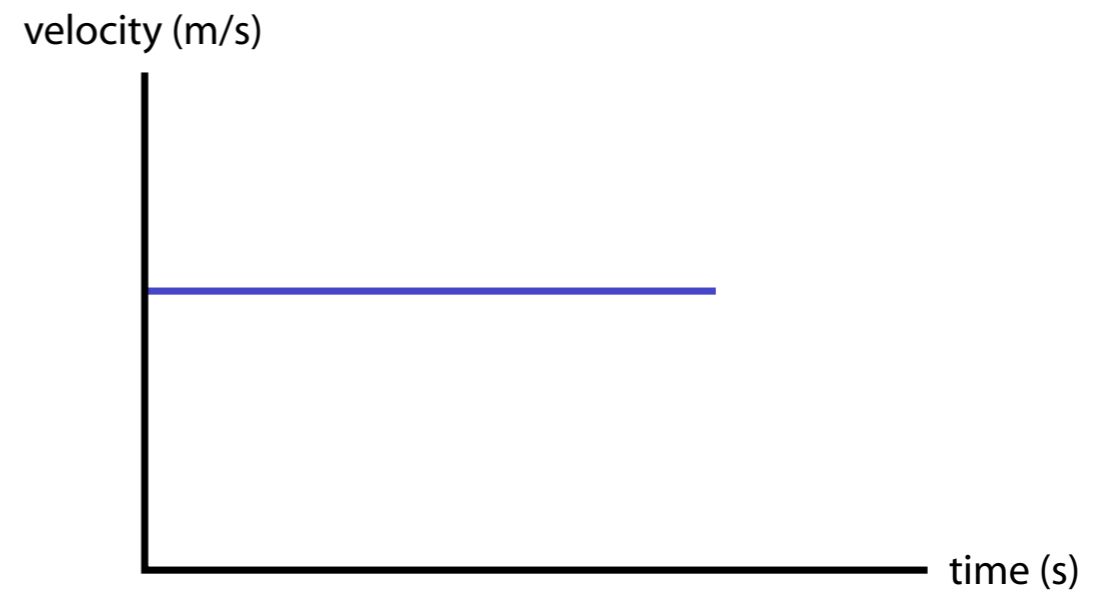
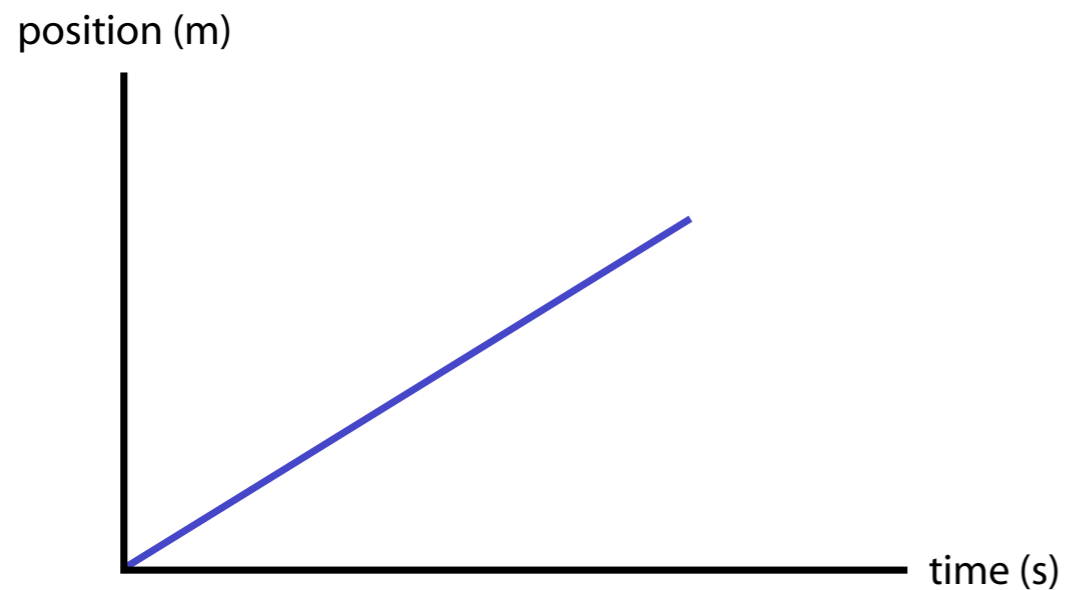


