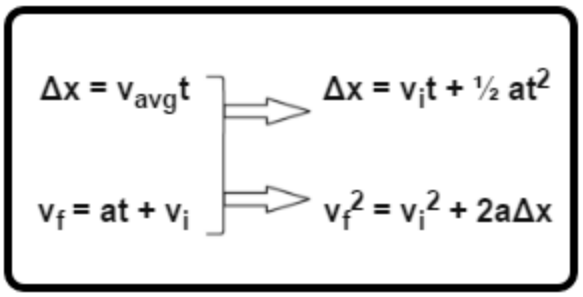
Advanced Practice Problems



The standard 4 kinematic equations.

What makes these problems advanced is that they involve either two objects or two distinct periods of motion. Furthermore, some problems require unit conversion.

Directions are not indicated. In such cases, it is common to omit reference to direction, as long as all objects go the same direction and that direction does not change. (Note that you are not asked to specify the direction in your answer to any of these questions.)

1. A car traveling 90 km/h is 100 m behind a truck traveling 75 km/h. How long will it take the car to reach the truck?

2. An airplane travels 2100 km at a speed of 800 km/h, and then encounters a tailwind that boosts its speed to 1000 km/h for the next 1800 km. What was the total time for the trip? What was the average speed of the plane for this trip? (Careful!)

3. A 75-m long train accelerates uniformly from rest. If the front of the train passes a railway worker 140 m down the track at a speed of 25 m/s, what will be the speed of the last car as it passes the worker?

4. An unmarked police car traveling a constant 95 km/h is passed by a speeder traveling 140 km/h. Precisely 1.00 s after the speeder passes, the policeman steps on the accelerator; if the police car's acceleration is 2.00 m/s^2, how much time passes before the police car overtakes the speeder?

5. Assume the speeder's speed (from the last problem) is not known. If the police car accelerates uniformly as given above and overtakes the speeder after accelerating for 6.0 s, what was the speeder's speed?