Case Study – Restoration Revival

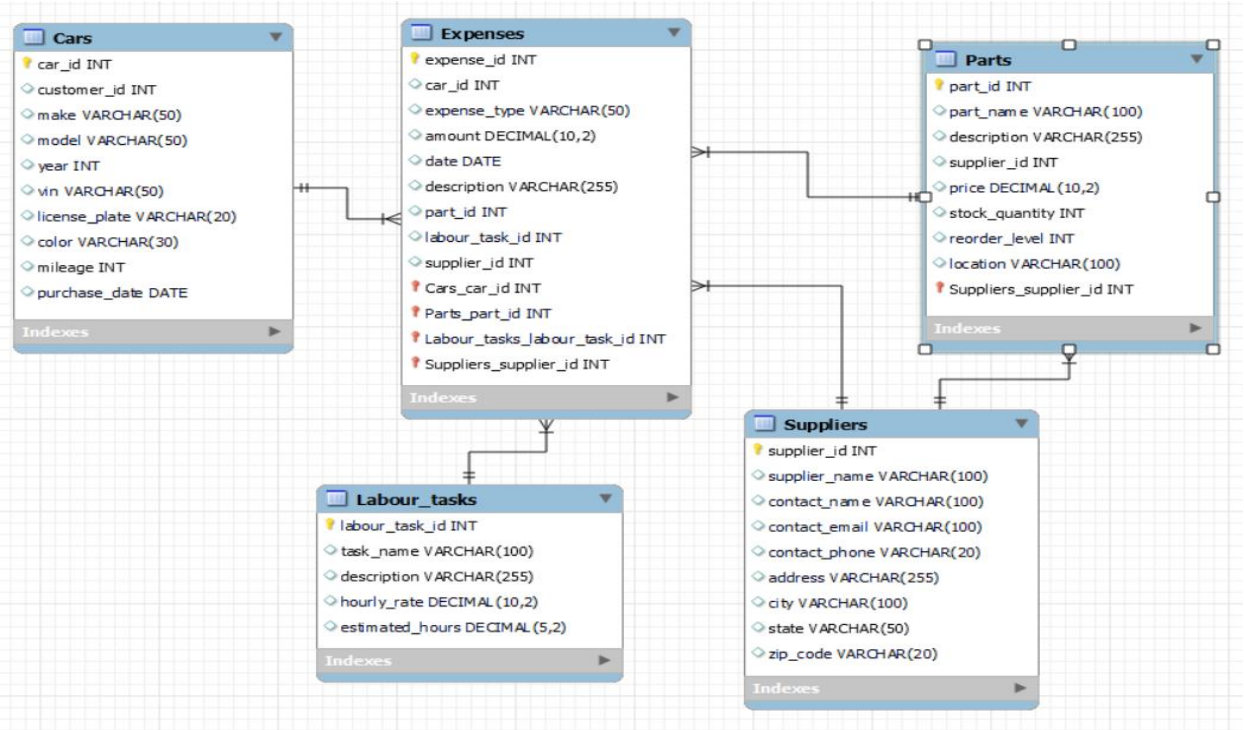
Introduction:

The Restoration_Revival database is a meticulously designed system for managing a car restoration and repair business. It encompasses several critical tables: Cars, Parts, Suppliers, Expenses, and Labour_Tasks. Each table captures key data points essential for the smooth operation and financial tracking of the business.

- **Cars**: Stores information about each car, including make, model, year, and color.
- **Parts**: Contains details about car parts, their prices, and the suppliers who provide them.
- **Suppliers**: Lists the suppliers along with their contact information and the parts they supply.
- **Expenses**: Tracks all expenses related to the restoration and repair projects.
- **Labour_Tasks**: Documents labor tasks, including descriptions, hourly rates, and estimated hours.

This comprehensive database facilitates efficient data management and analysis, supporting the business in making informed decisions, optimizing operations, and enhancing customer service.

Entity relationship diagram:



Database:

```
create database Restoration_Revival;
```

use Restoration_Revival;

Cars Table:

```
CREATE TABLE Cars (
    car_id INT AUTO_INCREMENT PRIMARY KEY,
    make VARCHAR(50),
    model VARCHAR(50),
    year INT,
    vin VARCHAR(50),
    license_plate VARCHAR(20),
    color VARCHAR(30),
    mileage INT,
    purchase_date DATE
);
```

```
INSERT INTO Cars (make, model, year, vin, license_plate, color, mileage, purchase_date) VALUES
('Toyota', 'Corolla', 2010, '1NXBU4EE0AZ169999', 'ABC123', 'Blue', 120000, '2020-01-15'),
('Honda', 'Civic', 2012, '2HGFB2F50CH510000', 'DEF456', 'Red', 100000, '2019-03-22'),
('Ford', 'Focus', 2015, '1FADP3F21FL271000', 'GHI789', 'Black', 85000, '2021-05-11'),
('Chevrolet', 'Malibu', 2018, '1G1ZC5ST4JF140000', 'JKL012', 'White', 60000, '2022-07-19'),
('Nissan', 'Sentra', 2013, '3N1AB7AP5DL700000', 'MNO345', 'Silver', 95000, '2018-11-30'),
('Hyundai', 'Elantra', 2016, 'KMHDH4AE2GU570000', 'PQR678', 'Gray', 70000, '2020-09-10'),
('Kia', 'Optima', 2017, '5XXGT4L35HG200000', 'STU901', 'Green', 65000, '2019-04-25'),
('Volkswagen', 'Jetta', 2014, '3VWLL7AJ1EM450000', 'VWX234', 'Blue', 95000, '2018-06-17'),
('Subaru', 'Impreza', 2015, 'JF1GPAA62F8270000', 'YZA567', 'Red', 80000, '2020-08-20'),
('Mazda', '3', 2011, 'JM1BL1VG0B1430000', 'BCD890', 'Black', 110000, '2019-12-29'),
('Toyota', 'Camry', 2018, '4T1B11HK7JU570000', 'EFG123', 'White', 40000, '2021-02-15'),
('Honda', 'Accord', 2019, '1HGCV1F39KA020000', 'HIJ456', 'Gray', 30000, '2022-03-10'),
('Ford', 'Fusion', 2017, '3FA6P0H79HR220000', 'KLM789', 'Silver', 50000, '2019-07-22'),
('Chevrolet', 'Cruze', 2014, '1G1PE5SB9E7400000', 'NOP012', 'Blue', 90000, '2018-01-05'),
('Nissan', 'Altima', 2016, '1N4AL3AP2GC100000', 'QRS345', 'Black', 65000, '2020-05-16'),
('Hyundai', 'Sonata', 2015, '5NPE24AF0FH010000', 'TUV678', 'Red', 85000, '2018-09-24'),
('Kia', 'Forte', 2013, 'KNAFX4A66D5650000', 'WXY901', 'White', 100000, '2017-11-13'),
('Volkswagen', 'Passat', 2012, '1VWAP7A31CC020000', 'ZAB234', 'Gray', 110000, '2019-04-01'),
('Subaru', 'Legacy', 2016, '4S3BNAC64G3050000', 'CDE567', 'Silver', 70000, '2020-06-19'),
```

