

This clip shows races between Cooper Mini's, one with a standard 5-speed transmission and the other with an automatic 6-speed transmission. The distance for these trials is $\frac{1}{4}$ mile, which is approximately 400 m. The times are given on the upper section of the electronic billboard, which the cameraman conveniently focuses on.

What is the acceleration of the cars?

First, have your students write down all that they know:

The times of the 2 cars are $t_1 = 16.42 \text{ s}$ and $t_2 = 15.07 \text{ s}$.

- The distance of travel is 400 m.
- Assume constant acceleration throughout the race.
- The initial velocity and position are zero.

Now, the appropriate kinematics equation is:

$$\Delta x = v_0 t + \frac{1}{2} a t^2$$

Solving for the acceleration, we find the acceleration for the two cars

$$a_1 = 3.0 \frac{\text{m}}{\text{s}^2}$$

$$a_2 = 3.5 \frac{\text{m}}{\text{s}^2}$$

You can also solve for their final velocities:

$$v = v_0 + at$$

Substituting the accelerations and times for the two cars:

$$v_1 = 49 \frac{\text{m}}{\text{s}} = 110 \text{ mph}$$

$$v_2 = 53 \frac{\text{m}}{\text{s}} = 120 \text{ mph}$$