Graphs of motion

- Constant velocity
- Constant acceleration
- Interpreting position-time graphs
- Interpreting velocity-time graphs
- Solving problems with graphs

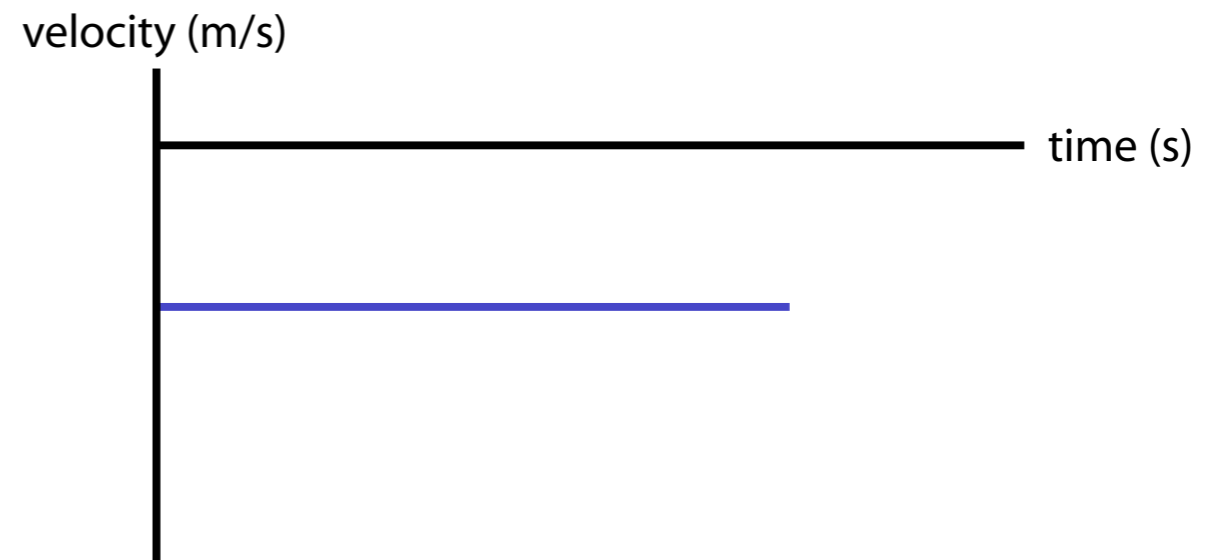
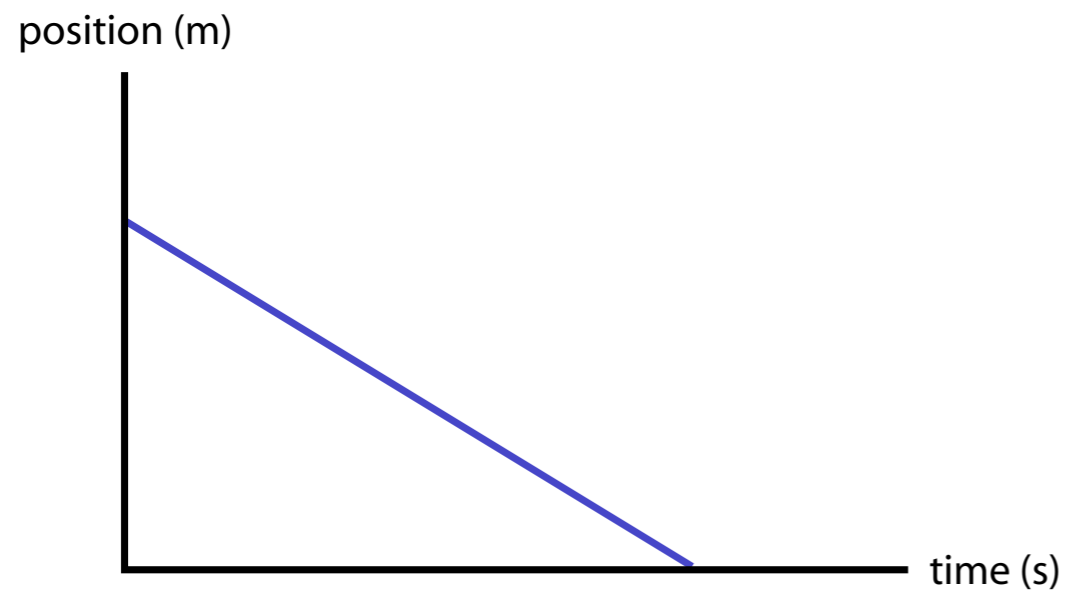
Constant velocity

- The rate of change of **position** with respect to time is the **velocity**.
- **Constant velocity** in the positive direction.