('Mazda', '6', 2017, 'JM1GL1U52H1130000', 'FGH890', 'Blue', 60000, '2021-11-07'),
('Toyota', 'Avalon', 2014, '4T1BK1EB1EU030000', 'IJK123', 'Black', 90000, '2019-10-23'),
('Honda', 'Fit', 2011, 'JHMGE8H54BC020000', 'LMN456', 'Red', 120000, '2017-08-15'),
('Ford', 'Escape', 2015, '1FMCU0GX0FUC10000', 'OPQ789', 'White', 75000, '2018-12-27'),
('Chevrolet', 'Equinox', 2013, '2GNFLCEK5D6130000', 'RST012', 'Gray', 105000, '2019-09-10'),
('Nissan', 'Rogue', 2016, '5N1AT2MV1GC800000', 'UVW345', 'Silver', 68000, '2020-02-14'),
('Hyundai', 'Tucson', 2018, 'KM8J3CA47JU600000', 'XYZ678', 'Blue', 50000, '2021-05-18'),
('Kia', 'Sorento', 2012, '5XYKTDA28CG210000', 'ABC901', 'Black', 115000, '2018-04-29'),
('Volkswagen', 'Tiguan', 2017, 'WVGAV7AX8HK040000', 'DEF234', 'Red', 55000, '2020-10-12'),
('Subaru', 'Outback', 2014, '4S4BRBLC0E3260000', 'GHI567', 'White', 93000, '2019-07-25'),
('Mazda', 'CX-5', 2019, 'JM3KFBCM1K1640000', 'JKL890', 'Gray', 35000, '2022-01-20'),
('Toyota', 'RAV4', 2013, 'JTMWFREV3DD050000', 'MNO123', 'Silver', 105000, '2018-03-28'),
('Honda', 'CR-V', 2016, '5J6RM4H74GL030000', 'PQR456', 'Blue', 80000, '2020-09-06'),
('Ford', 'Edge', 2015, '2FMDK3GC8FBA50000', 'STU789', 'Black', 95000, '2019-02-11'),
('Chevrolet', 'Traverse', 2017, '1GNKRGKD0HJ100000', 'VWX012', 'Red', 70000, '2021-08-09'),
('Nissan', 'Murano', 2018, '5N1AZ2MG6JN130000', 'YZA345', 'White', 45000, '2022-04-30'),
('Hyundai', 'Santa Fe', 2012, '5XYZTDLB9CG020000', 'BCD678', 'Gray', 115000, '2018-11-19'),
('Kia', 'Sportage', 2014, 'KNDPC3AC9E7600000', 'EFG901', 'Silver', 98000, '2019-05-27'),
('Volkswagen', 'Atlas', 2019, '1V2WR2CA9KC500000', 'HIJ234', 'Blue', 40000, '2022-06-21'),
('Subaru', 'Forester', 2016, 'JF2SJGDC4GH530000', 'KLM567', 'Black', 85000, '2020-12-14'),
('Mazda', 'CX-9', 2015, 'JM3TB2BV9F0460000', 'NOP890', 'Red', 78000, '2018-08-07'),
('Toyota', 'Highlander', 2017, '5TDKZRFH5HS070000', 'QRS123', 'White', 60000, '2021-03-11'),
('Honda', 'Pilot', 2014, '5FNYF4H5XEB020000', 'TUV456', 'Gray', 98000, '2019-10-30'),
('Ford', 'Explorer', 2018, '1FM5K7D83JGA10000', 'WXY789', 'Silver', 50000, '2022-02-17'),
('Chevrolet', 'Tahoe', 2013, '1GNSCAE04DR130000', 'ZAB012', 'Black', 125000, '2017-12-08'),
('Nissan', 'Pathfinder', 2015, '5N1AR2MN3FC600000', 'CDE345', 'Blue', 95000, '2018-05-14'),
('Hyundai', 'Palisade', 2019, 'KM8R5DHE4KU030000', 'FGH678', 'White', 30000, '2022-11-04'),
('Kia', 'Telluride', 2020, '5XYP5DHC5LG010000', 'IJK901', 'Gray', 25000, '2023-02-22'),
('Volkswagen', 'Touareg', 2014, 'WVGEF9BP4ED000000', 'LMN234', 'Silver', 95000, '2019-08-16'),
('Subaru', 'Ascent', 2019, '4S4WMARD7K3420000', 'OPQ567', 'Red', 40000, '2021-12-27'),
('Mazda', 'MX-5 Miata', 2016, 'JM1NDAD76G0110000', 'RST890', 'Blue', 70000, '2020-07-05'),
('Toyota', '4Runner', 2015, 'JTEBU5JR6F5270000', 'UVW123', 'Black', 85000, '2019-03-29'),
('Honda', 'Ridgeline', 2017, '5FPYK3F78HB020000', 'XYZ456', 'White', 65000, '2021-06-11'),
('Ford', 'F-150', 2012, '1FTFW1ET3CKD50000', 'ABC789', 'Gray', 130000, '2018-02-14'),

('Chevrolet', 'Silverado', 2014, '3GCUKREC4EG200000', 'DEF012', 'Silver', 100000, '2019-04-20'),

('Nissan', 'Frontier', 2016, '1N6AD0ER5GN700000', 'GHI345', 'Blue', 75000, '2020-08-15'),

('Hyundai', 'Santa Cruz', 2021, 'KM8JCCA19MU040000', 'JKL678', 'Red', 15000, '2023-01-10'),

('Kia', 'Mojave', 2013, 'KNDJX3AE1D5070000', 'MNO901', 'Black', 120000, '2017-09-22'),

('Volkswagen', 'Amarok', 2015, 'WV1ZZZ2HZFA700000', 'PQR234', 'White', 90000, '2019-06-01'),

('Subaru', 'Baja', 2006, '4S4BT62C766100000', 'STU567', 'Gray', 140000, '2017-11-11'),

('Mazda', 'BT-50', 2014, 'MM0UP0YF100G20000', 'VWX890', 'Silver', 110000, '2018-10-20'),

('Toyota', 'Tacoma', 2017, '5TFSX5ENXHX025000', 'YZA123', 'Blue', 60000, '2021-08-31'),

('Honda', 'Element', 2008, '5J6YH18378L025000', 'BCD456', 'Red', 130000, '2016-05-13'),

('Ford', 'Ranger', 2019, '1FTER1EH6KLA25000', 'EFG789', 'Black', 35000, '2022-11-27'),

('Chevrolet', 'Colorado', 2018, '1GCGTDEN5J1280000', 'HIJ012', 'White', 45000, '2021-04-03'),

('Nissan', 'Titan', 2015, '1N6AA1E54FN500000', 'KLM345', 'Gray', 85000, '2019-02-21');

Parts Table:

```
CREATE TABLE Parts (
    part_id int auto_increment primary key,
    part_name varchar(100),
    description varchar(255),
    supplier_id int,
    price decimal(10,2),
    stock_quantity int,
    reorder_level int,
    location varchar(100),
    FOREIGN KEY (supplier_id) REFERENCES Suppliers(supplier_id)
    );
```

INSERT INTO Parts (part_name, description, supplier_id, price, stock_quantity, reorder_level, location) VALUES

('Brake Pads', 'Front brake pads for sedans', 1, 45.99, 100, 20, 'Aisle 1, Shelf B'),

('Oil Filter', 'Standard oil filter', 2, 7.99, 200, 50, 'Aisle 2, Shelf A'),

('Air Filter', 'Engine air filter', 3, 12.99, 150, 30, 'Aisle 2, Shelf C'),

('Spark Plugs', 'Set of 4 spark plugs', 4, 19.99, 80, 20, 'Aisle 3, Shelf D'),

('Battery', '12V car battery', 5, 89.99, 50, 10, 'Aisle 4, Shelf E'),

('Battery', 'Set of 2 wiper blades', 6, 89.99, 100, 25, 'Aisle 5, Shelf E'),

('Headlight Bulb', 'Single headlight bulb', 1, 9.99, 120, 30, 'Aisle 6, Shelf G'),

('Tail Light Assembly', 'Complete tail light assembly', 2, 49.99, 40, 10, 'Aisle 7, Shelf H'),

('Radiator', 'Car radiator for cooling system', 3, 120.00, 30, 5, 'Aisle 8, Shelf I'),

('Alternator', 'Car alternator', 4, 180.00, 20, 5, 'Aisle 9, Shelf J'),

('Fuel Pump', 'Fuel pump for gasoline engines', 5, 135.00, 25, 5, 'Aisle 10, Shelf K'),

('Starter Motor', 'Starter motor assembly', 6, 150.00, 15, 5, 'Aisle 11, Shelf L'),

('Timing Belt', 'Engine timing belt', 1, 60.00, 50, 10, 'Aisle 12, Shelf M'),

('Water Pump', 'Engine water pump', 2, 75.00, 40, 10, 'Aisle 13, Shelf N'),

('Exhaust Muffler', 'Exhaust system muffler', 3, 90.00, 20, 5, 'Aisle 14, Shelf O'),

('Catalytic Converter', 'Emission control device', 4, 250.00, 10, 3, 'Aisle 15, Shelf P'),

('Brake Rotor', 'Front brake rotor', 5, 55.00, 60, 15, 'Aisle 16, Shelf Q'),

('Suspension Strut', 'Front suspension strut', 6, 140.00, 30, 5, 'Aisle 17, Shelf R'),

('Shock Absorber', 'Rear shock absorber', 1, 110.00, 40, 10, 'Aisle 18, Shelf S'),

('Wheel Bearing', 'Front wheel bearing', 2, 65.00, 50, 10, 'Aisle 19, Shelf T'),

('Drive Belt', 'Serpentine drive belt', 3, 25.00, 80, 20, 'Aisle 20, Shelf U'),

('Ignition Coil', 'Ignition coil for engine', 4, 35.00, 60, 15, 'Aisle 21, Shelf V'),

