

**Section A**

1. What equation is used to calculate distance?
2. What are the units of average speed we use most often?

Section B

Re-arrange this equation to find speed.

1. Re-arrange this equation to find time.

Section C

1. A sound wave from a ship horn travels a distance of 3 km. Sound waves travel at 340 ms^{-1} .

The time taken for the sound to be heard by an observer is

- A. 8 ms
- B. 8.8 s
- C. 0.1 μs
- D. 4.4 s
- E. 0.2 μs

2. A water wave is travelling at 12 ms^{-1} . The wave is observed to travel for 20 seconds down the river Clyde.

The distance travelled by the wave is

- A. 0.6 m
- B. 32 m
- C. 240 m
- D. 600 m
- E. 1.2 m

3. An x-ray emitted from a supernova travels at $3 \times 10^8 \text{ ms}^{-1}$. The x-ray takes 3 years to reach a satellite.

How far away is the supernova from the satellite?

- A. $2.8 \times 10^8 \text{ m}$
- B. $2.8 \times 10^{16} \text{ m}$
- C. $9 \times 10^8 \text{ m}$
- D. $1.7 \times 10^{18} \text{ m}$
- E. $9.4 \times 10^{15} \text{ m}$

4. During a rugby match at Murrayfield the crowd cheer when Scotland score a try. The speed of sound changes as the weather changes. The sound is heard 1.3 km away. It takes the sound 3.9 s to travel. On this day the speed of sound is measured as

- A. 340 ms^{-1}
- B. 333 ms^{-1}
- C. 507 ms^{-1}
- D. $507\,000 \text{ ms}^{-1}$
- E. 85 ms^{-1}

5. Light travels at $3 \times 10^8 \text{ ms}^{-1}$ from the sun to the earth (a distance of $1.44 \times 10^{11} \text{ m}$).

How long does it take light to travel this distance?

- A. Roughly 1 year
- B. Roughly 1 minute
- C. Roughly 8 minutes
- D. Roughly 7 days
- E. Roughly 30 days

**Section D**

1. The River Severn in England is a tidal river. At certain times the tide does not rise gradually, but instead tidal waves travel along the river. Surfing these waves is a popular activity.

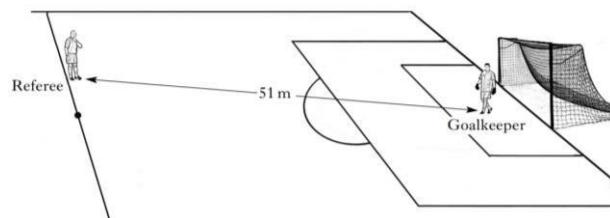


One tidal wave travels 34 km along the river in a time of two and a half hours.

Calculate the average speed of the tidal wave in km/h. **3**

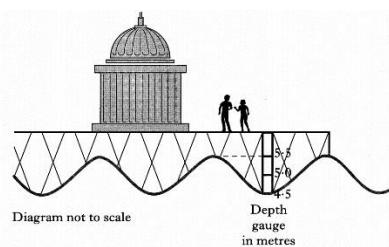
2. At the kick-off in a football match, during the World Cup Finals, the referee blows his whistle.

The whistle produces sound waves.



Using information from the diagram and the data sheet, calculate the time **3** taken for the sound waves to reach the goalkeeper.

3. Two pupils are watching the movement of water waves next to a pier. The pier has a gauge which measures the depth of the water as shown in the diagram.



One pupil notes that the crest of a wave takes 2.5 seconds to travel a distance **3** of 30 meters along the side of the pier.

The other pupil notes that 24 wave crests pass every minute.

Show that the speed of the waves is 12 meters per second. **3**