

# Maths

## Speed calculations

### Learning objectives


- The students learn how to calculate speed, time and distance.
- They learn about the SonicStar, a new aeroplane.
- In the project stage, students present a report on a form of transport.

### Preparations

Students will need a calculator (or calculator function on their mobile) for exercises 3 and 4.

### Warmer

Brainstorm a list of types of transport onto the board. Ask the students to put them in order from fastest to slowest. Then ask them to think about each type of transport and to try to name the fastest of each type and to guess its speed.

- 1**  **1.33** Ask the students, in pairs, to identify the means of transport in the photos first. Check their ideas. Next, ask them to put them in order of speed and then match each one with a speed in the box. Then play the recording so that they can check their ideas.

### Answers

- 1 Hydroptère (boat) – 97 km/h
- 2 Bugatti Veyron (sports car) – 431 km/h
- 3 Agusta (motorbike) – 302 km/h
- 4 Blackbird (plane) – 3,529 km/h
- 5 Formula Rossa (rollercoaster) – 240 km/h

### Audioscript

- Speaker 1:** So, what's the fastest of these things, then?
- Speaker 2:** Well, the Blackbird, that's the plane, has a top speed of 3,529 km/h, so that's the fastest by a long way.
- Speaker 1:** Yes. And I guess the sports car is probably the next fastest?
- Speaker 2:** That's right. The Bugatti Veyron's top speed is 431 km/h.
- Speaker 1:** Although you can't go that fast on a road, of course.
- Speaker 2:** No. Then next is the Agusta, that's the motorbike. Its top speed is 302 km/h.
- Speaker 1:** So, that's still quite fast.
- Speaker 2:** Yes. Then next is the Formula Rossa rollercoaster in Abu Dhabi, with a top speed of 240 km/h.
- Speaker 1:** Wow! I'm not sure I'd enjoy that.
- Speaker 2:** I know what you mean. And finally, with a top speed of 97 km/h, is the Hydroptère. It doesn't sound very fast compared to these other things, but that's pretty fast for a boat!

- 2** Ask the students to look at the paragraph headings and the diagrams and say what they think *speed*, *distance* and *time* are. Then ask them to read the complete text and check their ideas.

### Answers

- 1 Speed is how fast something moves. We often calculate it in kilometres per hour (km/h).
- 2 Distance is how far something goes. We often measure this in kilometres (km).
- 3 Time is how long it takes to travel. We often measure this in hours, minutes or seconds.

- 3** Ask the students to read the first paragraph again. Invite a student to come to the board and explain how to calculate speed.

Then ask the students to read the second paragraph and ask another student to explain how to convert speed from km/h to metres per second, and vice versa.

Next, write the first question on the board and ask a third student to come to the board and complete it. Then ask the students to work in pairs to finish the exercise. With weaker students, do the exercise together.

### Answers


- 1 850 km/h or 236.11 m/s
- 2 180 km/h or 50 m/s
- 3 108 km/h or 30 m/s
- 4 4.5 km/h or 1.25 m/s

- 4** Ask the students to read the third paragraph and invite a student to come to the board and explain how to calculate distance and time.

As a class, calculate the distance travelled by the motorcycle together on the board. Then ask the students to complete the rest of the table. If necessary, point out that the students will need to convert 18 m/s into km/h in row 3 because the time is given in hours and not seconds.

### Answers

- 1 297.5 km  
Distance = Speed 85 km/h × Time 3.5 h = 297.5 km
- 2 900 secs or 15 min  
Time = Distance 4,050 m ÷ Speed 4.5 m/s = 900 seconds ÷ 60 = 15 minutes
- 3 16.2 km  
Distance = Speed × Time  
Convert the speed into km/h:  
18 m/s × 3,600 ÷ 1,000 = 64.8 km/h  
Distance = Speed 64.8 km/h × Time 0.25 h = 16.2 km
- 4 0.4 hours or 24 minutes  
Time = Distance 12 km ÷ Speed 30 km/h = 0.4 hours  
0.4 × 60 = 24

- 5  1.34 Ask the students to identify the transport in the picture first. Then ask them to read the presentation and say what the connection is between the missing words (i.e. they are all numbers).