('Turbocharger', 'Engine turbocharger', 5, 500.00, 5, 2, 'Aisle 22, Shelf W'),

('Intercooler', 'Turbo intercooler', 6, 200.00, 10, 3, 'Aisle 23, Shelf X'),

('Air Conditioning Compressor', 'AC compressor', 1, 300.00, 8, 2, 'Aisle 24, Shelf Y'),

('Heater Core', 'Car heater core', 2, 130.00, 15, 3, 'Aisle 25, Shelf Z'),

('Fuel Injector', 'Fuel injector assembly', 3, 90.00, 25, 5, 'Aisle 26, Shelf AA'),

('Oxygen Sensor', 'O2 sensor for emissions', 4, 60.00, 40, 10, 'Aisle 27, Shelf BB'),

('Mass Air Flow Sensor', 'MAF sensor', 5, 80.00, 20, 5, 'Aisle 28, Shelf CC'),

('Throttle Body', 'Engine throttle body', 6, 150.00, 10, 3, 'Aisle 29, Shelf DD'),

('Power Steering Pump', 'Power steering pump', 1, 175.00, 12, 3, 'Aisle 30, Shelf EE'),

('Steering Rack', 'Steering rack assembly', 2, 400.00, 5, 1, 'Aisle 31, Shelf FF'),

('Battery', 'Constant velocity joint', 3, 89.99, 30, 8, 'Aisle 32, Shelf E'),

('Differential Gear', 'Differential gear set', 4, 250.00, 10, 2, 'Aisle 33, Shelf HH'),

('Transmission Filter', 'Automatic transmission filter', 5, 35.00, 50, 10, 'Aisle 34, Shelf II');

Labour_tasks Table:

create table Labour_Tasks (

labour_task_id int auto_increment primary key,

```
task_name varchar(100),
description varchar(100),
hourly_rate decimal(10,2),
estimated_hours decimal(10,2)
);

INSERT INTO Labour_Tasks (task_name, description, hourly_rate, estimated_hours) VALUES
('Oil Change', 'Replace engine oil and oil filter', 50.00, 1.5),
('Brake Inspection', 'Inspect brake pads, rotors, and fluid', 75.00, 1.0),
('Tire Rotation', 'Rotate tires and inspect tread wear', 25.00, 0.5),
('Battery Replacement', 'Replace old battery with new one', 100.00, 0.75),
('Air Filter Replacement', 'Replace engine air filter', 30.00, 0.5),
('Spark Plug Replacement', 'Replace spark plugs', 80.00, 1.0),
('Wheel Alignment', 'Align wheels for proper vehicle handling', 70.00, 1.0),
('Oil change', 'Replace engine oil and oil filter', 120.00, 1.5),
('Transmission Service', 'Replace transmission fluid and filter', 150.00, 2.0),
('Brake Pad Replacement', 'Replace worn brake pads', 120.00, 1.5),
('Timing Belt Replacement', 'Replace engine timing belt', 200.00, 3.0),
('Wheel Bearing Replacement', 'Replace worn wheel bearings', 140.00, 2.0),
('Suspension Inspection', 'Inspect and diagnose suspension issues', 60.00, 1.0),
('Steering System Service', 'Inspect and service steering components', 90.00, 1.5),
('Exhaust System Repair', 'Repair exhaust leaks or damage', 100.00, 1.0),
('Fuel System Cleaning', 'Clean fuel injectors and throttle body', 80.00, 1.0),
('Electrical System Diagnosis', 'Diagnose and repair electrical issues', 110.00, 2.0),
('HVAC System Service', 'Service heating and cooling systems', 130.00, 2.5),
('Engine Tune-Up', 'Perform comprehensive engine tune-up', 150.00, 3.0),
('Brake Fluid Flush', 'Flush and replace brake fluid', 80.00, 1.0),
('Oil Change', 'Replace engine oil and oil filter', 100.00, 1.5),
('Power Steering Service', 'Service power steering system', 90.00, 1.0),
('Clutch Replacement', 'Replace worn clutch components', 200.00, 4.0),
('Drive Belt Replacement', 'Replace worn serpentine belts', 60.00, 1.0),
('Cooling System Inspection', 'Inspect radiator, hoses, and thermostat', 50.00, 0.5),
('Suspension Bushing Replacement', 'Replace worn suspension bushings', 120.00, 2.0),
('Ignition System Service', 'Inspect and service ignition components', 70.00, 1.0),
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('Battery Charging System Test', 'Test and diagnose battery and alternator', 40.00, 0.5),

('Emission System Inspection', 'Inspect and diagnose emission issues', 90.00, 1.5),

('Cabin Air Filter Replacement', 'Replace cabin air filter', 30.00, 0.5),

('Engine Oil Leak Repair', 'Diagnose and repair engine oil leaks', 150.00, 2.0),

('Exhaust System Inspection', 'Inspect exhaust system for leaks or damage', 50.00, 0.5),

('Transmission Repair', 'Diagnose and repair transmission issues', 200.00, 3.0),

('Engine Overhaul', 'Perform extensive engine repairs', 250.00, 5.0),

('Turbocharger Replacement', 'Replace worn turbocharger', 300.00, 4.0),

('Fuel Injector Cleaning', 'Clean and test fuel injectors', 80.00, 1.0),

('Throttle Body Cleaning', 'Clean and adjust throttle body', 60.00, 0.5),

('Steering Rack Replacement', 'Replace worn steering rack', 180.00, 3.0),

('CV Joint Replacement', 'Replace worn CV joints', 140.00, 2.5),

('Differential Repair', 'Repair or replace damaged differential', 200.00, 4.0),

('Transmission Fluid Flush', 'Flush and replace transmission fluid', 120.00, 2.0),

('Engine Mount Replacement', 'Replace worn engine mounts', 100.00, 1.5),

('Heater Core Replacement', 'Replace faulty heater core', 160.00, 2.0);

Suppliers Table:

create table Suppliers (

supplier_id int auto_increment primary key,

supplier_name varchar(100),

contact_name varchar(100),

contact_email varchar(100),

contact_phone varchar(20),

address varchar(255),

city varchar(100),

state varchar(50),

zip_code varchar(20)

);

insert into Suppliers (supplier_name, contact_name, contact_email, contact_phone, address, city, state, zip_code) values

('Auto Parts Express', 'John Smith', 'john@example.com', '123-456-7890', '123 Main St', 'India', 'KL', '12345'),

('Car Parts Depot', 'Jane Doe', 'jane@example.com', '987-654-3210', '456 Oak Ave', 'India', 'PY', '54321'),

('Motor Parts Plus', 'Michael Johnson', 'michael@example.com', '456-789-0123', '789 Elm Blvd', 'Bigcity', 'TX', '67890'),

('Speedy Auto Supplies', 'Emily Brown', 'emily@example.com', '789-012-3456', '234 Pine Rd', 'India', 'FL', '45678'),

('Precision Motors', 'Robert Lee', 'robert@example.com', '234-567-8901', '567 Cedar Lane', 'Anytown', 'IL', '23456'),

('First Gear Parts', 'Sarah Adams', 'sarah@example.com', '567-890-1234', '890 Birch St', 'Cityburgh', 'WA', '89012'),

('Roadrunner Auto Parts', 'David Wilson', 'david@example.com', '345-678-9012', '678 Maple Ave', 'Uptown', 'GA', '56789'),

('Ace Auto Components', 'Jessica Taylor', 'jessica@example.com', '890-123-4567', '901 Oakwood Dr', 'Hometown', 'PA', '34567'),

('Gearhead Garage', 'Christopher Martinez', 'chris@example.com', '901-234-5678', '123 Pinecrest Ave', 'Springsville', 'MI', '67890'),

('Fast Lane Auto Parts', 'Amanda Clark', 'amanda@example.com', '012-345-6789', '345 Elmwood Ave', 'Junction City', 'OH', '12345'),

('Mega Motors', 'Kevin Scott', 'kevin@example.com', '678-901-2345', '456 Birchwood Ln', 'Bridgeview', 'KY', '23456'),

('Golden Gear Automotive', 'Stephanie White', 'stephanie@example.com', '123-456-7890', '567 Oakdale Rd', 'Riverside', 'MD', '45678'),

('AutoTech Parts', 'Daniel Moore', 'daniel@example.com', '456-789-0123', '789 Pinehurst Blvd', 'Greenfield', 'SC', '56789'),

('Universal Car Components', 'Laura Garcia', 'laura@example.com', '789-012-3456', '890 Maplewood Ave', 'Greenfield', 'TN', '67890'),

('Velocity Auto Supplies', 'Mark Young', 'mark@example.com', '234-567-8901', '901 Cedar Hill', 'Sunset City', 'OK', '89012'),

('Supreme Auto Parts', 'Jennifer Hernandez', 'jennifer@example.com', '567-890-1234', '012 Elm St', 'Lakeside', 'WA', '12345'),

('Fast Track Motors', 'Ryan Lewis', 'ryan@example.com', '345-678-9012', '234 Oakridge Dr', 'Greenfield', 'DE', '54321'),

('ProGear Automotive', 'Melissa Turner', 'melissa@example.com', '890-123-4567', '567 Pine Ln', 'Bayside', 'KS', '98765'),

('Eagle Eye Auto Parts', 'Jason King', 'jason@example.com', '901-234-5678', '890 Elm Ave', 'Baytown', 'IA', '23456'),

('High Gear Components', 'Rachel Adams', 'rachel@example.com', '012-345-6789', '123 Cedar Blvd', 'Seaview', 'NH', '87654'),

('Speedy Wheels', 'Justin Roberts', 'justin@example.com', '678-901-2345', '456 Oakwood Ave', 'Rivertown', 'NM', '76543'),

('Roadstar Auto Parts', 'Samantha Hill', 'samantha@example.com', '123-456-7890', '789 Pine Ave', 'Mountainview', 'NV', '65432'),

('Quick Fix Automotive', 'Charles Green', 'charles@example.com', '456-789-0123', '890 Cedar Dr', 'Valley City', 'NE', '54321'),

('Motorhead Parts', 'Rebecca Martinez', 'rebecca@example.com', '789-012-3456', '012 Birchwood Ln', 'Laketown', 'OR', '43210'),

('Turbospeed Auto', 'Patrick Lee', 'patrick@example.com', '234-567-8901', '345 Oak Hill', 'Greenfield', 'ID', '21098'),

('Gear Up Auto', 'Carol Hernandez', 'carol@example.com', '567-890-1234', '678 Pinecrest Ave', 'Cliffside', 'WV', '10987'),

('Auto Parts Direct', 'Jeffrey Scott', 'jeffrey@example.com', '345-678-9012', '901 Cedar Ave', 'Riverdale', 'RI', '09876'),

('Pit Stop Auto Supplies', 'Maria Turner', 'maria@example.com', '890-123-4567', '123 Elmwood Dr', 'Hillside', 'LA', '98765'),

('Vanguard Motors', 'Gregory Adams', 'gregory@example.com', '901-234-5678', '456 Oak Dr', 'Whitewood', 'VT', '87654'),

('Top Gear Auto Parts', 'Emily Roberts', 'emilyr@example.com', '012-345-6789', '789 Pine Ln', 'Greenfield', 'AK', '76543'),

('Car Crafters', 'Aaron Hill', 'aaron@example.com', '678-901-2345', '890 Cedar Ave', 'Sunrise City', 'MS', '65432'),

('Quick Fix Motors', 'Hannah Green', 'hannah@example.com', '123-456-7890', '012 Oak Blvd', 'Mapletown', 'MT', '54321'),

('Auto Gear Experts', 'Dylan King', 'dylan@example.com', '456-789-0123', '345 Pine Ave', 'Oakville', 'ND', '43210'),

('Rapid Auto Parts', 'Emma Martinez', 'emma@example.com', '789-012-3456', '678 Cedar Ln', 'Bayview', 'HI', '21098'),

('Gear Masters', 'Matthew Lee', 'matthew@example.com', '234-567-8901', '901 Oakwood Ave', 'Pineville', 'WY', '10987'),

('Express Auto Components', 'Olivia Hernandez', 'olivia@example.com', '567-890-1234', '123 Pine Dr', 'Mountainville', 'CT', '09876'),

('Fast Fix Motors', 'Lucas Scott', 'lucas@example.com', '345-678-9012', '456 Cedar Blvd', 'Riverside', 'WI', '87654'),

('Auto Supplies USA', 'Isabella Turner', 'isabella@example.com', '890-123-4567', '789 Elm Ave', 'Oaktown', 'MN', '76543'),

('Gear Shift Auto Parts', 'Gavin Adams', 'gavin@example.com', '901-234-5678', '012 Oak Dr', 'India', 'TN', '65432'),

('Speedy Auto Service', 'Madison Roberts', 'madison@example.com', '012-345-6789', '345 Cedar Ln', 'Springfield', 'AR', '54321');

Expenses Table:

create table Expenses (

