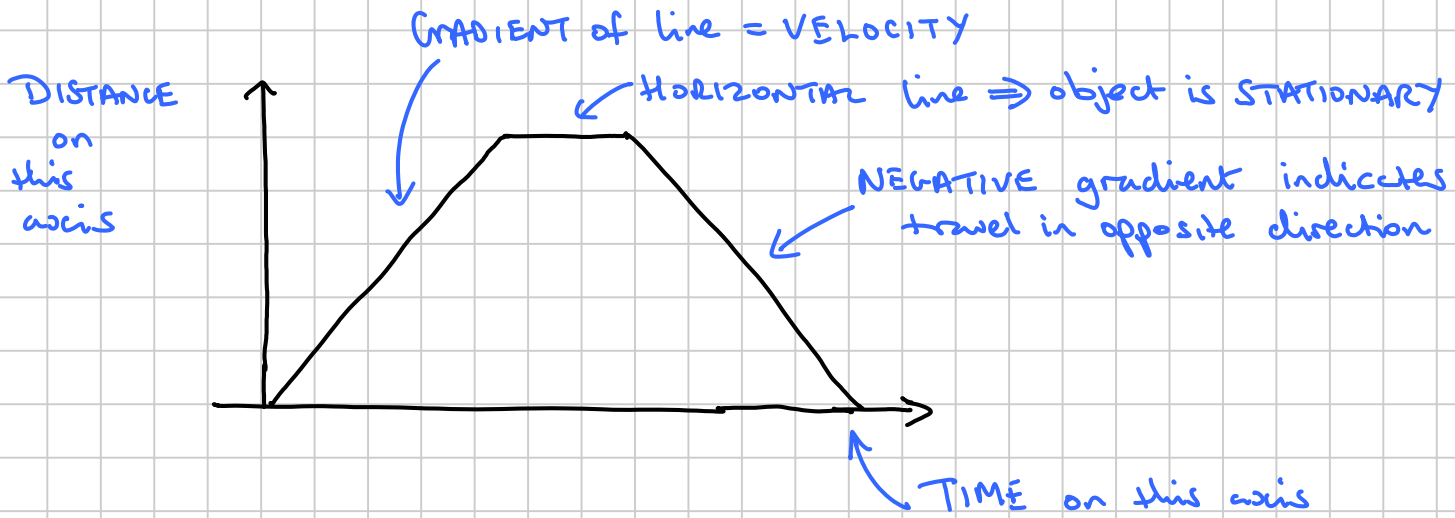


Distance-Time Graphs and Velocity-Time Graphs

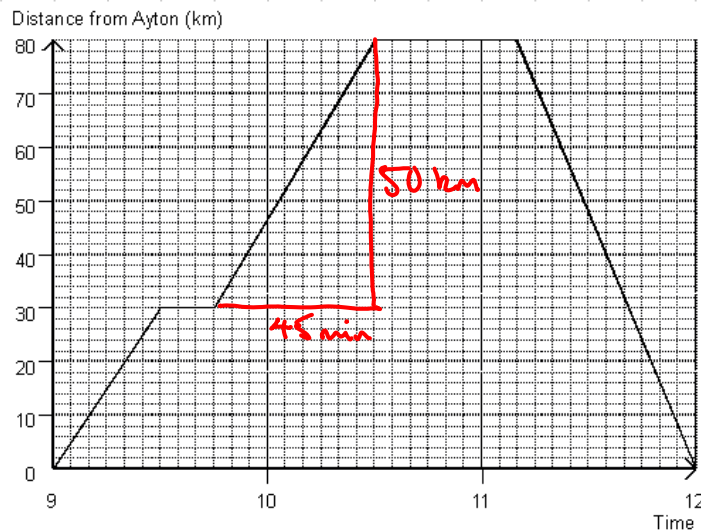
Distance-Time Graphs



Distance-Time Graphs Example

The graph below shows the journey of a car from Ayton to Beeton (a town 80km from Ayton) and back again. Using the graph, answer the following questions:

- At what time did the car stop for the first time?
- What was the car's speed from the first stop to Beeton?
- For how long did the car stop at Beeton?
- On which part of the journey did the car travel fastest? What was its speed on that part of the journey?



