Exceptional Closure Booklet Year 7

English

Write an advert for a newspaper, advertising for a superhero.

You will need

1. A catchy title to get people's attention. Maybe think about starting with WANTED
2. A description on the job with their roles and responsibilities.
3. What experience do they need to have had.

English

The images include Batman and the Joker. Write a comparison about the two character. Discuss not only how they are dressed, but also their personality. Think about what motivates them and why they behave as they do.

English

A Byronic hero is intelligent and skilled. They are also arrogant and self-aware. More importantly, to contrast them with Romantic heroes, Byronic heroes are also self-destructive and reckless.

This is a picture of Captain Jack Sparrow. He could be described as a Byronic character. Can you write a description of him from this image and write why he is a Byronic character.

English

I have just returned from a visit to my landlord--the solitary neighbour that I shall be troubled with. This is certainly a beautiful country! In all England, I do not believe that I could have fixed on a situation so completely removed from the stir of society. A perfect misanthropist's Heaven: and Mr. Heathcliff and I are such a suitable pair to divide the desolation between us. A capital fellow! He little imagined how my heart warmed towards him when I beheld his black eyes withdraw so suspiciously under their brows, as I rode up, and when his fingers sheltered themselves, with a jealous resolution, still further in his waistcoat, as I announced my name.

'Mr. Heathcliff?' I said.

A nod was the answer. 'Mr. Lockwood, your new tenant, sir. I do myself the honour of calling as soon as possible after my arrival, to express the hope that I have not inconvenienced you by my perseverance in soliciting the occupation of Thrushcross Grange: I heard yesterday you had had some thoughts--'

'Thrushcross Grange is my own, sir,' he interrupted, wincing. 'I should not allow any one to inconvenience me, if I could hinder it--walk in!'

The 'walk in' was uttered with closed teeth, and expressed the sentiment, 'Go to the Deuce': even the gate over which he leant manifested no sympathizing movement to the words; and I think that circumstance determined me to accept the invitation: I felt interested in a man who seemed more exaggeratedly reserved than myself.

Looking again at last lesson's extract, highlight 3 parts of the text that present Heathcliff as a typical Byronic Hero. Can you also note any language features used

Maths

2.2 Conversions

Small steps

- Explore conversion graphs
- Convert between currencies

Key words

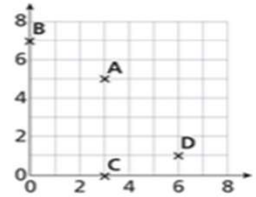
Conversion graph – a graph used to change from one unit to another

Axis – a reference line on a graph

Exchange rate – the value of a currency compared to another

Are you ready?

1 Write down the coordinates of the points A, B, C and D.



2 Draw a pair of axes from 0 to 6 in both directions. Plot the points (2, 4), (5, 0), (0, 2) and (3, 3).

3 Round these numbers to the nearest integer.

a 18.76 **b** 32.12 **c** 32.127 **d** 403.5

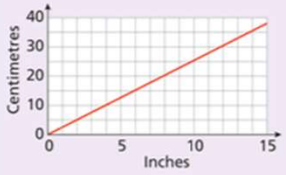
4 Round these amounts to the nearest penny. Some are done for you.

Amount	To the nearest penny
32.4p	32p
88.7p	
91.2p	
£1.27316	£1.27
£3.464	
£18.125	

Maths

Models and representations

A **conversion graph** shows the relationship between two quantities. It is very useful for converting between units of measure.



This graph can be used to convert inches to centimetres.

Example 1

Use the graph above to convert

a 6 inches to cm **b** 20 cm to inches **c** 200 cm to inches.

a 15 cm

Draw a vertical line from 6 inches to the graph.

Draw a horizontal line from the graph to the centimetres **axis** and read off the number of centimetres.

b 8 inches

Draw a horizontal line from 20 cm to the graph.

Draw a vertical line from the graph to the inches axis and read off the number of inches.

c $200 \div 20 = 10$ — There are 10 lots of 20 cm in 200 cm

$8 \times 10 = 80$ inches — As the number of inches and number of centimetres are in direct proportion, you can multiply the answer to part **b** by 10

If you do not have copies of graphs, you can line up "by eye" carefully with a ruler, but if you do have copies it is more reliable for drawing accurate lines.