```
expense_id int auto_increment primary key,
car_id int,
expense_type_parts varchar(50),
amount decimal(10,2),
date date,
description varchar(255),
part_id int,
labour_task_id int,
supplier_id int,
foreign key(car_id) references cars(car_id),
foreign key(part_id) references parts(part_id),
foreign key(labour_task_id) references labour_tasks(labour_task_id),
foreign key(supplier_id) references suppliers(supplier_id)
);

INSERT INTO Expenses (car_id, expense_type_parts, amount, date, description, part_id, labour_task_id, supplier_id) VALUES
(1, 'Part', 150.00, '2024-01-15', 'Engine repair', 1, 1, 1),
(1, 'Labour', 200.00, '2024-01-16', 'Engine installation', NULL, 1, NULL),
(2, 'Part', 50.00, '2024-01-20', 'Oil filter replacement', 2, NULL, 2),
(3, 'Part', 75.00, '2024-01-22', 'Brake pads', 3, NULL, 3),
(2, 'Labour', 100.00, '2024-01-23', 'Brake pad installation', NULL, 2, NULL),
(4, 'Part', 60.00, '2024-02-01', 'Air filter', 4, NULL, 1),
(4, 'Labour', 80.00, '2024-02-02', 'Air filter installation', NULL, 3, NULL),
(5, 'Part', 200.00, '2024-02-05', 'Battery replacement', 5, NULL, 2),
(5, 'Labour', 50.00, '2024-02-06', 'Battery installation', NULL, 4, NULL),
(6, 'Part', 300.00, '2024-02-10', 'Transmission repair', 6, NULL, 3),
(7, 'Part', 400.00, '2024-02-15', 'Suspension replacement', 7, NULL, 1),
(8, 'Labour', 150.00, '2024-02-20', 'Suspension installation', NULL, 5, NULL),
(9, 'Part', 90.00, '2024-02-25', 'Spark plugs', 8, NULL, 2),
(10, 'Labour', 60.00, '2024-03-01', 'Spark plug installation', NULL, 6, NULL),
(21, 'Part', 70.00, '2024-03-05', 'Fuel filter', 9, NULL, 3),
(2, 'Labour', 100.00, '2024-03-10', 'Fuel filter replacement', NULL, 7, NULL),
(13, 'Part', 120.00, '2024-03-15', 'Alternator', 10, NULL, 1),
(1, 'Labour', 180.00, '2024-03-20', 'Alternator installation', NULL, 8, NULL),
```

(15, 'Part', 140.00, '2024-03-25', 'Radiator', 11, NULL, 2),

(16, 'Labour', 200.00, '2024-03-30', 'Radiator installation', NULL, 9, NULL),

(17, 'Part', 250.00, '2024-04-01', 'Exhaust system', 12, NULL, 3),

(18, 'Labour', 220.00, '2024-04-05', 'Exhaust system installation', NULL, 10, NULL),

(19, 'Part', 110.00, '2024-04-10', 'Brake discs', 13, NULL, 1),

(2, 'Labour', 130.00, '2024-04-15', 'Brake disc installation', NULL, 11, NULL),

(21, 'Part', 85.00, '2024-04-20', 'Shock absorbers', 14, NULL, 2),

(22, 'Labour', 100.00, '2024-04-25', 'Shock absorber replacement', NULL, 12, NULL),

(23, 'Part', 130.00, '2024-04-30', 'Steering pump', 15, NULL, 3),

(24, 'Labour', 140.00, '2024-05-05', 'Steering pump installation', NULL, 13, NULL),

(25, 'Part', 190.00, '2024-05-10', 'Turbocharger', 16, NULL, 1),

(26, 'Labour', 210.00, '2024-05-15', 'Turbocharger installation', NULL, 14, NULL),

(27, 'Part', 95.00, '2024-05-20', 'Timing belt', 17, NULL, 2),

(28, 'Labour', 120.00, '2024-05-25', 'Timing belt replacement', NULL, 15, NULL),

(29, 'Part', 180.00, '2024-05-30', 'Clutch kit', 18, NULL, 3),

(30, 'Labour', 250.00, '2024-06-01', 'Clutch kit installation', NULL, 16, NULL),

(31, 'Part', 90.00, '2024-06-05', 'Headlights', 19, NULL, 1),

(32, 'Labour', 70.00, '2024-06-10', 'Headlight installation', NULL, 17, NULL),

(33, 'Part', 110.00, '2024-06-15', 'Tail lights', 20, NULL, 2),