Play the recording at least twice. If necessary, play the recording for a third time and stop it after each answer is given. Either write the answers on the board and ask the students to correct their summary or ask students for their answers, checking that they say the numbers correctly. Note: The speed of sound can vary depending on the altitude you are at.

### Mixed ability

Write the answers on the board in the wrong order. Ask the students to listen and put the answers in the correct space.

### Answers

1 2021 2 1,191 3 2 4 3.5 5 3,800 6 19,000 7 2  
8 20 9 5 10 15

### Audioscript

- Teacher:** OK, everyone. Are we ready for the first presentations today? ... Can everyone sit down, please? ... Right then. We'll start with Kevin. What's your presentation about today?
- Kevin:** It's about the SonicStar – a new type of high-speed plane.
- Teacher:** Great, Kevin. That sounds really interesting. Go ahead, please.
- Kevin:** OK. Today, I'm going to talk about the SonicStar. It's a new aeroplane that will be ready to fly in 2021. A European company called HyperMach is designing the SonicStar as a new form of passenger transport. The new plane will fly at supersonic speeds – that means it will go faster than the speed of sound.
- Teacher:** Excuse me, Kevin. Can you tell us what the speed of sound is? I don't think everyone knows.
- Kevin:** The speed of sound is 331 metres per second. That's 1,191 kilometres per hour. It's also called Mach 1.
- Teacher:** Thank you, Kevin. Continue, please.
- Kevin:** Alright. So, before now, the only supersonic passenger plane was Concorde. Its top speed was Mach 2, or twice the speed of sound, so about 2,240 kilometres per hour. But Concorde stopped flying in 2003, and at the moment, there aren't any other supersonic passenger planes. ... Um ... Oh, right. The SonicStar will be much faster than Concorde. Its top speed will be Mach 3.5 – that's three and a half times the speed of sound, so about 3,800 kilometres per hour! Of course, it won't fly that fast all the time. It will go much slower when it takes off and when it lands, like other passenger planes. The SonicStar will also fly very high, at a maximum altitude of 19,000 metres. Most passenger planes only fly at about 10 or 12 thousand metres.

**Teacher:** That's very interesting, Kevin. And how long will it take the SonicStar to fly from London to New York, for example?

**Kevin:** Not long at all! The distance from London to New York is about 5,500 kilometres, and the SonicStar will travel that distance in about two hours. It will fly slower when it takes off and lands, of course, and it will only fly at top speed over the Atlantic Ocean. For longer flights, it will be much better. Right now, a flight from London to Sydney would take about 20 hours, and most passenger planes stop along the way, so it takes even longer. But on the SonicStar it will be a non-stop flight, and it will take only five hours!

**Teacher:** Really! That's quite a difference, isn't it! And when did you say the SonicStar will be ready?

**Kevin:** They say the first flight will be in 2021, so we won't have to wait much longer! I'd love to be on the first flight, but it will be really expensive, I think. The SonicStar will be a plane for business people, and it will only carry about 15 passengers at a time.

**Teacher:** Well, thank you, Kevin. That was very good. Does anyone have any questions for Kevin? I'm sure you've all ...

### Answers

	cheetah	horse	kangaroo	Usain Bolt
<b>Top speed</b>	120 km/h 33.33 m/s	88 km/h 24.44 m/s	70 km/h 19.44 m/s	37.59 km/h 10.44 m/s
<b>Distance</b>	100m	100m	100m	100m
<b>Time</b>	3.00 seconds	4.09 seconds	5.14 seconds	9.58 seconds
<b>Position</b>	1	2	3	4

\*Point out that the speed they calculate for Usain Bolt is his average speed and not his top speed. Experts have calculated that he can reach top speeds of 12.27 m/s (but this is still slower than a house cat, which has a top speed of 13.33 m/s).

### Project

Tell the class they are going to prepare their own presentation about a form of transport. Ask them to read the presentation in exercise 5 again and say how the paragraphs are organised.

Next, organise them into small groups or pairs and ask them to choose one of the types of transport from the list in the box (Famous transport systems) or to choose a system from their own country. Ask them to find the answers to the questions and then write a presentation similar to the one in exercise 5.

Now organise the students into different groups and encourage them to take turns to ask and answer the questions about each other's chosen transport. Finally they can vote on their favourite form of transport.