

SECTION 1

Vehicle layouts

USE THIS SPACE FOR LEARNER NOTES

Learning objectives

After studying this section you should be able to:

- Identify the engine arrangements found in a range of light vehicles.
- Identify the driveline configurations for a range of vehicles.
- State advantages and disadvantages of each layout.
- Identify transmission components for front-wheel drive and rear-wheel drive vehicles.
- Explain the difference between all-wheel drive and four-wheel drive.

Key terms

Transverse engine The engine is fitted across the vehicle.

All-wheel drive (AWD) A term associated with vehicles that have permanent four-wheel drive.

Four-wheel drive (4WD or 4x4) This term is usually used where vehicles have selectable four-wheel drive.

Longitudinal (in-line) engine The engine is positioned in the centre line of the vehicle.

Propeller shaft (propshaft) Transmits torque from the gearbox to the final drive.

Drive shaft A shaft designed to take drive from the final drive to the driven wheels.

LAYOUT OF POWER TRAIN AND TRANSMISSION COMPONENTS



Look at the following diagrams and answer the four questions:

- 1 Describe the engine configuration and drive layout of the following vehicles.
- 2 State a make and model of vehicle for each layout.

- 3 Give advantages of each layout using the word bank below:

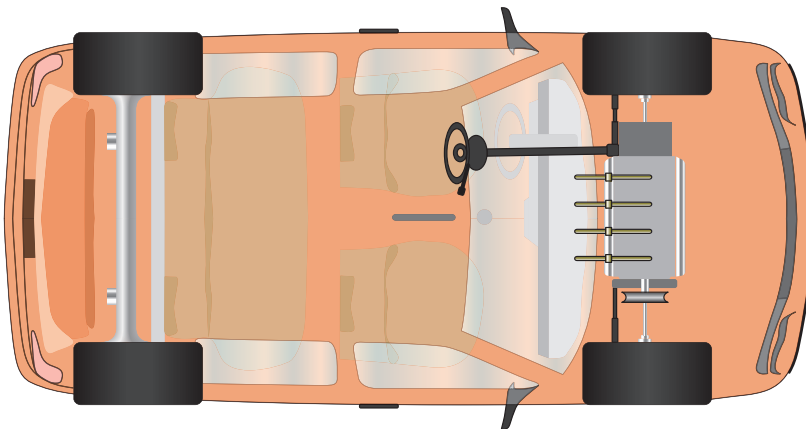
good weight distribution
easier to fit larger engines
More room in the passenger compartment
good traction

better protection in a front end crash
easy engine cooling
good vehicle handling (even weight distribution)

- 4 State the disadvantages of each layout using the following word bank:

Difficult engine cooling
Only two seats
Heavy Steering

Reduced passenger space due to transmission tunnel
Long distance for clutch and throttle controls



- 1 transverse front engine, front-wheel drive

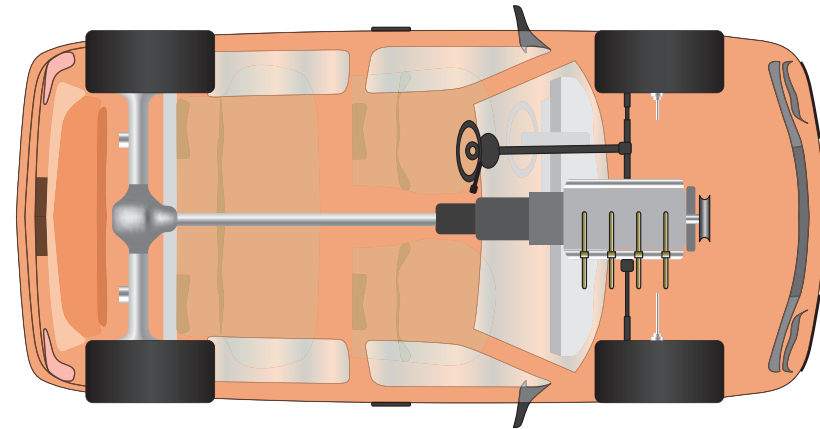
- 2 Make: Ford Model: Mondeo

- 3 Advantages

- good traction
- easy engine cooling
- more room in the passenger compartment
- better protection in a front-end crash