(a) 9:30 am

(b) Use $S = \frac{D}{T}$ or find gradient

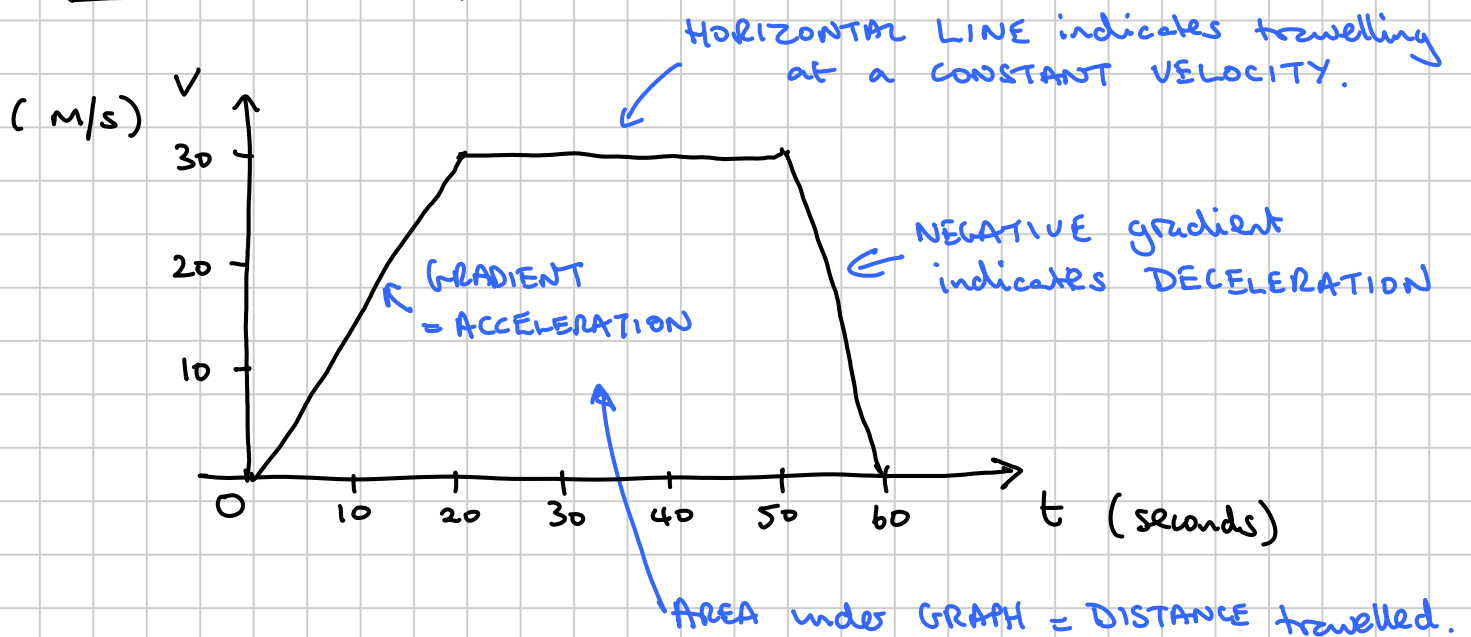
$$\begin{aligned}\text{Speed} &= \frac{50 \text{ km}}{45 \text{ min}} \\ &= 1.1 \text{ km/min} \\ &= 1.1 \times 60 \text{ km/hr} \\ &= 66.6 \text{ km/hr}\end{aligned}$$

