

Problem 2.9

Sitting on the end of a pier, you observe the waves washing along and notice they are very regular. Using a stopwatch, you record 20 waves passing by in 10 seconds. If when one crest washes by a column of the pier, another crest is also washing by the next column 5 meters away, with another in between, determine the period, frequency, wavelength, and speed of the wave.

Solution

Use the fact that 20 waves pass by in 10 seconds to determine the frequency ν .

$$\nu = \frac{20 \text{ waves}}{10 \text{ s}} = 2 \text{ Hz}$$

Between two crests of the wave is another crest, so the wavelength λ is half of 5 meters.

$$\lambda = 2.5 \text{ m}$$

The speed is the product of the wavelength and the frequency.

$$v = \lambda \nu = (2.5 \text{ m})(2 \text{ Hz}) = 5 \frac{\text{m}}{\text{s}}$$