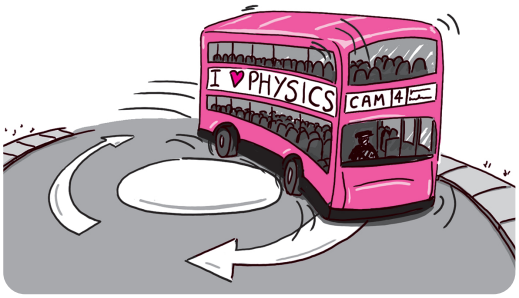
Acceleration

Velocity is the _____ and _____ of something's motion.

Acceleration means that the _____ is _____.

An accelerating bus could be _____, _____ or _____.

Slowing down is a special kind of acceleration called _____.



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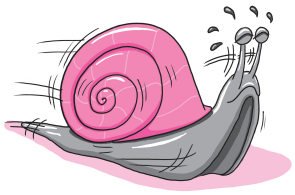
1 Is it accelerating? How did you decide?

(a) A snail starting to move.



(b) A cyclist riding East at 12 mph.

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2 Is it accelerating? How did you decide?

(a) The Earth going round the Sun.

(b) A train slows to stop at a station.

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3 An aeroplane begins to speed up down a runway. An airport worker measures the velocity after each second. This is the speed along the runway.

Time (s)	0	1	2	3	4	5
Velocity (m/s)	0	4	8	12	16	20

(a) Is the aeroplane accelerating? How can you tell?

(b) What do you think the velocity is after 7 s?

(c) When will the velocity be 36 m/s?

(d) How much does the velocity change each second?

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4 A truck speeds up after leaving a town. The velocities (speeds away from the town) are in the table below, but one is missing.

Time (s)	0	2	4	6	8
Velocity (m/s)	10	13		19	22

(a) Is the truck accelerating? How can you tell?

(b) What is the missing velocity?

(c) If it keeps accelerating like this, when will the velocity be 28 m/s?

(d) How much does the velocity change each second?

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5 The velocities of three accelerating vehicles are given in the tables below

Aeroplane

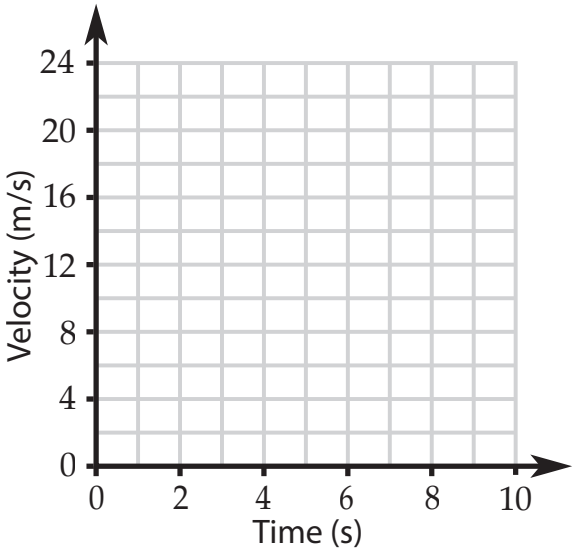
Time (s)	0	1	2	3	4	5
Velocity (m/s)	0	4	8	12	16	20

Truck

Time (s)	0	2	4	6	8
Velocity (m/s)	10	13		19	22

Bus

Time (s)	0	1	2	3
Velocity (m/s)	12	9		3



(a) Plot graphs of the velocities of the three vehicles. Add best fit lines to your points.

(b) How can you tell from the graph which vehicle has the largest acceleration?

(c) How can you tell from the graph which vehicle is slowing down?

The _____ in _____ each _____ is called the acceleration.
Acceleration is measured in metres per second squared (m/s^2).
An acceleration of 20 m/s^2 means the object _____ each _____.

6 A rocket accelerates at 20 m/s^2.

(a) Complete the sentence: The velocity gets ☐ m/s greater every second.

(b) Work out the velocity change in five seconds using an equation.

velocity change (m/s) = acceleration (m/s^2) × time (s)

☐ = 20 × ☐

(c) Work out the velocity change in 10 s using an equation.

velocity change (m/s) = acceleration (m/s^2) × time (s)

☐ = 20 × ☐

(d) Work out the velocity change in 25 s.

7 A more powerful rocket accelerates at 30 m/s^2.

(a) Complete the sentence: The rocket gets ☐ m/s faster every second.

(b) Work out how much time it will take to gain 60 m/s using an equation.

velocity change (m/s)	$=$	acceleration (m/s^2)	$\times$	time (s)
☐	$=$	30	$\times$	☐

(c) Work out how much time it will take to gain 150 m/s using an equation.

velocity change (m/s)	$=$	acceleration (m/s^2)	$\times$	time (s)
☐	$=$	30	$\times$	☐

(d) Work out the time taken for the rocket to gain 1500 m/s.

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8 A falling netball reaches 30 m/s in 3 s from rest.

(a) Velocity gained in one second $=$ ☐ $\div$ ☐ $=$ ☐ m/s

(b) Complete the sentence: The netball's acceleration (in m/s^2) is ☐.

(c) A motorcyclist gains 24 m/s in 4 s. Work out their acceleration using an equation.

velocity gain (m/s)	$=$	acceleration (m/s^2)	$\times$	time (s)
☐	$=$	☐	$\times$	4

(d) Work out the acceleration of a drag race car which gains 40 m/s in 0.8 s.

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9 Complete the word equations using **acceleration**, **velocity change** and **time taken**.

(a) acceleration $=$ (b) velocity change $=$ (c) time taken $=$

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10 Rewrite your word equations using symbols.
a is the acceleration, t is the time taken and v is the velocity change.

(a) $a =$ (b) $v =$ (c) $t =$

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11 A car leaving a town starts at 12 m/s and accelerates to 30 m/s in 6 s.

(a) Calculate its acceleration in m/s^2.

(b) How much time does it take to gain 12 m/s?