

Acceleration

1. Write down the **acceleration equation**.

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

2. Rearrange the acceleration equation for **time**.

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

3. Rearrange the acceleration equation for **change in velocity**.

$$\Delta v = v - u = a \times t$$

4. Find the missing value.

Initial Velocity (u)	Final Velocity (v)	Time (t)	Acceleration (a)
2 m/s	8 m/s	3 s	2 m/s ²
2 m/s	12 m/s	5 s	2 m/s ²
0 m/s	60 m/s	20 s	3 m/s ²

5. A train comes to **rest** from a speed of **70 m/s** by decelerating at **0.5m/s²**.
Find the **time taken** by the train to decelerate.

$$u = 70 \text{ m/s}, \quad v = 0 \text{ m/s}, \quad a = -0.5 \text{ m/s}^2, \quad t = ?$$

$$t = \frac{v-u}{a} = \frac{0-70}{-0.5} = \underline{140 \text{ s}}$$

6. Maria drops a book off her balcony by accident. Assuming air resistance is negligible, **how many seconds does** it take the book to reach a speed of **20 m/s**?

$$u = 0 \text{ m/s}, \quad v = 20 \text{ m/s}, \quad a = 10 \text{ m/s}^2, \quad t = ?$$

$$t = \frac{v-u}{a} = \frac{20-0}{10} = \underline{2 \text{ s}}$$

7. A rabbit is moving with a velocity of 5.0 m/s. The rabbit speeds up to 15 m/s with a constant acceleration of 2.0 m/s². **How many seconds** does it take the rabbit to speed up?

$$u = 5 \text{ m/s}, \quad v = 15 \text{ m/s}, \quad a = 2 \text{ m/s}^2, \quad t = ?$$

$$t = \frac{v-u}{a} = \frac{15-5}{2} = \underline{5 \text{ s}}$$

8. A train travelling at 100 m/s slows down and stops at a platform in 25 seconds.
What was its **acceleration**?

$$u = 100 \text{ m/s}, \quad v = 0 \text{ m/s}, \quad a = ?, \quad t = 25 \text{ s}$$

$$a = \frac{v-u}{t} = \frac{0-100}{25} = -4 \text{ m/s}^2$$

Acceleration

9. A car travels from 0 to 6 m/s in 0.5 seconds. What is its **acceleration** in m/s²?

$$u = 0 \text{ m/s}, \quad v = 6 \text{ m/s}, \quad a = ?, \quad t = 0.5 \text{ s}$$

$$a = \frac{v-u}{t} = \frac{6-0}{0.5} = 12 \text{ m/s}^2$$

10. A helicopter decelerates at 5 m/s² for 12 seconds. If it was initially travelling at a velocity of 200 m/s, what is its **final velocity**?

$$u = 200 \text{ m/s}, \quad v = ?, \quad a = 5 \text{ m/s}^2, \quad t = 12 \text{ s}$$

$$v = a \times t + u = 5 \times 12 + 200 = 260 \text{ m/s}$$

11. A plane is flying at 250 m/s. It accelerates at 5 m/s² for 10 seconds. Find the **change in velocity and its final velocity**.

$$u = 250 \text{ m/s}, \quad v = ?, \quad \Delta v = ?, \quad a = 5 \text{ m/s}^2, \quad t = 10 \text{ s}$$

$$v = a \times t + u = 5 \times 10 + 250 = \underline{300 \text{ m/s}}$$

$$\Delta v = v - u = 300 - 250 = 50 \text{ m/s}$$