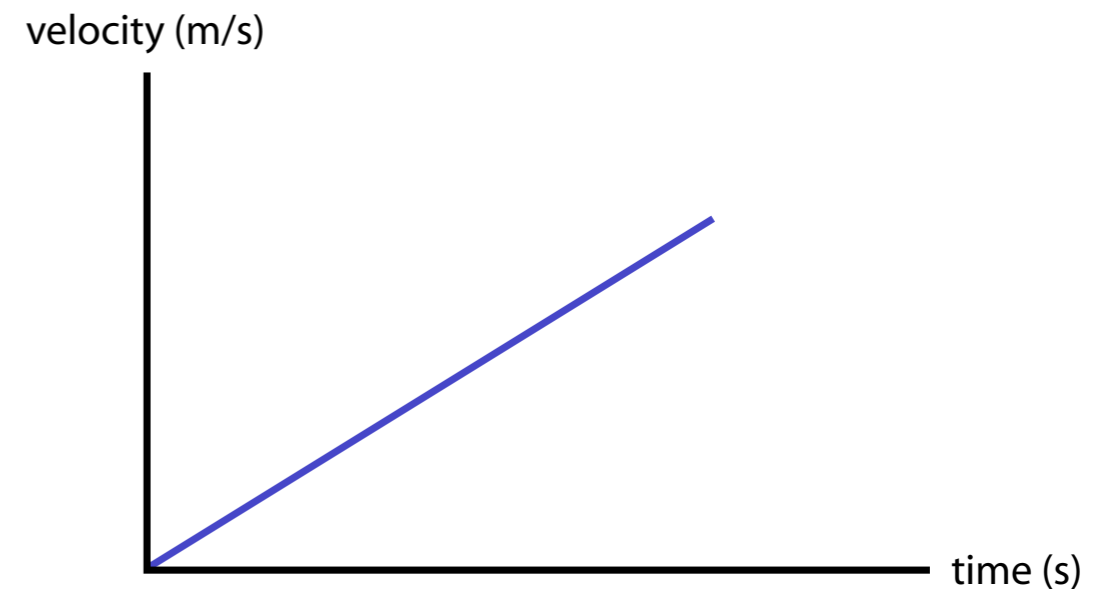
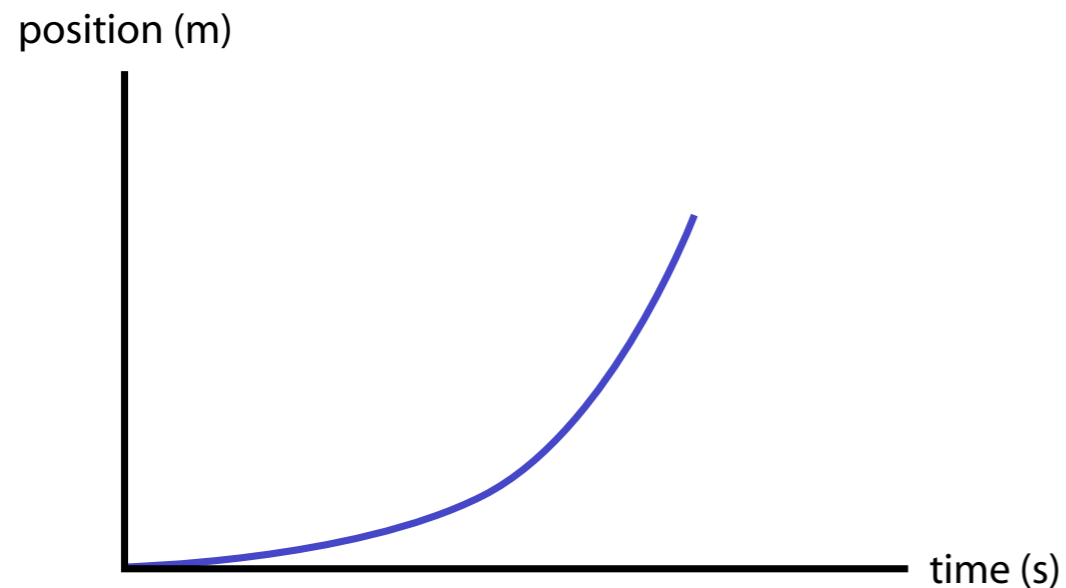
Constant velocity

- Constant velocity in the negative direction.



