GCSE Physics Calculations
Using $v^2 = u^2 + 2as$

This equation links velocity, acceleration and distance without needing the time taken. These questions become progressively more challenging and include accelerating and braking vehicles in realistic situations.

1. A child on a scooter starts at 2 m/s and accelerates at 1.5 m/s² over a distance of 16 m. Calculate their final velocity.
2. A cyclist leaves traffic lights at 4 m/s and accelerates at 2 m/s² over a distance of 24 m. Calculate their final velocity.
3. A horse gallops at 8 m/s and accelerates at 1.5 m/s² over a distance of 48 m. Calculate its final velocity.
4. An electric car accelerates from 10 m/s at 3 m/s² over a distance of 75 m. Calculate its final velocity.
5. A rollercoaster train enters a launch section at 12 m/s and accelerates at 5 m/s² over a distance of 80 m. Calculate its exit velocity.
6. A train starts from rest and accelerates at 1 m/s² over a distance of 800 m. Calculate its final velocity.
7. A Formula 1 car increases its speed from 30 m/s to 70 m/s over a distance of 500 m. Calculate its acceleration.
8. A motorbike accelerates from 12 m/s to 32 m/s over a distance of 220 m. Calculate its acceleration.
9. A sprinter increases their speed from 5 m/s to 11 m/s over a distance of 24 m. Calculate their acceleration.
10. A car travelling at 20 m/s brakes to a stop in 40 m. Calculate its deceleration.
11. A cyclist travelling at 14 m/s brakes to a stop in 28 m. Calculate the deceleration.
12. A train travelling at 35 m/s brakes and comes to rest over a distance of 490 m. Calculate the deceleration.
13. A family car travelling at 25 m/s brakes with a deceleration of 6.25 m/s². Calculate the stopping distance.
14. A passenger jet lands at 80 m/s and decelerates at 2 m/s² until it stops. Calculate the length of runway required.

15. A rocket leaves the launch pad from rest and reaches a velocity of 150 m/s after travelling 750 m. Calculate its acceleration.
16. A sports car accelerates at 3.5 m/s² over a distance of 210 m and reaches a final velocity of 42 m/s. Calculate its initial velocity.
17. A high-speed train is travelling at 90 m/s when emergency braking is applied. The train comes to rest after travelling 1800 m.

a) Calculate the deceleration.

b) Calculate the stopping distance if the deceleration had been only 1.5 m/s².

c) Explain why reducing the stopping distance is important for railway safety.