- 4 Disadvantage

- heavy steering



- 1 front longitudinal (in-line) engine, rear-wheel drive

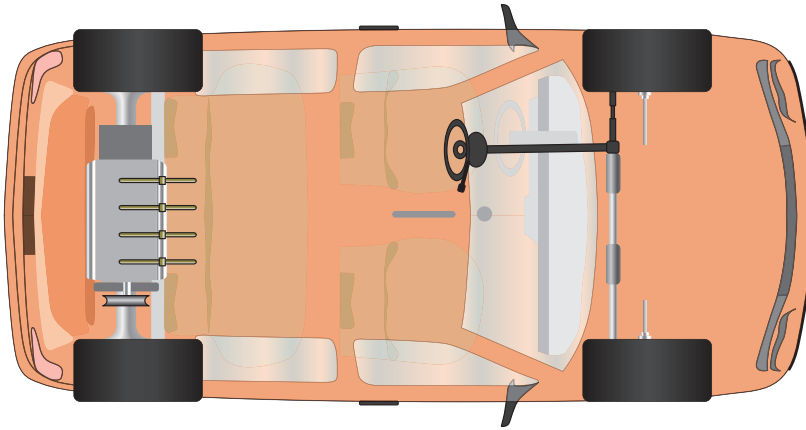
- 2 Make: BMW Model: 5 Series

- 3 Advantages

- good weight distribution
- easy engine cooling
- good traction
- easier to fit larger engines

- 4 Disadvantage

- reduced passenger space due to transmission tunnel



1 rear engine, rear-wheel drive

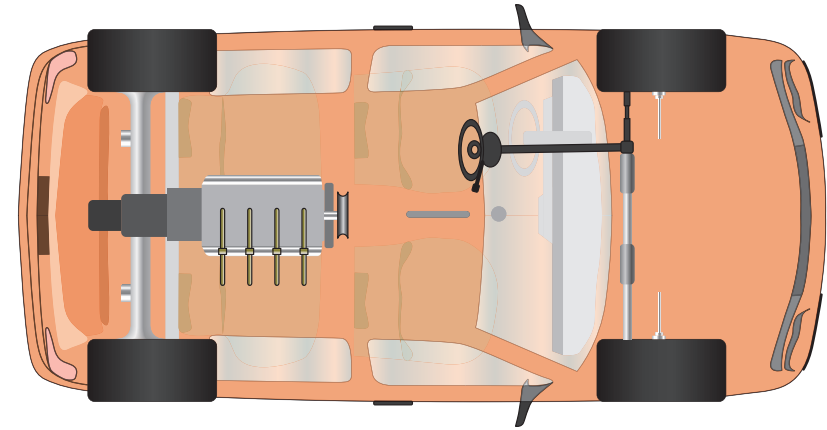
2 Make: VW Model: Beetle

3 Advantages

- good traction
- more room in passenger compartment

4 Disadvantages

- difficult engine cooling
- long distance for clutch and throttle controls



1 longitudinal (in-line) mid-engine, rear-wheel drive

2 Make: Ferrari Model: 360

3 Advantages

- good vehicle handling (even weight distribution)
- good traction

4 Disadvantage

- only two seats

MID-ENGINE TYPES OF LAYOUT

Mid-engine vehicles may have transversely mounted engines.