Constant acceleration

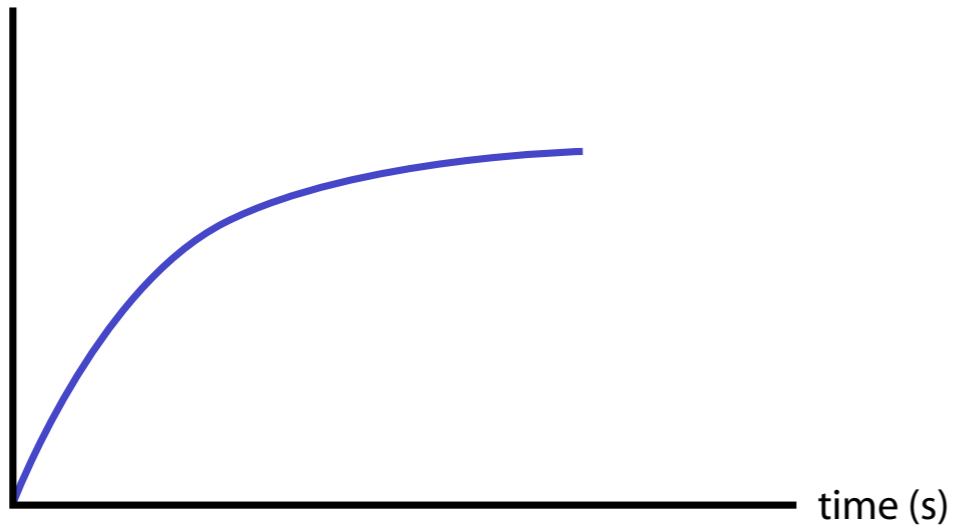
- The rate of change of **velocity** with respect to time is the **acceleration**.
- Increasing velocity, moving in the positive direction. (Speeding up)



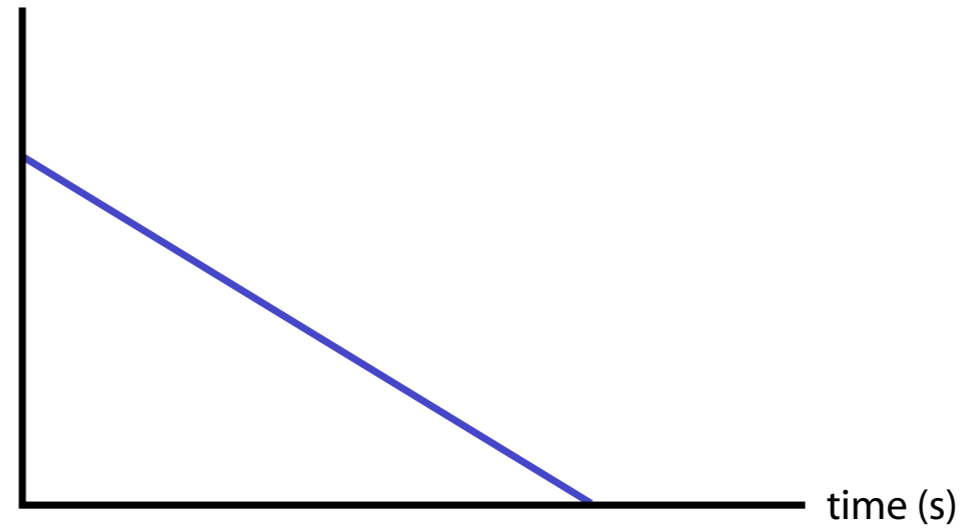
Constant acceleration

- Decreasing velocity, moving in the positive direction. (Slowing down)

position (m)

