Kinematics in One Dimension (SwiftStudy Printable)

Key Formulas

$$\Delta x = v_i \Delta t + \frac{a\left(\Delta t\right)^2}{2}$$

Δx	displacement	m
v_i	intitial velocity	m/s
Δt	elapsed time	s
a	acceleration	m/s^2

$$v_f^2 - v_i^2 = 2a\Delta x$$

v_f	final velocity	m/s
v_i	initial velocity	m/s
a	acceleration	m/s^2
Δx	displacement	m

Tips to Remember

- Watch your signs! Objects moving in opposite directions have opposite signs. If a ball starts rolling up a ramp at 3 m/s and later rolls down at 2 m/s, then v_i is 3 m/s, but v_f is -2 m/s. If the motion is vertical, it's best to define upward as positive and downward as negative. This means that the acceleration due to gravity will be -9.8 m/s^2, not +9.8 m/s^2, because gravity pulls **downward**. Also, an object that ends up at a lower position than it started will have a negative displacement.

- Sometimes v_i or v_f are zero, but you have to infer that from the information given. For example, "brakes to a stop" indicates that v_f is zero. Similarly, "an object falls from a balcony" (as opposed to being thrown) implies that v_i is zero.

- On the other hand, don't make the mistake of thinking that an object's final velocity must be zero because it's resting on the ground at the end of the problem. If your problem says something like "a ball falls 15 m to the ground," the final velocity is the velocity the ball had reached at the instant it hit the ground. The final velocity isn't zero **until after the ground stops it**, and that's no longer the same problem!

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