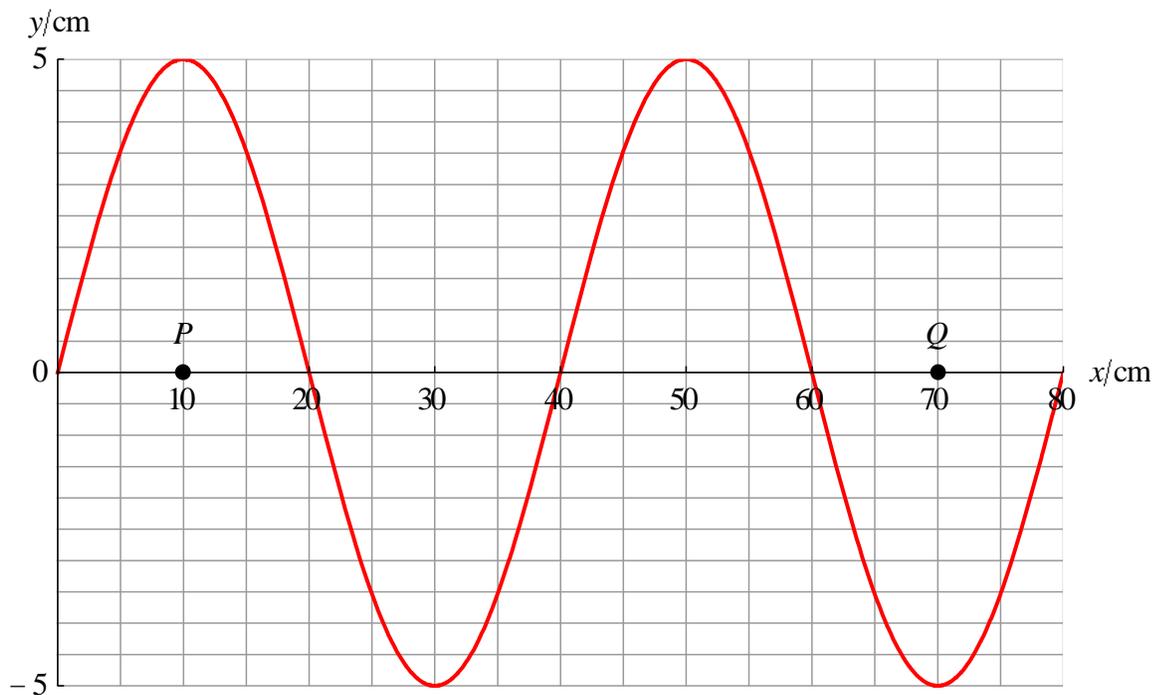# Teacher Notes

# Topic C

## Another longitudinal wave problem.

The graph shows, at an instant of time, a longitudinal wave propagating to the right. P and Q are the **equilibrium** positions of two points in the medium.



(a) What is the distance between P and Q at this instant?
(b) What is the distance between P and Q half a period later?
(c) The average speed of P during the half period is 16 m s$^{-1}$. What is the speed of the wave?

## Answers

(a) P is at position $x$ = 10 + 5 = 15 cm and Q at $x$ = 70 – 5 = 65 cm. The distance between them is then 50 cm.

(b) Half a period later P is at $x$ = 10 – 5 = 5 cm and Q at $x$ = 70 + 5 = 75 cm. The distance between them is then 70 cm.

(c) During a half period P moves a distance equal to two amplitudes i.e.10 cm. Hence

$$16 = \frac{0.10}{\dfrac{T}{2}} \quad \Rightarrow \quad T = 1.25 \times 10^{-2} \text{ s.}$$ The wavelength is 0.40 m so the wave speed is

$$v = \frac{0.40}{1.25 \times 10^{-2}} = 32 \text{ m s}^{-1}.$$