Lesson 10 - Calculating speed using an equation

Physics - KS3

Forces and Motion

Mrs Wolstenholme

Calculating Speed

Speed   =   distance ÷   time

(**m/s**)   (**m**)   (**s**)

(**mile/h**)   (**mile**)   (**h**)

(**km/h**)   (**km**)   (**h**)

Speed   =   distance ÷   time

	I ran 100 m in 25 seconds. Calculate my average speed
Values	Distance = 100 m. time= 25 s
Equation	Speed = distance ÷ time
Substitute	speed = 100 ÷ 25
Rearrange	
Answer	Speed = 4
Units	m/s

4 m/s

Speed   =   distance ÷   time

	The train travelled **550** km in **2.2** hours. Calculate my average speed.
Values	Distance = **550 km**. time= **2.2 h**
Equation	Speed = distance ÷ time
Substitute	speed = **550 ÷ 2.2**
Rearrange	
Answer	Speed = 250
Units	**km/h**

250 km/h

Speed   =   distance ÷   time

	A caterpillar moved 2 m in 250 s. Calculate its speed.
Values	
Equation	
Substitute	
Rearrange	
Answer	
Units	

Speed   =   distance ÷ time

	The tractor travelled 5 km in 0.4 h. Calculate its speed.	Usain Bolt set a record when he ran 100m in 9.58 seconds. What was his speed?
Values		
Equation		
Substitute		
Rearrange		
Answer		
Units		

Speed   =   distance ÷   time

	A plane travelled 5,537 km from London to New York. The flight took 8 hours. Calculate its speed.	A snail moves 1 metre in 200 seconds. Calculate the speed.
Values		
Equation		
Substitute		
Rearrange		
Answer		
Units		

Speed   =   distance ÷   time

	A car travels at 30 km/h. How far will the car have travelled after 1.5h?
Values	speed = **30 km/h**. time= **1.5** h
Equation	Speed = distance ÷ time
Substitute	**30** = distance ÷ **1.5**
Rearrange	**30 x 1.5** = distance ÷ **1.5 x 1.5** **30 x 1.5** = distance
Answer	45 = distance
Units	**km**

45 km

What is the next step?

40 = distance ÷ 5

Option 1

40 x 5 = distance ÷ 5 x 5

Option 2

40 x 40 = distance ÷ 5 x 40

Option 3

40 ÷ 5 = distance ÷ 5 ÷ 5

Option 4

PANIC!!

What is the next step?

6.5 = distance ÷ 1.5

Option 1

6.5 ÷ 6.5 = distance ÷ 1.5 ÷ 6.5

Option 2

6.5 ÷ 1.5 = distance ÷ 1.5 ÷ 1.5

Option 3

6.5 x 1.5 = distance ÷ 1.5 x 1.5

Option 4

PANIC!!

What is the next step?

35 = distance ÷ 4

Option 1

35 x 35 = distance ÷ 4 x 4

Option 2

35 x 35 = distance ÷ 4 x 35

Option 3

35 x 4 = distance ÷ 4 x 4

Option 4

PANIC!!

Speed   =   distance ÷ time

	The fastest speed reached by a human in swimming is 2.2 m/s. He completed the race in 21.8 seconds. What distance did he swim?
Values	
Equation	
Substitute	
Rearrange	
Answer	
Units	

	A man swims at a speed of 4 m/s. Calculate the distance swam in 25 seconds.	A skate boarder has a speed of 11 m/s. Calculate the distance travelled in 2.5 seconds.
Values **E**quation **S**ubstitute **R**earrange **A**nswer **U**nits		

Independent practice

1. A model car travels 30 metres in 3 seconds. Calculate the speed.

2. A snail moves 1 metre in 200 seconds. Calculate the speed.

3. A fish swim 5 km in 4 hours. Calculate the speed.

4. A cat runs with a speed of 4 m/s for 30 seconds. Calculate the distance covered by the cat.

5. A motor bike has a speed of 20 m/s. Calculate the distance covered in 20 s

Same direction: **S**ubtract

Opposite direction: Add

Two cars are travelling in the **same** direction on a road.

The blue car is travelling at **25** m/s in front of the yellow car, which is travelling at **30** m/s. What is their relative speed?

Relative speed = **30 - 25** = 5 m/s

Same direction: **S**ubtract

Opposite direction: Add

A railway line and a road are side by side. A train and a car are travelling in the **same** direction, with the train in front of the car. The train travels at **52** m/s and the car at **30**m/s. What is their relative speed?

Relative speed = **52 - 30** = 22 m/s

Same direction: **S**ubtract

Opposite direction: Add

Two cars are travelling on a road in **opposite** directions.

The blue car is travelling at **25** m/s and the yellow car is travelling at **30** m/s. What is their relative speed?

Relative speed = **25 + 30** = 55 m/s

How do you calculate relative speed of two objects moving in opposite directions?

Option 1

Multiply them

Option 2

Add them

Option 3

Subtract them

Option 4

Divide them

How do you calculate relative speed of two objects moving in the same direction?

Option 1

Multiply them

Option 2

Add them

Option 3

Subtract them

Option 4

Divide them

Same direction: **S**ubtract

Opposite direction: Add

Whilst tidying my lab, I was walking towards the bin at 4 mph and I threw a screwed-up piece of paper at 2 mph towards the bin. Calculate the relative speed of me and the paper.

Same direction: **S**ubtract

Opposite direction: Add

Whilst walking away from the bin at 3 mph I threw a screwed-up piece of paper at 2 mph towards the bin.

Calculate what I would observe the speed of the screwed-up piece of paper to be.

Same direction: **S**ubtract Opposite direction: Add

1. If you were travelling in the car at 40 mph, what speed would you observe an over-taking train travelling at 80 mph to be travelling at?

2. If you were travelling in a car that was travelling at 20 mph along the carriages of a train which was travelling in the same direction at 50 mph, what is their relative speed?

3. If you were travelling in a car at 30 mph and you threw a ball backwards at 3 mph, with what speed would you observe the ball to move away from you?

4. This morning I was travelling at 60 mph on the motorway when a car over took me. If the over-taking car was travelling at 73 mph, what speed did I observe the over-taking car to be travelling at?

5. Yesterday I was running at 5 mph along the canal when I over-took a barge travelling at 3 mph. At what speed did the barge captain observe my speed to be?