(34, 'Labour', 90.00, '2024-06-20', 'Tail light installation', NULL, 18, NULL),

(35, 'Part', 220.00, '2024-06-25', 'Fuel pump', 21, NULL, 3),

(36, 'Labour', 240.00, '2024-06-30', 'Fuel pump installation', NULL, 19, NULL),

(37, 'Part', 130.00, '2024-07-01', 'Water pump', 22, NULL, 1),

(38, 'Labour', 170.00, '2024-07-05', 'Water pump installation', NULL, 20, NULL),

(39, 'Part', 85.00, '2024-07-10', 'Thermostat', 23, NULL, 2),

(40, 'Labour', 110.00, '2024-07-15', 'Thermostat replacement', NULL, 21, NULL),

(41, 'Part', 60.00, '2024-07-20', 'Windshield wipers', 24, NULL, 3),

(42, 'Labour', 40.00, '2024-07-25', 'Windshield wiper replacement', NULL, 22, NULL),

(43, 'Part', 75.00, '2024-07-30', 'Coolant hose', 25, NULL, 1),

(44, 'Labour', 90.00, '2024-08-01', 'Coolant hose replacement', NULL, 23, NULL),

(45, 'Part', 110.00, '2024-08-05', 'Oxygen sensor', 26, NULL, 2),

(46, 'Labour', 120.00, '2024-08-10', 'Oxygen sensor replacement', NULL, 24, NULL),

(47, 'Part', 65.00, '2024-08-15', 'Fan belt', 27, NULL, 3),

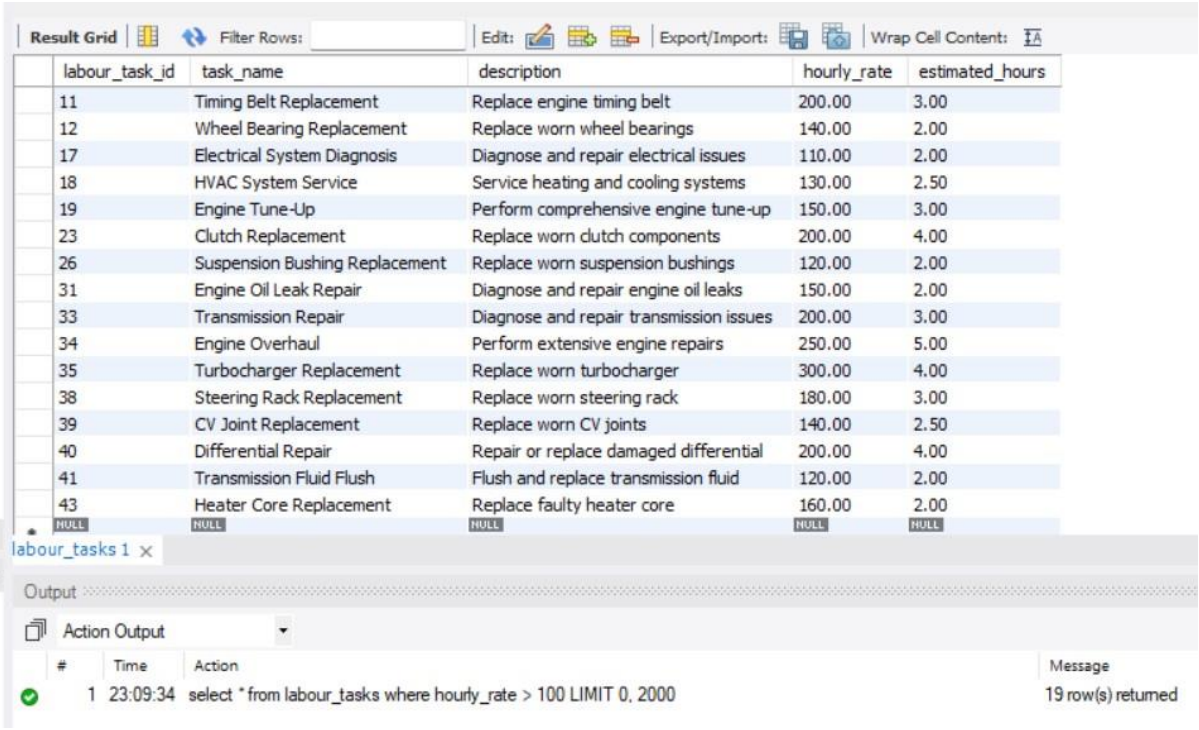
(48, 'Labour', 80.00, '2024-08-20', 'Fan belt replacement', NULL, 25, NULL),

(49, 'Part', 140.00, '2024-08-25', 'Fuel injector', 28, NULL, 1);

Case Study Problems

1. **Which tasks in the labour_tasks table have an hourly rate greater than $100 ?**

   select * from labour_tasks where hourly_rate > 100;



Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

labour_task_id	task_name	description	hourly_rate	estimated_hours
11	Timing Belt Replacement	Replace engine timing belt	200.00	3.00
12	Wheel Bearing Replacement	Replace worn wheel bearings	140.00	2.00
17	Electrical System Diagnosis	Diagnose and repair electrical issues	110.00	2.00
18	HVAC System Service	Service heating and cooling systems	130.00	2.50
19	Engine Tune-Up	Perform comprehensive engine tune-up	150.00	3.00
23	Clutch Replacement	Replace worn clutch components	200.00	4.00
26	Suspension Bushing Replacement	Replace worn suspension bushings	120.00	2.00
31	Engine Oil Leak Repair	Diagnose and repair engine oil leaks	150.00	2.00
33	Transmission Repair	Diagnose and repair transmission issues	200.00	3.00
34	Engine Overhaul	Perform extensive engine repairs	250.00	5.00
35	Turbocharger Replacement	Replace worn turbocharger	300.00	4.00
38	Steering Rack Replacement	Replace worn steering rack	180.00	3.00
39	CV Joint Replacement	Replace worn CV joints	140.00	2.50
40	Differential Repair	Repair or replace damaged differential	200.00	4.00
41	Transmission Fluid Flush	Flush and replace transmission fluid	120.00	2.00
43	Heater Core Replacement	Replace faulty heater core	160.00	2.00
NULL	NULL	NULL	NULL	NULL

labour_tasks 1 ×

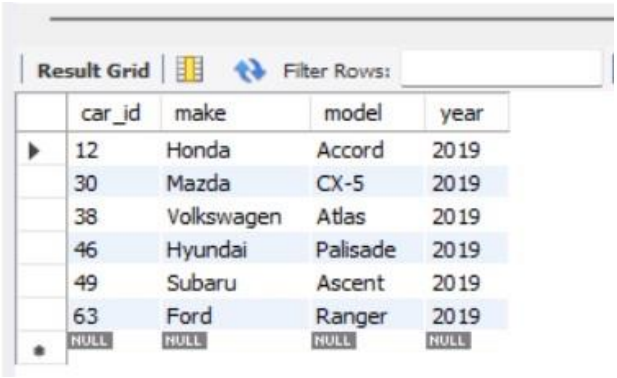
Output

Action Output

#	Time	Action	Message
1	23:09:34	select * from labour_tasks where hourly_rate > 100 LIMIT 0, 2000	19 row(s) returned

2. **Which cars were manufactured in 2019?**

   select car_id,
   make,
   model,
   year
   from cars where year = 2019;

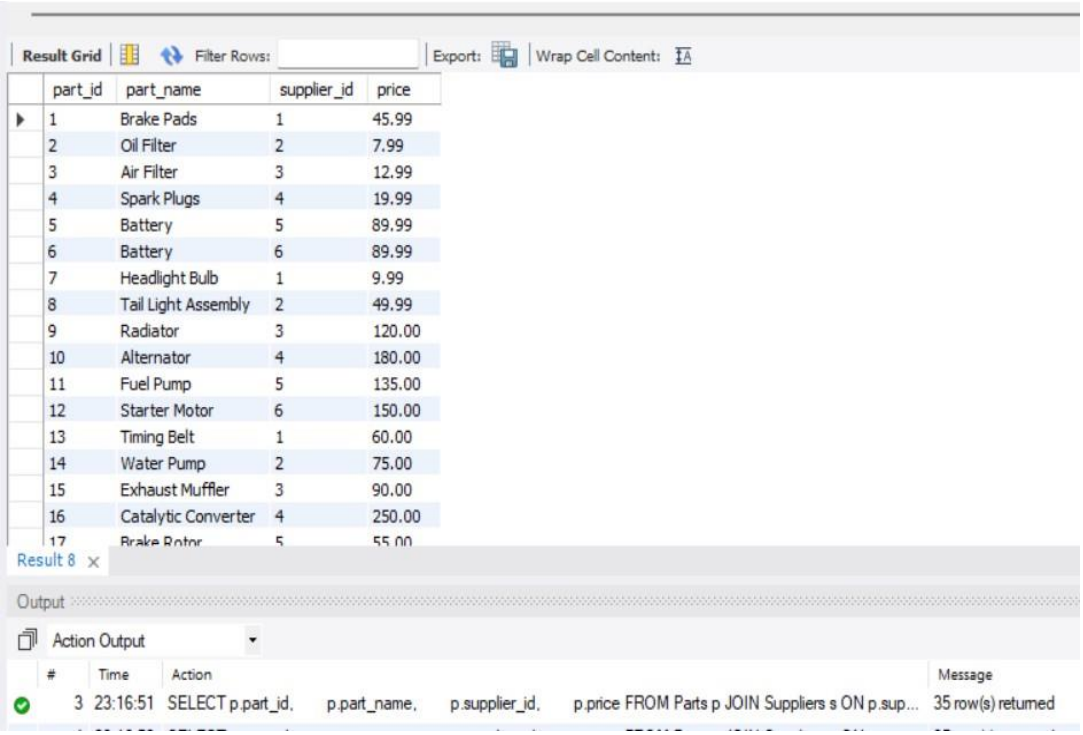


Result Grid | Filter Rows:

car_id	make	model	year
12	Honda	Accord	2019
30	Mazda	CX-5	2019
38	Volkswagen	Atlas	2019
46	Hyundai	Palisade	2019
49	Subaru	Ascent	2019
63	Ford	Ranger	2019
NULL	NULL	NULL	NULL

3. **Which parts are supplied by suppliers, along with their details?**

