

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)



$$\text{Speed} = \text{distance} \div \text{time}$$

	I ran 100 m in 25 seconds. Calculate my average speed
V alues	Distance = 100 m. time= 25 s
E quation	Speed = distance $\div$ time
S ubstitute	speed = 100 $\div$ 25
R earrange	
A nswer	Speed = 4
U nits	m/s

4 m/s



Speed = distance ÷ time

	The train travelled 550 km in 2.2 hours. Calculate my average speed.
V alues	Distance = 550 km . time= 2.2 h
E quation	Speed = distance ÷ time
S ubstitute	speed = 550 ÷ 2.2
R earrange	
A nswer	Speed = 250
U nits	km/h

250 km/h



$$\text{Speed} = \text{distance} \div \text{time}$$

	A caterpillar moved 2 m in 250 s. Calculate its speed.
V alues	
E quation	
S ubstitute	
R earrange	
A nswer	
U nits	



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?
V alues		
E quation		
S ubstitute		
R earrange		
A nswer		
U nits		



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.
V alues		
E quation		
S ubstitute		
R earrange		
A nswer		
U nits		



$$\text{Speed} = \text{distance} \div \text{time}$$

	A car travels at 30 km/h. How far will the car have travelled after 1.5h?
V alues	speed = 30 km/h . time= 1.5 h
E quation	Speed = distance ÷ time
S ubstitute	30 = distance ÷ 1.5
R earrange	30 x 1.5 = distance ÷ 1.5 x 1.5 30 x 1.5 = distance
A nsWER	45 = distance
U nits	km

45 km



What is the next step?

$$40 = \text{distance} \div 5$$

Option 1

$$40 \times 5 = \text{distance} \div 5 \times 5$$

Option 3

$$40 \div 5 = \text{distance} \div 5 \div 5$$

Option 2

$$40 \times 40 = \text{distance} \div 5 \times 40$$

Option 4

PANIC!!



What is the next step?

$$6.5 = \text{distance} \div 1.5$$

Option 1

$$6.5 \div 6.5 = \text{distance} \div 1.5 \div 6.5$$

Option 3

$$6.5 \times 1.5 = \text{distance} \div 1.5 \times 1.5$$

Option 2

$$6.5 \div 1.5 = \text{distance} \div 1.5 \div 1.5$$

Option 4

PANIC!!



What is the next step?

$$35 = \text{distance} \div 4$$

Option 1

$$35 \times 35 = \text{distance} \div 4 \times 4$$

Option 3

$$35 \times 4 = \text{distance} \div 4 \times 4$$

Option 2

$$35 \times 35 = \text{distance} \div 4 \times 35$$

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?
V alues	
E quation	
S ubstitute	
R earrange	
A nswer	
U nits	



	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.
V alues		
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 metres in 3 seconds. 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: Subtract

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: Subtract

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: Subtract

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: Subtract 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?

