Question #77511, Physics / Other

A train that is 268.7 m long undergoes constant acceleration the moment the last car (end of the train) is outside of the station, how far is the front of the train from the station after 25.0 s if its initial speed before acceleration is 4.48 m/s and its final speed is 27.4 meters per second?

663 m

399 m

667 m

678 m

Solution

At the initial time instant (t = 0), the front of the train is at 268.7 m from the station an moving at 4.48 m/s.

The train's acceleration is

$$a = \frac{\Delta v}{t} = \frac{27.4 - 4.48}{25} = 0.917 \text{ m/s}^2$$

The position of an object performing UARM is calculated as follows.

$$x = x_0 + \frac{v^2 - v_0^2}{2a} = 268.7 + \frac{27.4^2 - 4.48^2}{2 \times 0.917} = 667 \text{ m}$$

Answer: 667 m.