```
SELECT p.part_id,
    p.part_name,
    p.supplier_id,
    p.price
FROM Parts p
JOIN Suppliers s ON p.supplier_id = s.supplier_id;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

part_id	part_name	supplier_id	price
1	Brake Pads	1	45.99
2	Oil Filter	2	7.99
3	Air Filter	3	12.99
4	Spark Plugs	4	19.99
5	Battery	5	89.99
6	Battery	6	89.99
7	Headlight Bulb	1	9.99
8	Tail Light Assembly	2	49.99
9	Radiator	3	120.00
10	Alternator	4	180.00
11	Fuel Pump	5	135.00
12	Starter Motor	6	150.00
13	Timing Belt	1	60.00
14	Water Pump	2	75.00
15	Exhaust Muffler	3	90.00
16	Catalytic Converter	4	250.00
17	Brake Rotor	5	55.00

Result 8

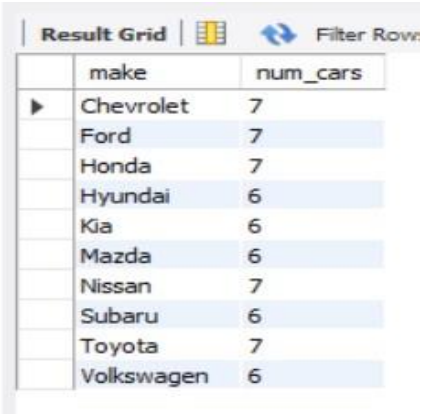
Output

Action Output

#	Time	Action	Message
3	23:16:51	SELECT p.part_id, p.part_name, p.supplier_id, p.price FROM Parts p JOIN Suppliers s ON p.sup...	35 row(s) returned

4. **How many cars are there for each make?**

```
SELECT make,
COUNT(*) AS num_cars
FROM Cars
GROUP BY make;
```



Result Grid | Filter Row

make	num_cars
Chevrolet	7
Ford	7
Honda	7
Hyundai	6
Kia	6
Mazda	6
Nissan	7
Subaru	6
Toyota	7
Volkswagen	6

5. **Find the average hourly rate for labour tasks ?**

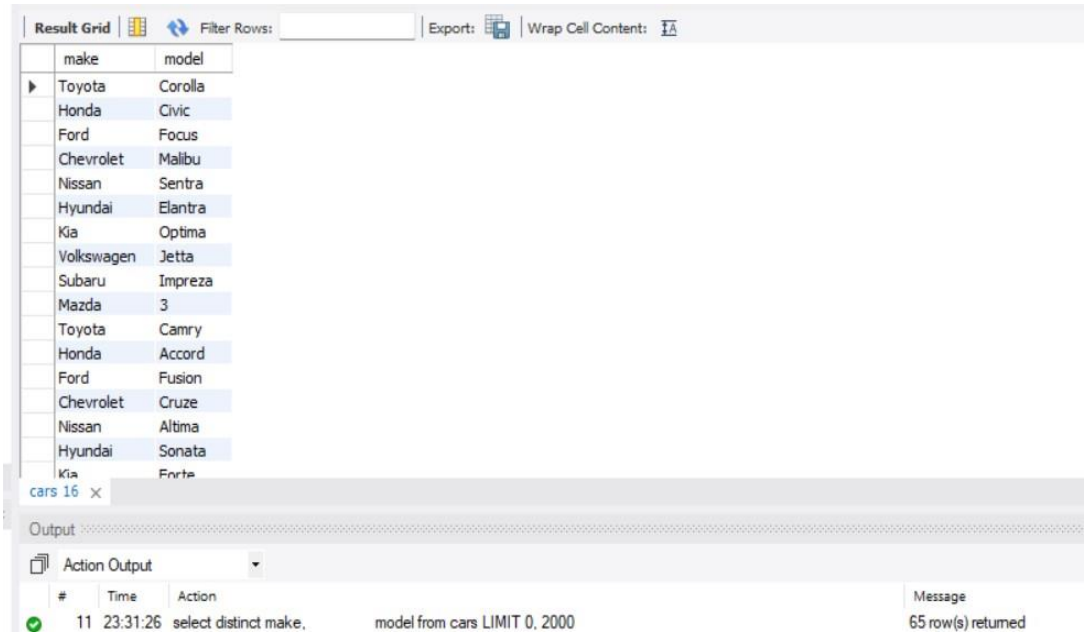
```
select avg(hourly_rate) as avg_hourly_rate
from labour_tasks;
```

Result Grid | Filter Rows:

avg_hourly_rate
111.627907

6. **What are the distinct combinations of make and model in the Cars table?**

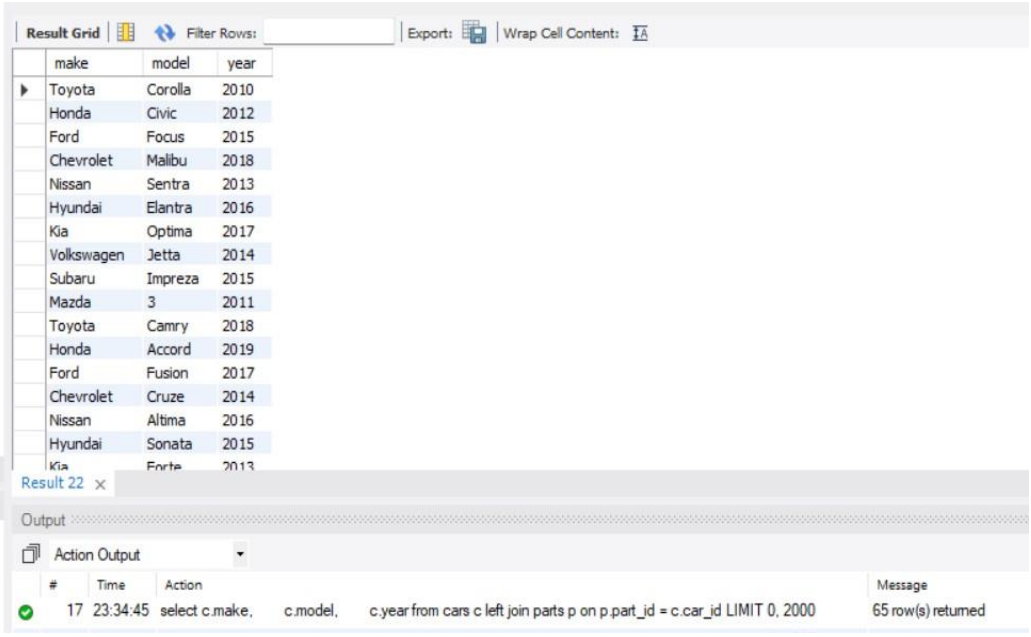
```
select distinct make,
        model
from cars;
```



make	model
Toyota	Corolla
Honda	Civic
Ford	Focus
Chevrolet	Malibu
Nissan	Sentra
Hyundai	Elantra
Kia	Optima
Volkswagen	Jetta
Subaru	Impreza
Mazda	3
Toyota	Camry
Honda	Accord
Ford	Fusion
Chevrolet	Cruze
Nissan	Altima
Hyundai	Sonata
Kia	Forte

