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# National 5 Physics

## Waves

### Worked Examples

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# 1 Wave Parameters and Behaviours

## 1.1 Frequency, Number of Waves and Time

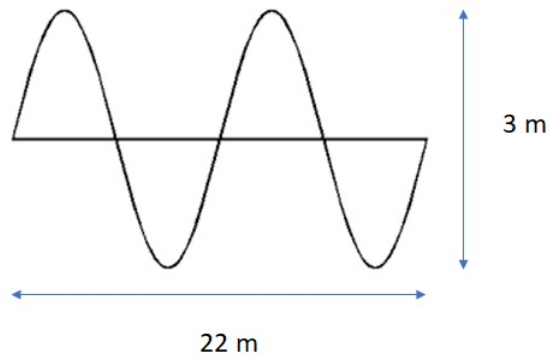
1. A boy counts 24 water waves hitting the entrance to a harbour in 4 minutes.  
Calculate the frequency of the waves.

2. A loudspeaker vibrates at a frequency of 256 Hz to produce a note called middle C.  
Calculate the number of sound waves produced by the loudspeaker in 3 seconds.

3. A swimmer at a pool calculates the frequency of waves in the water to be 3 Hz. Calculate the time taken for 27 waves to pass the swimmer.

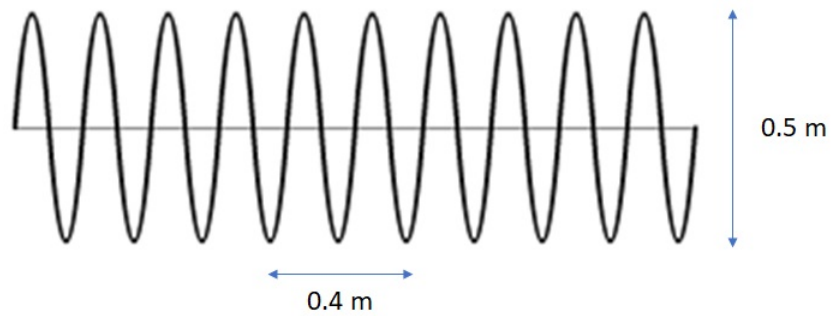
## 1.2 Frequency and Period

1. Two waves are produced in 5 seconds.



Determine the: (a) wavelength (b) amplitude (c) frequency (d) period.

2. A total of 125 waves pass a point in 20 seconds. Some of these waves are shown in the diagram below.



Determine the: (a) wavelength (b) amplitude (c) frequency (d) period.

3. A total of 50 waves pass a point in 10 seconds.

Calculate the: (a) frequency of the wave (b) period of the wave.



### 1.3 Distance, Speed and Time

1. A sound wave travels a distance of 150 m through water in 0.12 s.  
Calculate the speed of the sound in the water.

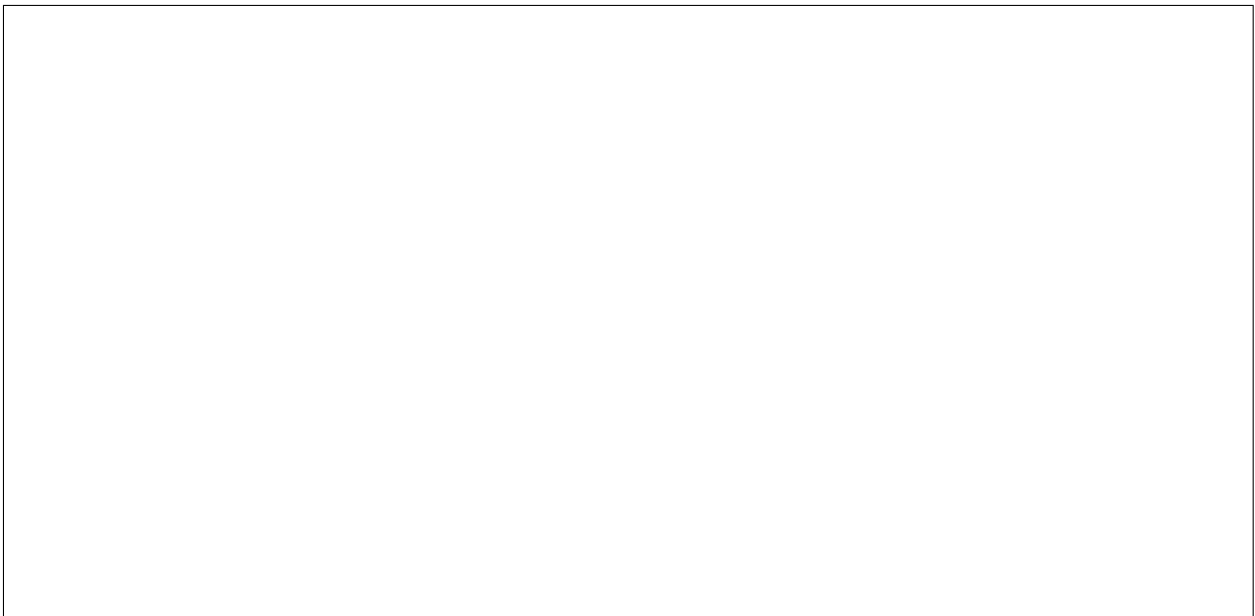
2. When tourists near Edinburgh Castle watch the 1 o'clock gun being fired they see the puff of smoke 5 s before they hear the bang.