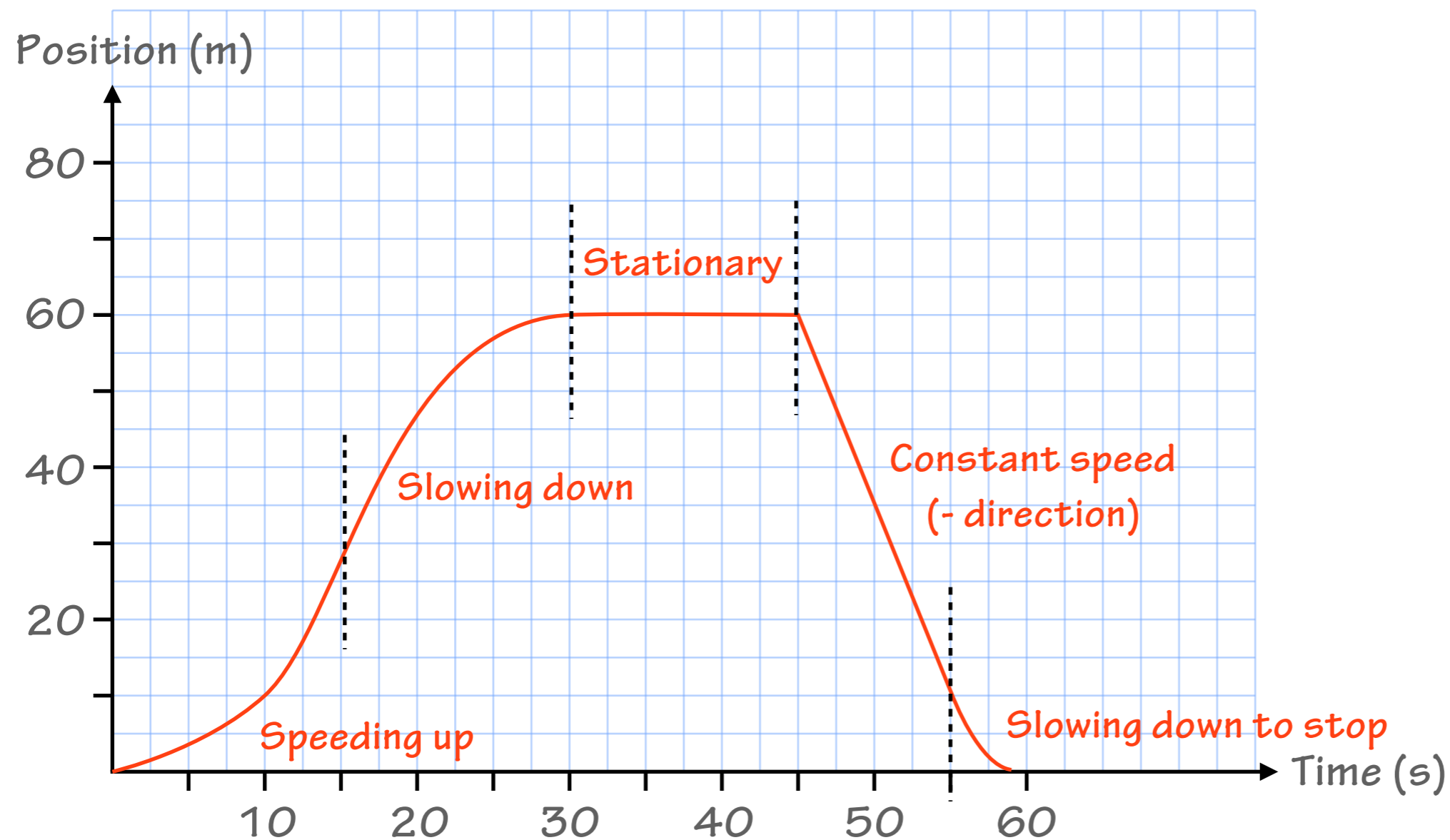


velocity (m/s)