7. **What are the makes, models, and years of cars that have corresponding parts in the parts table?**

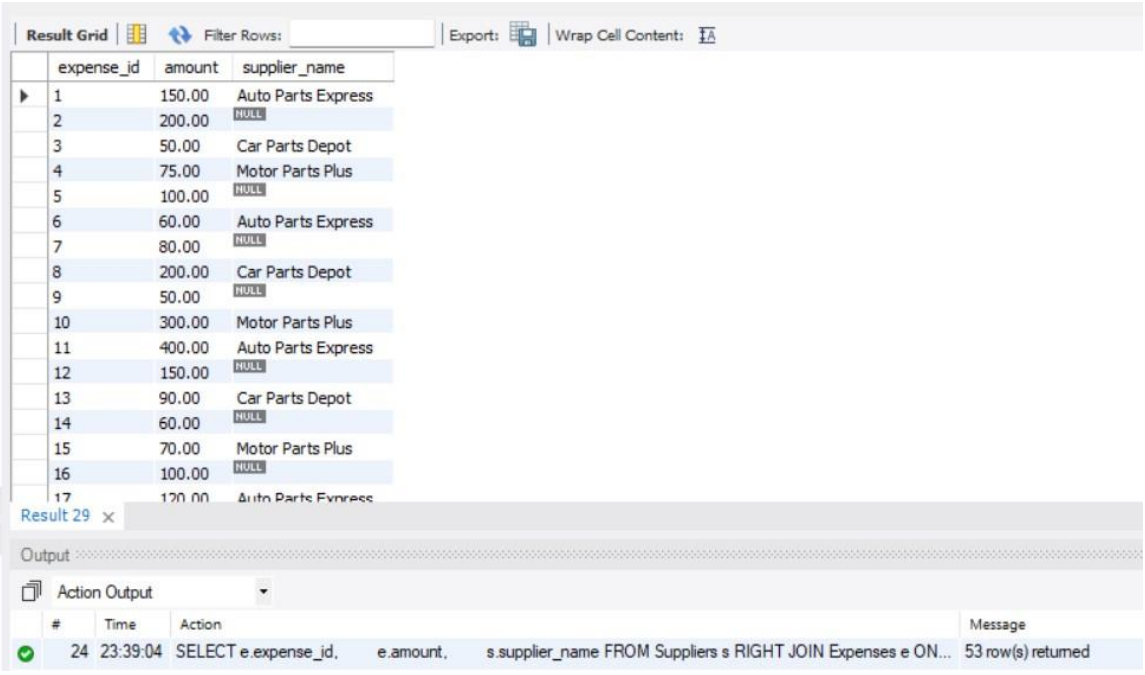
```
select c.make,
       c.model,
       c.year
from cars c
left join parts p on p.part_id = c.car_id;
```



make	model	year
Toyota	Corolla	2010
Honda	Civic	2012
Ford	Focus	2015
Chevrolet	Malibu	2018
Nissan	Sentra	2013
Hyundai	Elantra	2016
Kia	Optima	2017
Volkswagen	Jetta	2014
Subaru	Impreza	2015
Mazda	3	2011
Toyota	Camry	2018
Honda	Accord	2019
Ford	Fusion	2017
Chevrolet	Cruze	2014
Nissan	Altima	2016
Hyundai	Sonata	2015
Kia	Forte	2013

8. **Which expenses, including their amounts, are associated with suppliers, including those without any expenses?**

```
SELECT e.expense_id,
    e.amount,
    s.supplier_name
FROM Suppliers s
RIGHT JOIN Expenses e ON s.supplier_id = e.supplier_id;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

expense_id	amount	supplier_name
1	150.00	Auto Parts Express
2	200.00	NULL
3	50.00	Car Parts Depot
4	75.00	Motor Parts Plus
5	100.00	NULL
6	60.00	Auto Parts Express
7	80.00	NULL
8	200.00	Car Parts Depot
9	50.00	NULL
10	300.00	Motor Parts Plus
11	400.00	Auto Parts Express
12	150.00	NULL
13	90.00	Car Parts Depot
14	60.00	NULL
15	70.00	Motor Parts Plus
16	100.00	NULL
17	120.00	Auto Parts Express

Result 29

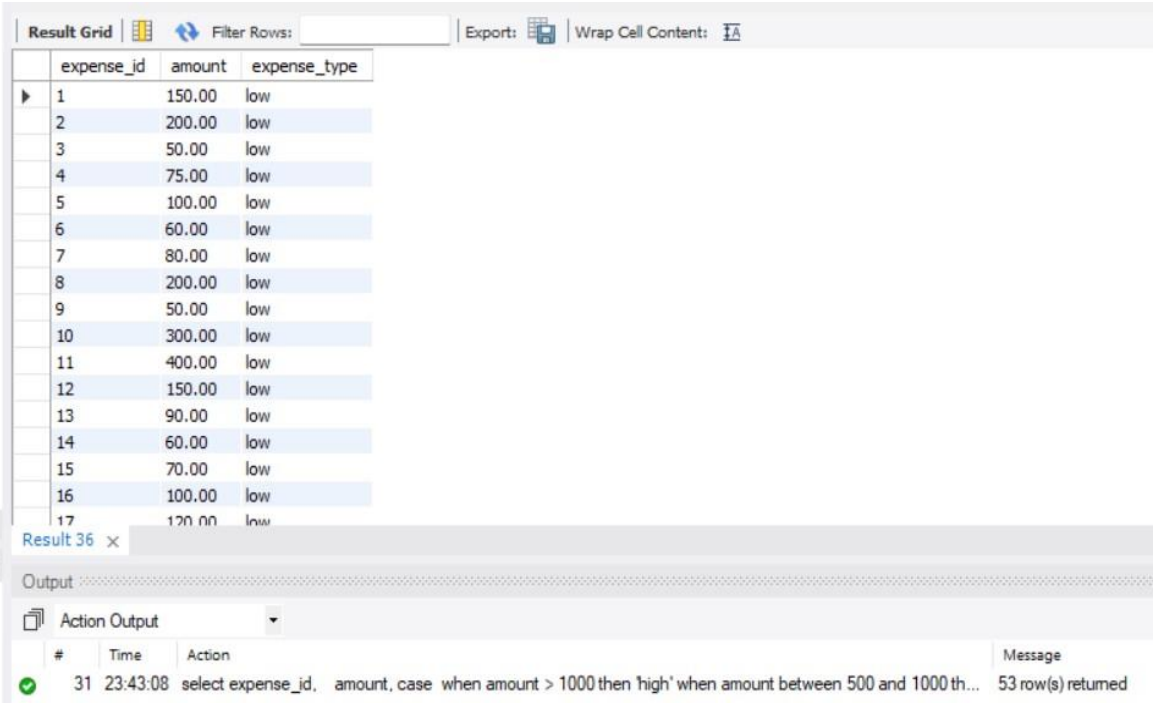
Output

Action Output

#	Time	Action	Message
24	23:39:04	SELECT e.expense_id, e.amount, s.supplier_name FROM Suppliers s RIGHT JOIN Expenses e ON...	53 row(s) returned

9. **How were expenses grouped or labeled based on their amounts in the database?**

```
select expense_id,
        amount,
case
when amount > 1000 then 'high'
when amount between 500 and 1000 then 'medium'
else 'low'
end as expense_type
from expenses;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

expense_id	amount	expense_type
1	150.00	low
2	200.00	low
3	50.00	low
4	75.00	low
5	100.00	low
6	60.00	low
7	80.00	low
8	200.00	low
9	50.00	low
10	300.00	low
11	400.00	low
12	150.00	low
13	90.00	low
14	60.00	low
15	70.00	low
16	100.00	low
17	120.00	low