(c) 40 minutes

(d) Steepest gradient is last part from Beeton back to Ayton

$$\begin{aligned}\text{Speed} &= \frac{80 \text{ km}}{50 \text{ min}} \\ &= 1.6 \text{ km/min} \\ &= 1.6 \times 60 \text{ km/hr} \\ &= \underline{96 \text{ km/hr}}\end{aligned}$$

Velocity-Time Graphs



(a) Find the acceleration over the first 20 seconds

$$\frac{30 \text{ m/s}}{20 \text{ s}} = 1.5 \text{ m/s/s} \quad \text{or} \quad 1.5 \text{ m/s}^2$$

(b) Find the acceleration over the last 10 seconds

$$-\frac{30}{10} = -3 \text{ m/s}^2$$

(negative acceleration is deceleration).

(c) Find the total distance travelled in 60 seconds.

This is equal to the area under the graph

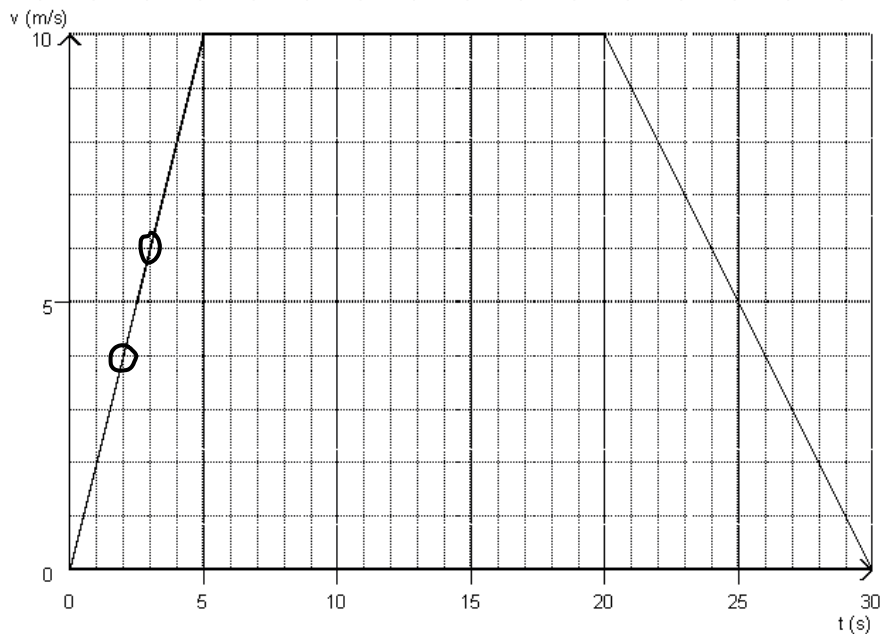
$$\begin{aligned} \text{Area of trapezium} &= \frac{1}{2} (a+b) h \\ &= \frac{1}{2} (30 + 60) \times 30 \\ &= \frac{1}{2} \times 90 \times 30 \\ &= \underline{\underline{1350 \text{ metres}}} \end{aligned}$$

$$\frac{1}{2} \times 90 \cancel{\text{s}} \times 30 \frac{\text{m}}{\cancel{\text{s}}}$$

Velocity - Time Graphs Example

Remember -

- The GRADIENT of a velocity-time graph gives the **ACCELERATION**
- The AREA under a velocity-time graph gives the **DISTANCE TRAVELLED**



The diagram shows the journey of a car between two traffic lights.

- What is the car doing between 5 seconds and 20 seconds?
- What is the acceleration of the car after 3 seconds?
- What is the total distance travelled by the car?
- What is the average speed of the car over this journey?

(a) The car is travelling at a constant velocity.

(b) acceleration = gradient = $\frac{10}{5} = 2 \text{ m/s}^2$

(c) Distance travelled = area under graph
= area of trapezium
= $\frac{1}{2}(a+b)h$
= $\frac{1}{2}(30+15)10$
= 225 m

(d) Ave speed = $\frac{D}{T} = \frac{225}{30}$
= 7.5 m/s