You will be expected to recall the formula linking change in velocity, acceleration and time in your examination. You should also be able to change the subject of the formula and to use the correct units.

1 The table shows the time it takes for a car to accelerate in different situations. Copy the table and calculate the missing accelerations.

2 A cyclist decelerates from 12 m/s to 2 m/s. Her acceleration is –2.5 m/s^2. How long does this change of speed take?

3 A car accelerates from rest to a velocity of 10 m/s. Its acceleration is 0.5 m/s^2. How long does this change of speed take?

	Initial velocity (m/s)	Final velocity (m/s)	Acceleration (m/s^2)	Time (s)
a	0	15		7.5
b	10	20		5
c	5	30		25
d	25	10		3

4 A cyclist is travelling at 15 m/s and applies the brakes. Her acceleration is –3 m/s. How long does it take her to come to a stop?

5 A car accelerates at 1.25 m/s^2 for 20 seconds. What is its change in velocity?

6 **a** A ball is dropped. What is its velocity after 3 seconds? The acceleration due to gravity is 10 m/s^2.

b What would the ball's velocity be 3 seconds after it was dropped on the Moon, where the acceleration due to gravity is 1.6 m/s^2?

7 A rocket accelerates at 4*g* when it is launched. How fast is it moving 10 seconds later?

8 A car is travelling at 10 m/s. It accelerates at 2.5 m/s^2 for 10 seconds. What is its final velocity?

9 Show that a cyclist slows from 6 m/s to 2 m/s when they decelerate at 0.5 m/s^2 for 8 seconds.

'Show that' in an exam question means you need to demonstrate that the statement that follows is true. In this case, you need to carry out a calculation to work out the final speed from the initial speed, acceleration and time given. Your answer should come out as 2 m/s!

10 A cyclist brakes for a second with an acceleration of –4 m/s^2. If he was travelling at 5 m/s before he braked, what is his final velocity?

11 A ball is thrown vertically upwards with a velocity of 10 m/s. What is its velocity 1.5 seconds later? The acceleration due to gravity is 10 m/s^2. (*Hint:* the acceleration due to gravity is in the opposite direction to the initial velocity of the ball, so the acceleration is negative.)

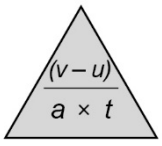
12 A spacecraft accelerates at 0.2 m/s^2 for 3 minutes and reaches a velocity of 236 m/s. Calculate its initial velocity.

13 A spacecraft changes velocity from 400 m/s to 364 m/s over one hour. Calculate its acceleration.

14 A fighter plane is descending at 30 m/s. The pilot ejects, and the ejector seat accelerates him upwards at 120 m/s^2 for 2 seconds. What is his velocity at the end of the 2 seconds? (*Hint*: think about the direction in which he accelerates compared to the direction the plane is moving.)

15 A bullet leaves a rifle with a velocity of 1500 m/s. Its acceleration is 5×10^5 m/s^2. How long did it take to travel through the barrel?

16 A different rifle accelerates the bullet at 2×10^5 m/s^2, and the bullet spends 5×10^{-3} seconds inside the barrel. How fast is it moving when it leaves the barrel?



v = final velocity (m/s)

u = initial velocity (m/s)

a = acceleration (m/s^2)

t = time (s)

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

$$a = \frac{(v - u)}{t}$$