Or

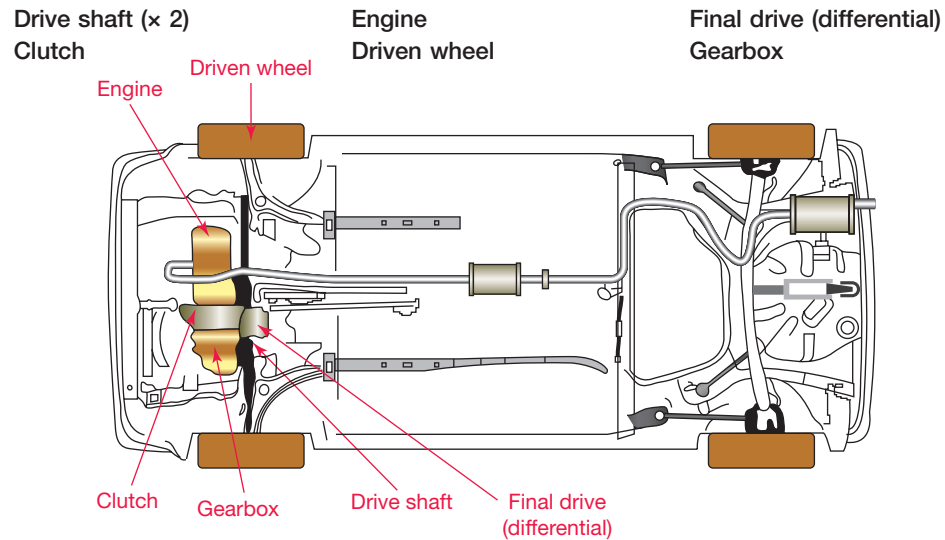
In-line or longitudinal engines such as the Porsche Boxster.

Describe engine positioning for:

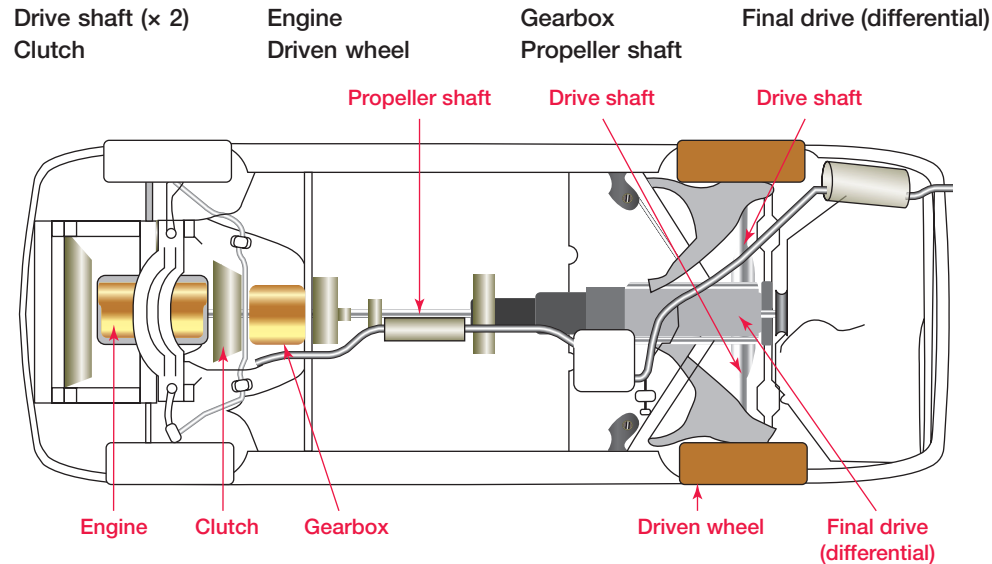
1 Rear-wheel drive – engine behind rear axle line

2 Mid-engine – engine in front of rear axle line

Label the front-wheel drive layout below using the following terms:



Label the rear-wheel drive layout below using the following terms:

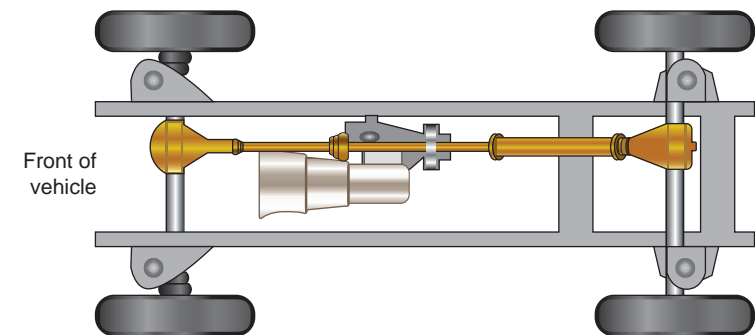


Arrange with your supervisor in your college or training workshop to have vehicles safely raised on vehicle hoists so you can draw the basic layout of the transmission components of:

- A transverse engine front-wheel drive
- A longitudinal mounted front engine rear-wheel drive.