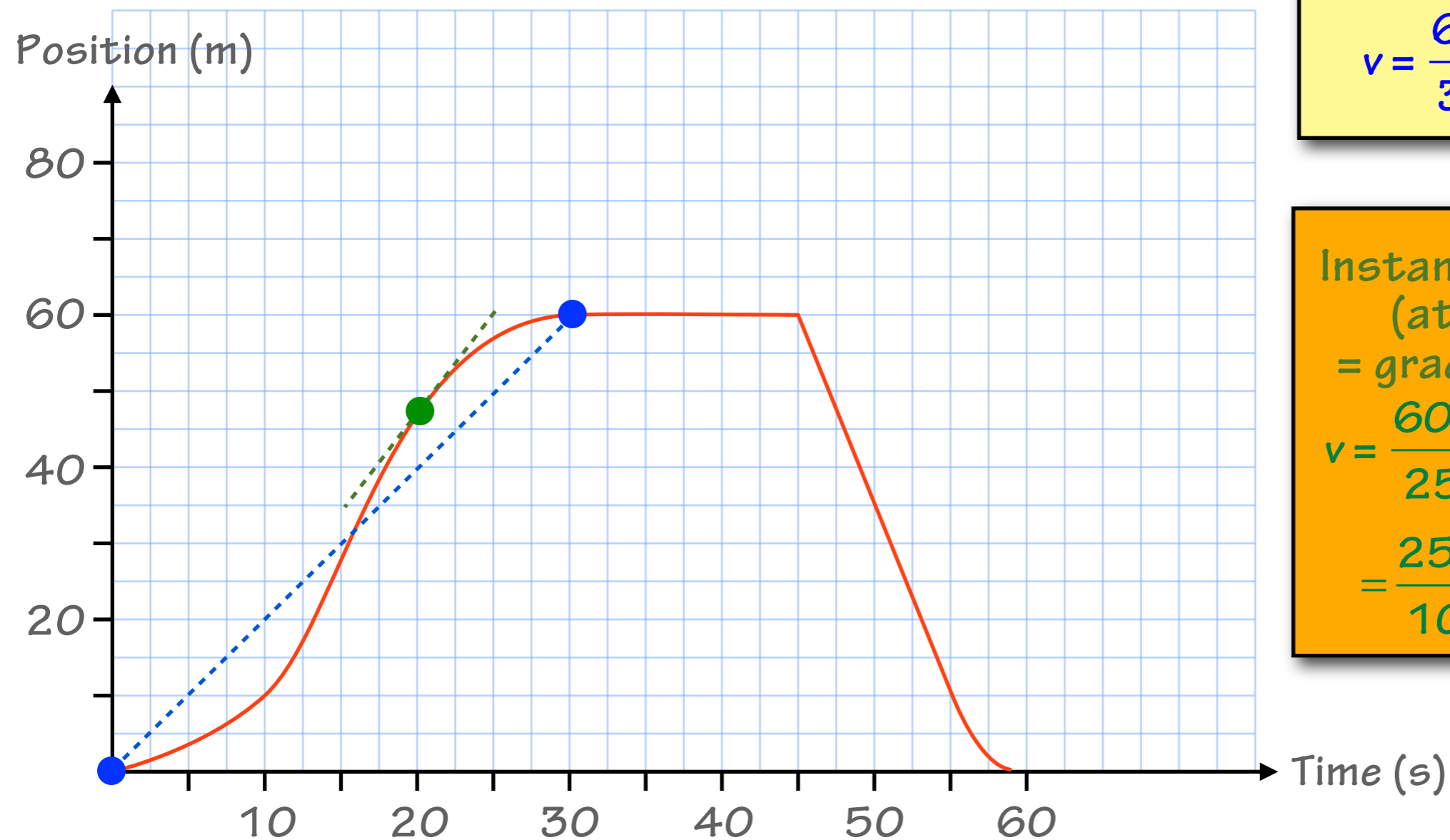
Interpreting position-time graphs

- A position-time graph plots where an object is during a time period.
- The **gradient** of the graph gives the **velocity**.



Interpreting position-time graphs

- A position-time graph plots where an object is during a time period.
- The **gradient** of the graph gives the **velocity**.



