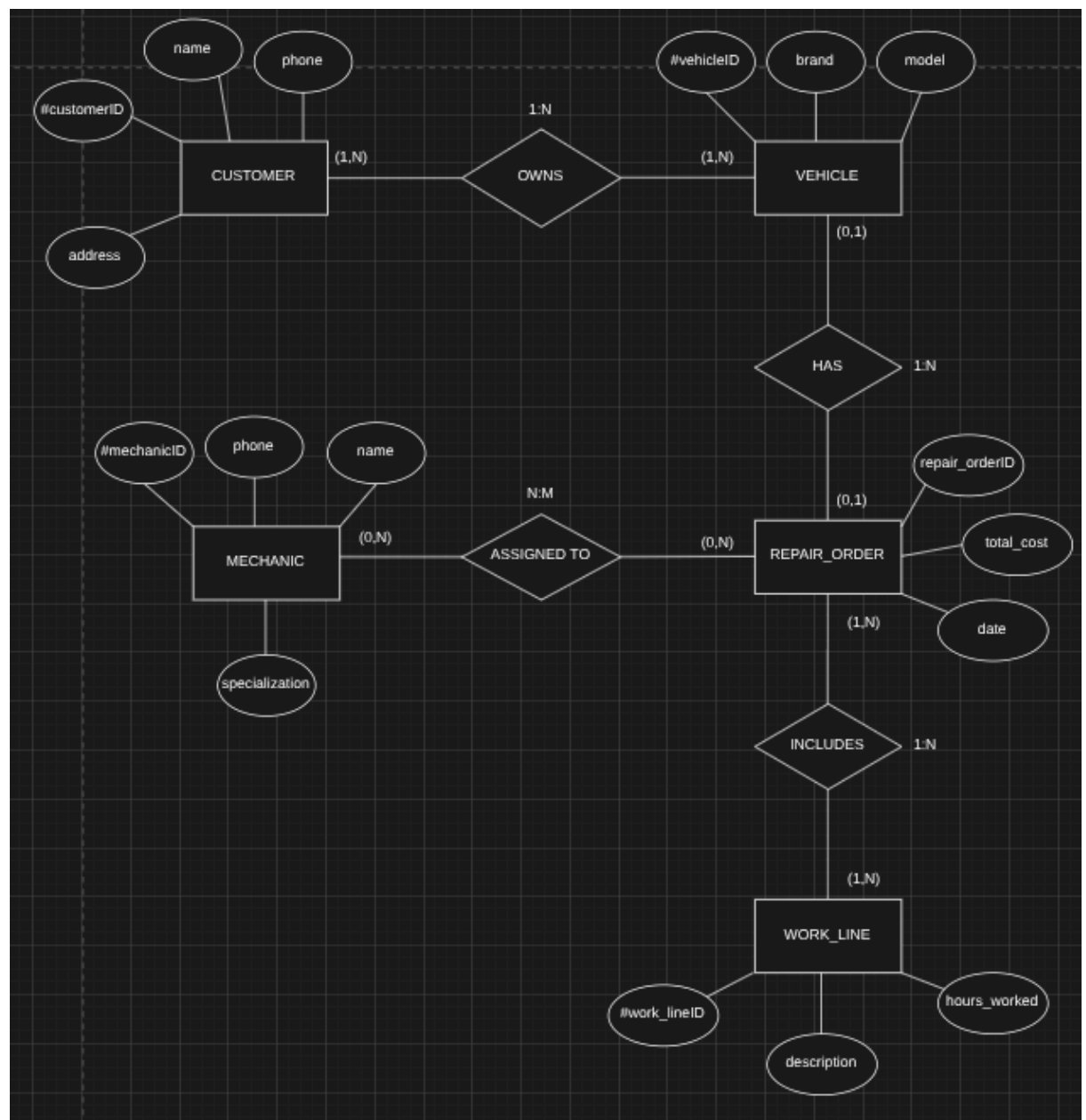REPAIR_ORDER = existence.

WORK_LINE = identification and existence.

• Establish the **relationships** between entities and specify their **minimum and maximum cardinalities**.

For each relationship, complete a table like the one below:

| Relationship | Direction | Source Entity | Target Entity | Minimum | Maximum | Justificación |
|---|---|---|---|---|---|---|
| **Owns** | CUSTOMER → VEHICLE | CUSTOMER | VEHICLE | 1 | N | A customer can have one or more vehicles. |
| **Belongs_to** | VEHICLE → CUSTOMER | VEHICLE | CUSTOMER | 1 | 1 | Each vehicle belongs to a single customer. |
| **Has** | VEHICLE → REPAIR_ORDER | VEHICLE | REPAIR_ORDER | 0 | N | A vehicle can have many repair orders. |
| **Relates_to** | REPAIR_ORDER → VEHICLE | REPAIR_ORDER | VEHICLE | 1 | 1 | Each order corresponds to a single vehicle. |
| **Includes** | REPAIR_ORDER → WORK_LINE | REPAIR_ORDER | WORK_LINE | 1 | N | An order includes several lines of work. |
| **Part_of** | WORK_LINE → REPAIR_ORDE | WORK_LINE | REPAIR_ORDER | 1 | 1 | A work line belongs to a single |

| | R | | | | | order. |
|---|---|---|---|---|---|---|
| **Assigned_to** | REPAIR_ORDER ↔ MECHANIC | REPAIR_ORDER | MECHANIC | 0 | N | An order can be handled by multiple mechanics, and one mechanic can be involved in multiple orders. (N:M ratio) |

• Draw the **complete ERD**.



## Submission instructions

Export the document in PDF format and submit it through **Google Classroom**.