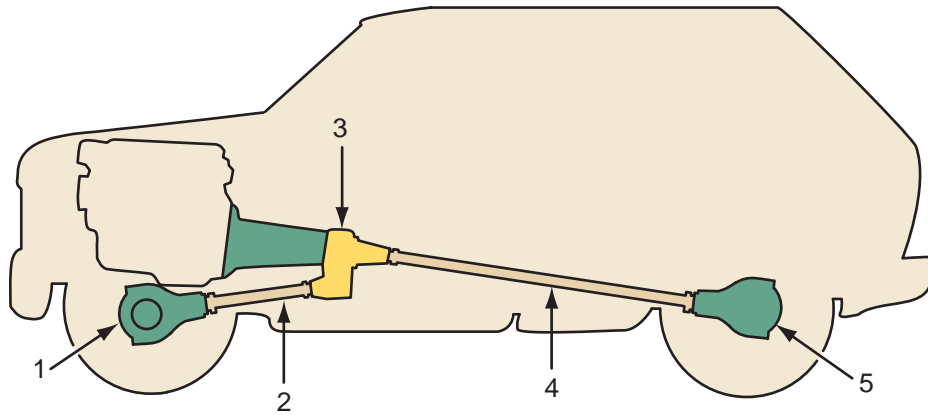
FOUR-WHEEL DRIVE AND ALL-WHEEL DRIVE

Four-wheel drive



This type of drive is mainly found in off-road vehicles. Two or four-wheel drive can be selected by the driver.

Name the numbered components on this four-wheel drive layout:



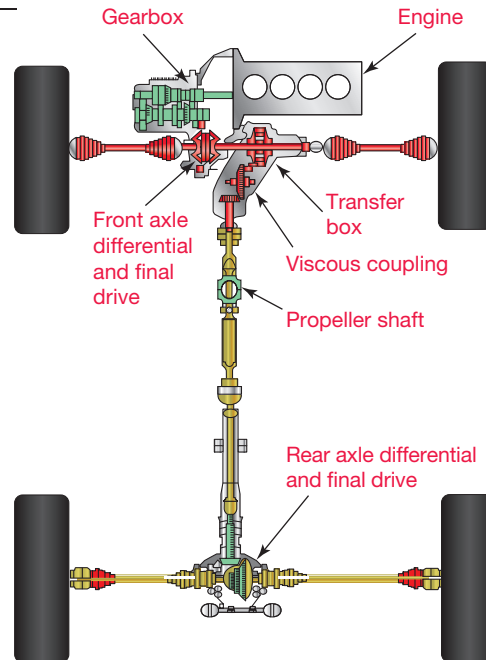
- | | |
|--------------------------------|-------------------------------|
| 1 <u>front drive axle</u> | 4 <u>rear propeller shaft</u> |
| 2 <u>front propeller shaft</u> | 5 <u>rear drive axle.</u> |
| 3 <u>transfer box</u> | |

All-wheel drive

Permanent four-wheel drive used for performance vehicles. Torque split is often controlled electronically between front and rear axles. These vehicles are often evolved from front-wheel drive vehicles.

Label the drawing with these components:

- Front axle differential and final drive
- Transfer box
- Rear axle differential and final drive
- Gearbox
- Propeller shaft
- Viscous coupling
- Engine



Multiple choice questions

Choose the correct answer from a), b) or c) and place a tick [✓] after your answer.

1 What component allows four-wheel drive to be transmitted to both axles on a four-wheel drive car?

- a) final drive []
- b) transfer box [✓]
- c) clutch. []

3 Complete the following abbreviations:

- a) FWD – Front-wheel drive
- b) RWD – Rear-wheel drive
- c) AWD – All-wheel drive
- d) 4WD – Four-wheel drive.

2 What is a disadvantage of having engines at the rear of a vehicle?

- a) difficult to cool the engine [✓]
- b) poor traction []
- c) heavy steering. []