Average velocity
(first 30 seconds)
= gradient of chord

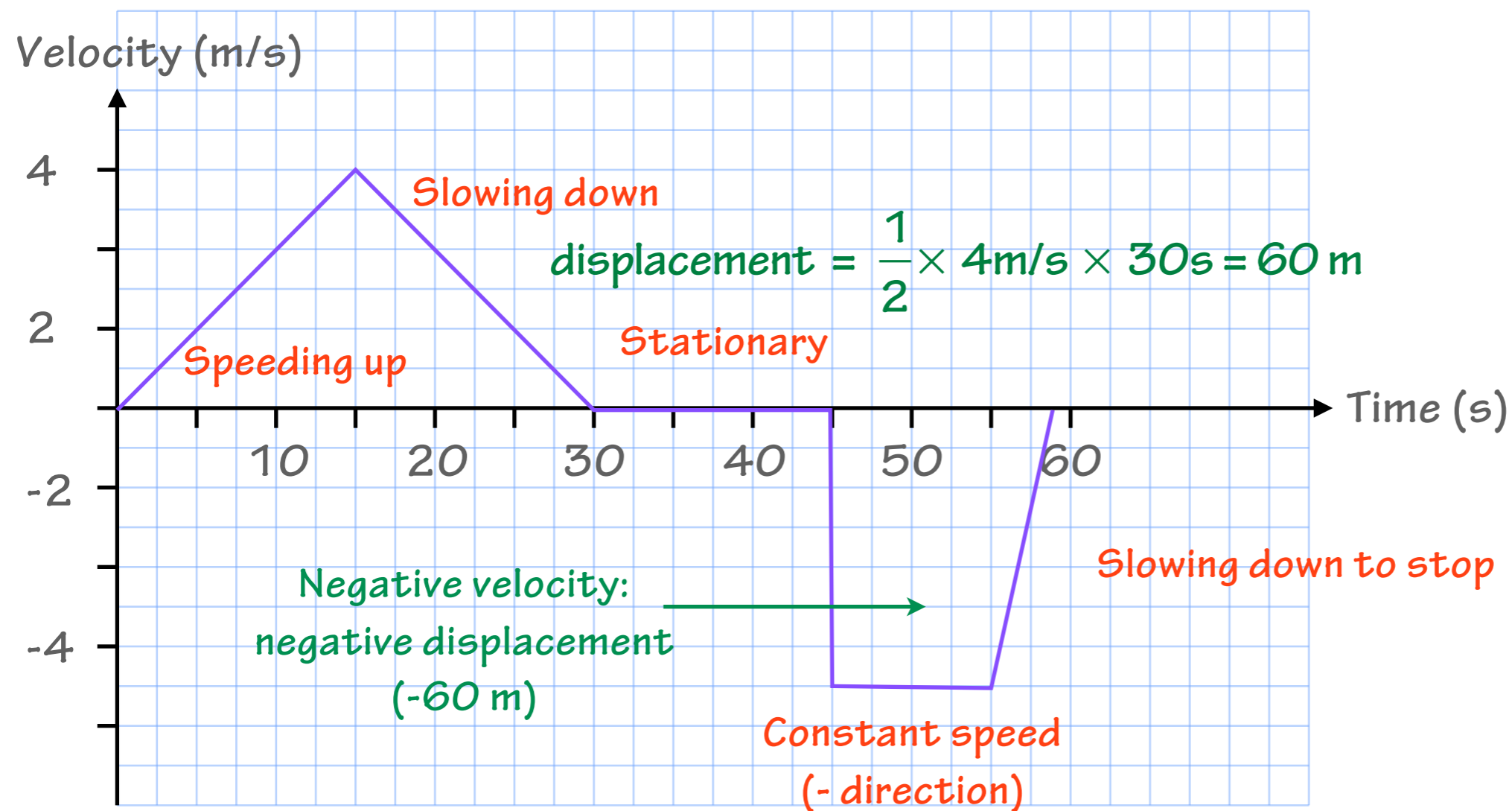
$$v = \frac{60 \text{ m}}{30 \text{ s}} = 2 \text{ m/s}$$

Instantaneous velocity
(at 20 seconds)
= gradient of tangent

$$v = \frac{60 \text{ m} - 35 \text{ m}}{25 \text{ s} - 15 \text{ s}}$$
$$= \frac{25 \text{ m}}{10 \text{ s}} = 2.5 \text{ m/s}$$

