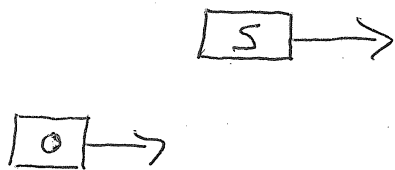


A siren emitting a frequency of 1600 Hz passes an observer moving at 2.44 m/s . Determine the speed of the siren if the observer detects a frequency of 1590 Hz after being passed.



$$v_s = ?$$

$$f_s = 1600 \text{ Hz}$$

$$v = 343 \text{ m/s} \text{ air @ STP}$$

$$v_o = 2.44 \text{ m/s} \quad f_o = 1590 \text{ Hz}$$

$$f_o = f_s \left(\frac{1 + \frac{v_o}{v}}{1 + \frac{v_s}{v}} \right)$$

↙ moving toward source
↑ moving away from observer

moving away from observer

$$1 + \frac{v_s}{v} = \frac{f_s}{f_0} \left(1 + \frac{v_0}{v} \right)$$

$$v_s = \left[\left[\frac{f_s}{f_0} \left(1 + \frac{v_0}{v} \right) \right] - 1 \right] v$$

$$= \left[\left[\frac{1660 \text{ Hz}}{1590 \text{ Hz}} \left(1 + \frac{2.44 \text{ m/s}}{343 \text{ m/s}} \right) \right] - 1 \right] 343 \text{ m/s}$$

$$= 4.61 \text{ m/s}$$