

F:(12 pts) Linear Acceleration

A soccer ball accelerates uniformly from rest to a speed of 60mi/h through a distance of 0.3m .

- (4pts) What is the ball's average speed in m/s ?

$$v_{avg} = \underline{\hspace{2cm}}$$

- (4pts) What is the ball's acceleration in m/s^2 ?

$$a = \underline{\hspace{2cm}}$$

- (4pts) How long does the acceleration take?

$$T = \underline{\hspace{2cm}}$$

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- (4pts) What is the ball's average speed in m/s ?

$$v_{\text{avg}} = \underline{13.4 \text{ m/s}}$$

$$v = 60 \frac{\text{mi}}{\text{h}} \times \frac{1609 \text{ m}}{\text{mi}} \times \frac{\text{h}}{3600 \text{ s}}$$
$$= 26.8167 \text{ m/s}$$

$$v_0 = 0$$

$$v_{\text{avg}} = \frac{v_0 + v}{2} = v/2 = \underline{13.4083 \text{ m/s}}$$

- (4pts) What is the ball's acceleration in m/s^2 ?

$$a = \underline{1200 \text{ m/s}^2}$$

$$v^2 = \cancel{v_0^2} + 2a \Delta x, \quad \Delta x = 0.3 \text{ m}$$

$$a = \frac{v^2}{2\Delta x} = \underline{1198.56 \text{ m/s}^2}$$

- (4pts) How long does the acceleration take?

$$T = \underline{0.0224 \text{ s}}$$

$$v = \cancel{v_0} + aT$$

$$T = v/a = \frac{2\Delta x}{v} = \Delta x / v_{\text{avg}}$$

$$= \underline{0.0223741 \text{ s}}$$