Question.

At a certain time a particle had a speed of 18 m/s in the positive x direction, and 2.4 s later it's speed was 30 m/s in the opposite direction. What is the average acceleration of the particle during the 2.4 s interval?

Given:

$$v_0 = 18 \, \frac{m}{s}$$

$$v = -30 \, \frac{m}{s}$$

$$t = 2.4 \, s$$

Find:

$$a = ?$$

Solution.

Average acceleration is the rate at which velocity changes. Average acceleration is the change in velocity divided by an elapsed time. By definition:

$$a = \frac{\Delta v}{\Delta t}$$

In our case, time changes from 0 to 2.4 s. So, $\Delta t = t = 2.4 \, s$.

$$\Delta v = v - v_0$$

Therefore,

$$a = \frac{v - v_0}{t}$$

Calculate:

$$a = \frac{-30 - 18}{2.4} = -\frac{48}{2.4} = -20 \, \frac{m}{s^2}$$

Answer.

$$a = \frac{v - v_0}{t} = -20 \, \frac{m}{s^2}$$