

Uniformly Accelerated Motion 2

Section 1: $v_f^2 = v_i^2 + 2ad$

1. A skateboarder accelerates from rest at $a = 1.5 \text{ m/s}^2$ over 20.0 m. What is his final velocity?
2. A basketball is thrown upward at $v_i = 12.0 \text{ m/s}$. At the top of its path, $v_f = 0$. Take $a = -9.8 \text{ m/s}^2$ for gravity downward. How high does it rise?
3. A roller-coaster car speeds up from $v_i = 10.0 \text{ m/s}$ to $v_f = 22.0 \text{ m/s}$ over 60.0 m. What is its acceleration?
4. A train travelling at $v_i = 25.0 \text{ m/s}$ comes to rest after 250 m. What is its acceleration?
5. A cyclist brakes with $a = -2.0 \text{ m/s}^2$ and stops after 22.5 m. What was her initial velocity?
6. A bobsled accelerates from $v_i = 5.0 \text{ m/s}$ at $a = 3.0 \text{ m/s}^2$ while sliding 40.0 m.
 - (a) What is its final velocity?
 - (b) How long does this take?

Section 2: $d = \frac{(v_f + v_i)}{2} \cdot t$

7. A cyclist slows from $v_i = 12.0 \text{ m/s}$ to rest in 6.0 s. How far does she travel?
8. A sprinter runs 100 m in 10.0 s, finishing at $v_f = 12.0 \text{ m/s}$. What was his initial velocity?
9. A car travels 80.0 m in 4.0 s, starting at $v_i = 10.0 \text{ m/s}$. What is its final velocity?
10. An elevator moves upward from $v_i = 0.5 \text{ m/s}$ to $v_f = 2.5 \text{ m/s}$ while covering 6.0 m. How long does this take?
11. A car accelerates uniformly from $v_i = 12.0 \text{ m/s}$ to $v_f = 20.0 \text{ m/s}$ in 4.0 s. How far does it travel?
12. A roller-coaster accelerates uniformly from rest to $v_f = 18.0 \text{ m/s}$, covering 81.0 m.
 - (a) How long does this take?
 - (b) What is its acceleration?

Section 3: $v_f^2 = v_i^2 + 2ad$ and $d = \frac{(v_f + v_i)}{2} \cdot t$

13. A car is travelling at 24.0 m/s. While braking uniformly, its velocity decreases to 12.0 m/s over a displacement of 72.0 m. The driver continues braking with the **same constant acceleration** until the car stops.
- a) Determine the acceleration of the car during braking.
 - b) Determine the additional distance the car travels from 12.0 m/s until it stops.
 - c) Determine the total braking distance.
 - d) Determine the total time from the beginning of braking until the car stops.
14. A train accelerates uniformly along a straight track. During the first 120 m, it travels for 8.0 s and reaches a velocity of 20.0 m/s.
- a) Determine the train's velocity at the beginning of the 120 m section.
 - b) Determine the train's acceleration. The train then continues with the **same constant acceleration** for another 200 m.
 - c) Determine its velocity at the end of the second section.
 - d) Determine how long it takes the train to travel the second 200 m.