Result 36

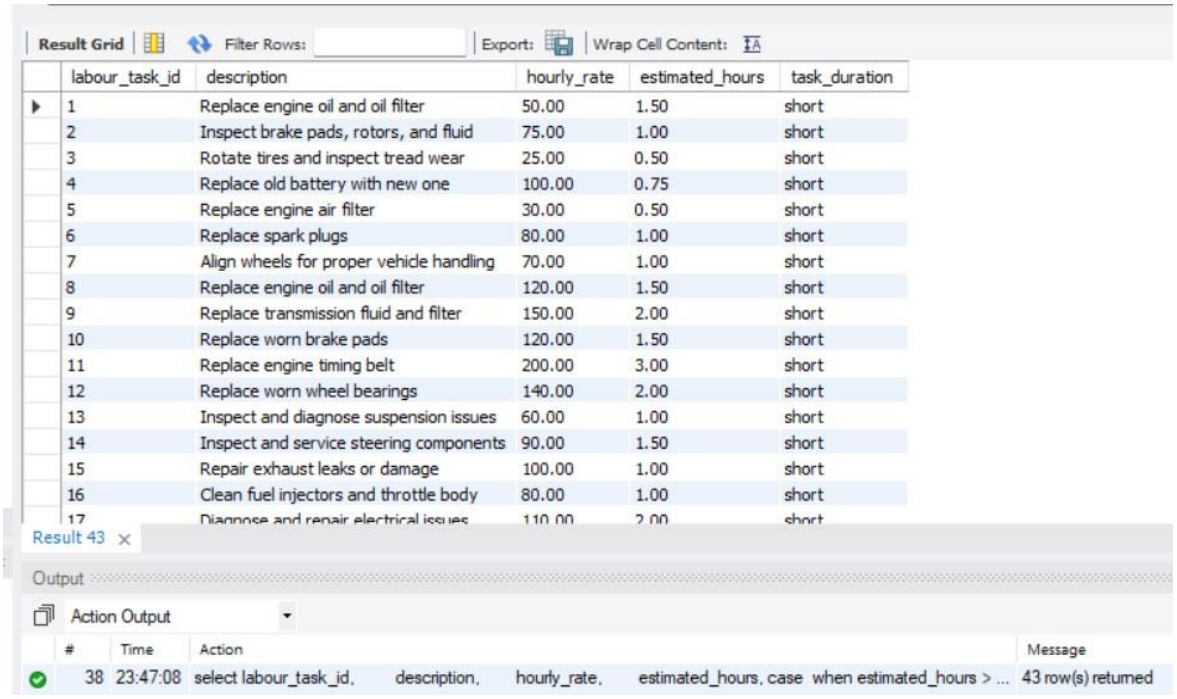
Output

Action Output

#	Time	Action	Message
31	23:43:08	select expense_id, amount, case when amount > 1000 then 'high' when amount between 500 and 1000 th...	53 row(s) returned

10. **How were the tasks categorized based on their estimated duration in the labor tasks database?**

```
select labour_task_id,
    description,
    hourly_rate,
    estimated_hours,
case
when estimated_hours > 8 then 'long'
when estimated_hours between 4 and 8 then 'medium'
else 'short'
end as task_duration
from labour_tasks;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

labour_task_id	description	hourly_rate	estimated_hours	task_duration
1	Replace engine oil and oil filter	50.00	1.50	short
2	Inspect brake pads, rotors, and fluid	75.00	1.00	short
3	Rotate tires and inspect tread wear	25.00	0.50	short
4	Replace old battery with new one	100.00	0.75	short
5	Replace engine air filter	30.00	0.50	short
6	Replace spark plugs	80.00	1.00	short
7	Align wheels for proper vehicle handling	70.00	1.00	short
8	Replace engine oil and oil filter	120.00	1.50	short
9	Replace transmission fluid and filter	150.00	2.00	short
10	Replace worn brake pads	120.00	1.50	short
11	Replace engine timing belt	200.00	3.00	short
12	Replace worn wheel bearings	140.00	2.00	short
13	Inspect and diagnose suspension issues	60.00	1.00	short
14	Inspect and service steering components	90.00	1.50	short
15	Repair exhaust leaks or damage	100.00	1.00	short
16	Clean fuel injectors and throttle body	80.00	1.00	short
17	Diagnose and repair electrical issues	110.00	2.00	short

Result 43

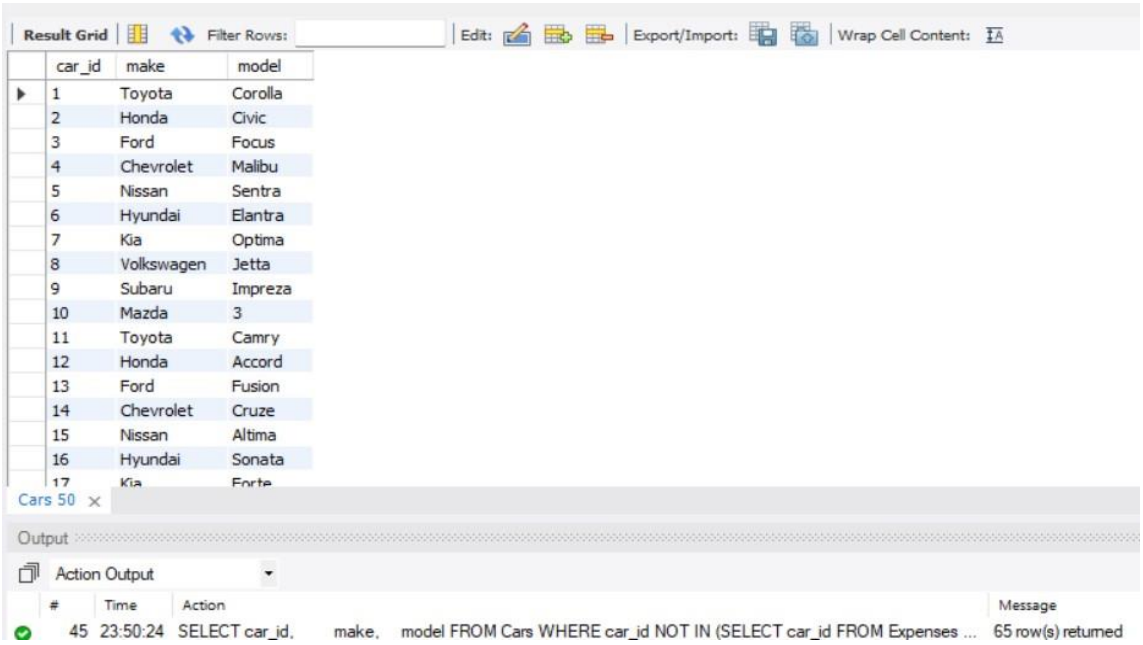
Output

Action Output

#	Time	Action	Message
38	23:47:08	select labour_task_id, description, hourly_rate, estimated_hours, case when estimated_hours > ...	43 row(s) returned

11. What query identifies cars that haven't incurred expenses exceeding $1000?

```
SELECT car_id,
    make,
        model
FROM Cars
WHERE car_id NOT IN (SELECT car_id FROM Expenses WHERE amount > 1000);
```



Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

car_id	make	model
1	Toyota	Corolla
2	Honda	Civic
3	Ford	Focus
4	Chevrolet	Malibu
5	Nissan	Sentra
6	Hyundai	Elantra
7	Kia	Optima
8	Volkswagen	Jetta
9	Subaru	Impreza
10	Mazda	3
11	Toyota	Camry
12	Honda	Accord
13	Ford	Fusion
14	Chevrolet	Cruze
15	Nissan	Altima
16	Hyundai	Sonata
17	Kia	Forte

Cars 50

Output

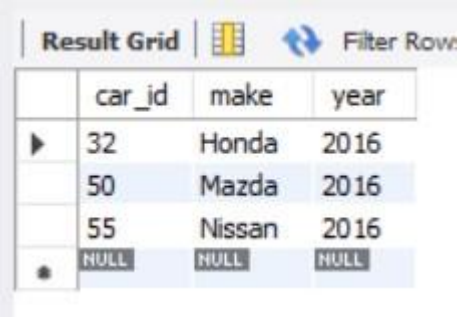
Action Output

#	Time	Action	Message
45	23:50:24	SELECT car_id, make, model FROM Cars WHERE car_id NOT IN (SELECT car_id FROM Expenses ...	65 row(s) returned

12. **What cars are blue and made in the same year as some cars made in 2016?**

```
select * from cars;

select car_id,
    make,
    year
from cars where color = 'blue'
AND car_id IN (
  SELECT car_id
  FROM Cars
  WHERE year = 2016
);
```



car_id	make	year
32	Honda	2016
50	Mazda	2016
55	Nissan	2016
NULL	NULL	NULL