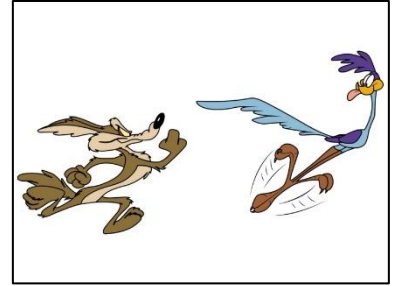


## Chase Problems – A Classic Kinematics Problem

Trying to figure out how long it takes for something to catch up to another object in motion is a classic kinematics problem.

It all revolves around the idea that once something has “caught” the other object, their distance from the starting point is the same.

$$\Delta d_1 = \Delta d_2$$



By setting their distances equal you can calculate the unknown variables for the moving objects.

Try these questions as samples:

1. Car A has a head start of 200m on Car B. Car A is moving at 50 m/s and Car B is moving at 100 m/s. How **long** will it take for Car B to catch up to Car A?
2. The blue car has a 60m headstart on the red car. The blue car is going 10 m/s and the red car is moving at 30 m/s. How long will it take until the red car catches the blue car?
3. A stationary car begins to accelerate at  $1 \text{ m/s}^2$  just as a car moving at a constant velocity of 4 m/s passes it. How long will it take the accelerating car to catch up?
4. A stationary car begins to accelerate at  $0.25 \text{ m/s}^2$  just as a car moving at a constant velocity of 10 m/s passes it. How long will it take the accelerating car to catch up?
5. A car moving at a constant velocity of 20 m/s passes a stationary car just as the stationary car starts to accelerate at a rate of  $4 \text{ m/s}^2$ .
  - a. How many seconds does it take for the accelerating car to catch the constant velocity car?
  - b. How far away from the point where it started does the accelerating car catch up to the other car?
6. A boy runs out his front door and starts down the road at 3.0m/s. Eight minutes later, his mother discovers that he has forgotten his lunch and she runs after him at 5.0 m/s.
  - a. How long does it take for her to catch him?
  - b. How far are they away from home when they meet?
7. A Porsche moving at 30m/s is passed by a pickup truck moving at 40m/s. The Porsche doesn't like getting passed by a pickup truck, so he begins to accelerate at a constant rate of  $1\text{m/s}^2$ , to try to catch the truck.
  - a. how long will it take for the Porsche to catch the pickup truck?
  - b. How far did the Porsche travel to catch the pickup truck?
  - c. How fast was the Porsche going when it passed the pickup truck?

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**Answers :**

**1.** 4.0s, **2.** 3.0s **3.** 8.0s, **4.** 80s, **5a.** 10s, **5b.** 200m **6a.** 720s (12 min), **6b.** 3600m  
**7a.** 20s, **7b.** 800m, **7c.** 50m/s