Calculate how far the tourists are from the castle.

3. Calculate the time taken for sound to travel 1.5 km in water.



4. A girl standing on a ship shouts towards a cliff. The ship is 595 m from the cliff.  
Calculate the time taken for the girl's echo to return.





## 1.4 Speed, Frequency and Wavelength

1. A sound wave has a frequency of 28.3 Hz and a wavelength of 12 m.  
Calculate the speed of the sound wave.

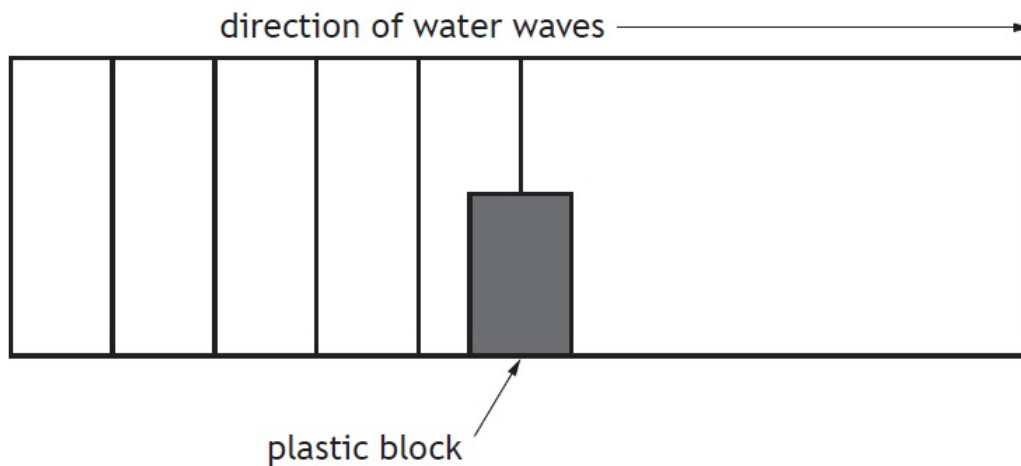
2. A wave generator in a pool creates waves with a wavelength of 0.2 m. The speed of the waves is  $1.5 \text{ m s}^{-1}$ .

Calculate the frequency of the waves.

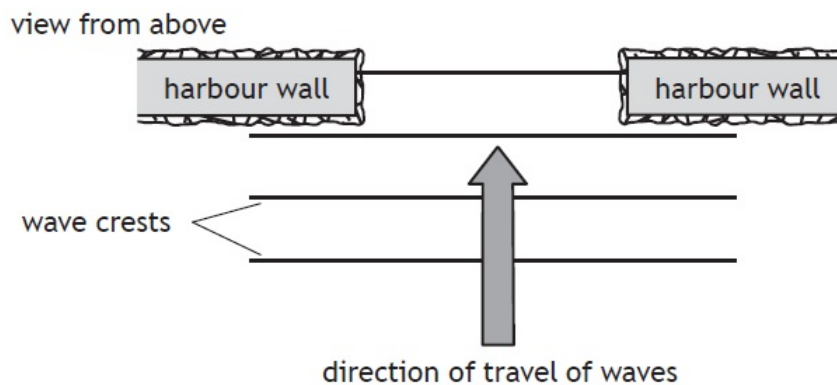
3. A source produces waves with a frequency of  $4 \times 10^6 \text{ Hz}$  and a speed of  $2 \times 10^4 \text{ ms}^{-1}$ . Calculate the wavelength of the waves.

## 1.5 Diffraction and Wavelength

1. A plastic block is placed in a ripple tank, as shown below.  
Complete the diagram to show the pattern of the water waves beyond the plastic block.



2. Waves travel towards the entrance of a harbour, as shown below.  
Complete the diagram to show the pattern of wave crests inside the harbour.



3. Explain why a house located behind a hill might receive a better radio signal than TV signal. Justify your answer using a labelled diagram.