Interpreting velocity-time graphs

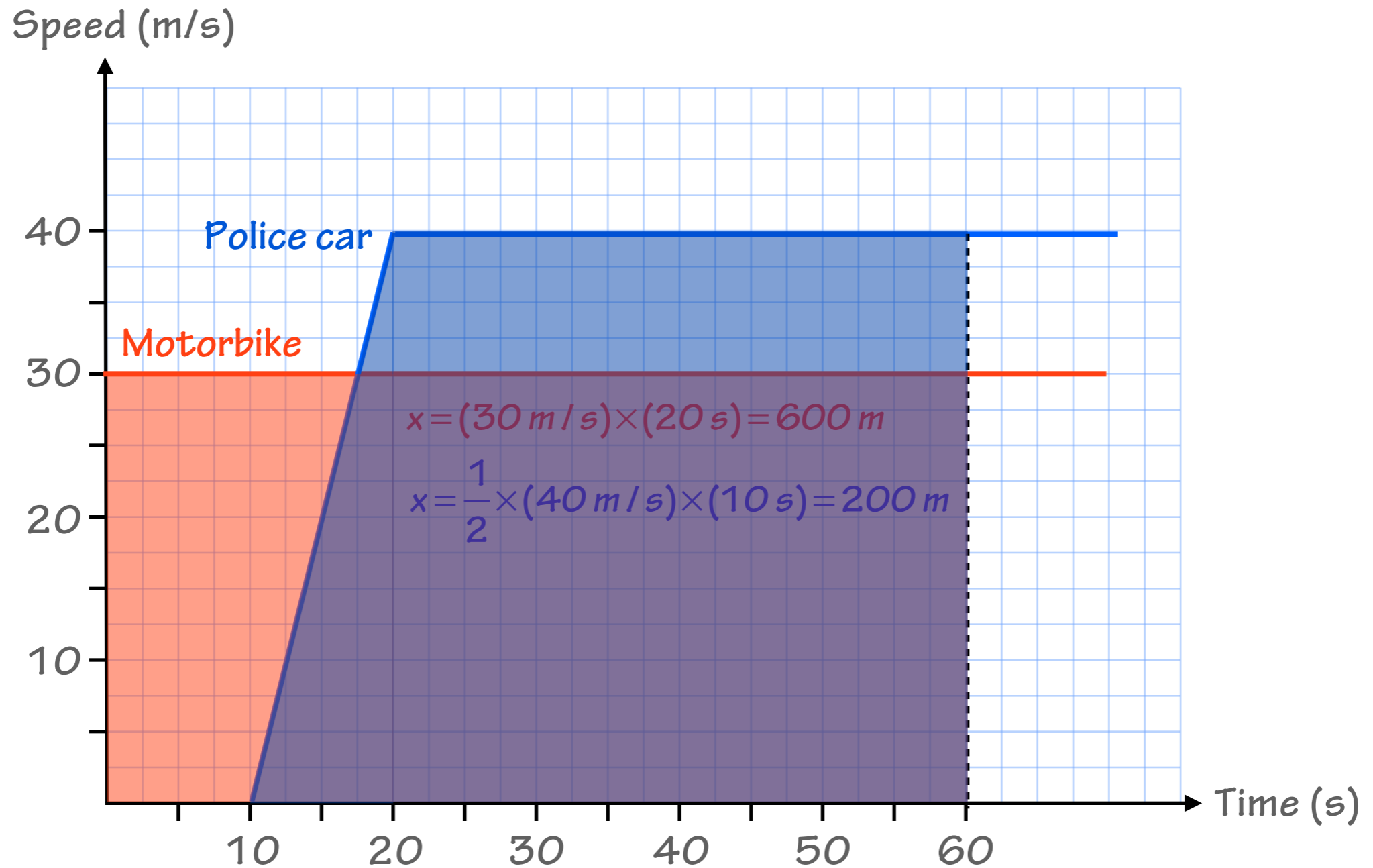
- A velocity-time graph plots the velocity during a time period.
- The **gradient** of the graph gives the **acceleration**.
- The **area under the graph** gives the **displacement**.



Solving problems with graphs

- A police car sees a speeding motorbike go past at 108 km/h.
- 10 seconds later, the police car gives chase.
- It accelerates at a constant rate to 144 km/h in 10 seconds, then follows at a constant speed until reaching the motorbike.
- How far will the two vehicles travel? How long will it take to catch up?

Solving problems with graphs



Time	0 s	10 s	20 s	30 s	40 s	50 s	60 s
Motorbike	0 m	300 m	600 m	900 m	1200 m	1500 m	1800 m
Police	0 m	0 m	200 m	600 m	1000 m	1400 m	1800 m