

Q1 A team of pilots are testing a prototype of a new kind of rocket.

- a) It's 20 000 kilometres from Manchester to Sydney, Australia. The rocket does the journey in 4 hours. What was the average speed for the trip in m/s?
- b) If the rocket could go straight through the centre of the Earth, the distance is only 12 740 km. If the rocket travelled at the same speed, how long would it take to get to Sydney?
- c) From lift-off, the team can get the rocket up to 2 km/s in 14 seconds. What's the acceleration of the rocket in  $\text{m/s}^2$ ?

Q2 It's 70 miles by road from Birmingham to Oxford. The journey usually takes me 1 hour and 10 minutes on the motorway.

- a) How far is the journey in kilometres?
- b) What's my average speed during the journey in mph and km/h?
- c) I could get to Oxford in 45 minutes if I went faster. How fast would I have to go and would this be legal? (The motorway speed limit is 70 mph.)
- d) Yesterday I overtook a caravan that was doing 80 km/h. The velocity of my car increased from 80 km/h to 110 km/h in 4 seconds. What was my acceleration, in  $\text{m/s}^2$ ?

Q3 Sound travels at a rather stately 330 m/s in air.

- a) I looked at my watch the moment I saw a flash of lightning and heard the thunder 12 seconds later. To the nearest kilometre, how far away did the lightning strike?
- b) A girl and boy are standing under a tree. The boy starts running, accelerating at  $0.2 \text{ m/s}^2$ . What speed is he running at when he reaches the middle of the field 18 seconds later?
- c) The middle of the field is 32.4 m away. What was the boy's average speed?
- d) If the girl yells at the boy from under the tree, how long will it take her voice to reach him?
- e) The next flash of lightning lights up the sky. It takes 18 s this time before I hear the rumble of thunder. How far away is it now? Is it getting closer or further away?