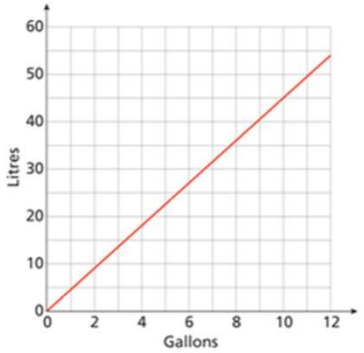
Practice 2.2A

1 You can use this graph to convert between gallons and litres.

a Convert 10 gallons to litres.

b Convert 30 litres to gallons.

c How accurate are your answers?



2 **a** Will a conversion graph for stones and kilograms go through (0, 0)? How do you know?

b Use your answer to **a**, and the fact that 10 stones is about 63.5 kg, to draw a conversion graph for stones and kilograms. Go from 0 to 15 stones on the horizontal axis and 0 to 100 kg on the vertical axis.

c Use your graph to convert

i 8 stones to kg **ii** 80 kg to stones.

d Ed weighs 41 kg and Jackson weighs 6 stones. Who is heavier, Ed or Jackson?

3 A teacher is drawing a graph to convert marks out of 80 (on the horizontal axis) to percentages (on the vertical axis).

a Will the graph pass through the point (0, 0)?

b Which of the points (80, 100) and (100, 80) will the graph go through?

c Draw the conversion graph and use it to convert these marks out of 80 to percentages.

i 60 **ii** 32 **iii** 52

Maths

4 This graph can be used to convert between temperatures in degrees Celsius and degrees Fahrenheit.

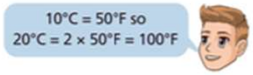
a Use the graph to convert these temperatures to degrees Celsius.

i 70°F **ii** 10°F **iii** 85°F

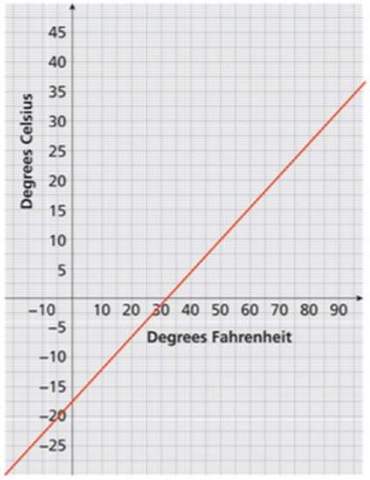
b Use the graph to convert these temperatures to degrees Fahrenheit.

i 30°C **ii** 0°C **iii** −10°C

c Zach used the graph to convert 10°C to 50°F



Explain why Zach is wrong.



What do you think?

1 Marta and Jakub are drawing graphs to convert miles to kilometres using the fact that 5 miles ≈ 8 km. The miles axis goes from 0 to 60 miles.


Marta: I'm going to use the points (0, 0) and (5, 8) to draw my line.


Jakub: I'm going to use the points (0, 0) and (50, 80) to draw my line.

Whose graph is likely to be more accurate to read from, and why?

2 Seb thinks all conversion graphs show directly proportional relationships. Explain why Seb is wrong.

3 At the time of writing this book, £30 = $38 (US dollars).

a Draw a conversion graph for pounds and dollars, from 0 to £40 on the horizontal axis.

b Use your graph to convert

i £20 to US dollars **ii** $30 to pounds.

4 A conversion graph between pounds and Croatian kuna goes as far as £45

How could you use the graph to convert

a £400 to kuna **b** £100 to kuna?

You can also convert currencies by doing calculations using **exchange rates**.

Example 2

Samira is going on holiday to Brazil. The unit of currency in Brazil is the real.
£1 = 7 Brazilian real

a Samira takes £250 spending money and converts this all to Brazilian real. How many Brazilian real does she receive?

b She spends 294 Brazilian real at a restaurant. How much is this in pounds?

a 250 × 7 = 1750 Brazilian real
Each pound is worth 7 Brazilian real, so £250 is worth 250 × 7 Brazilian real.

b 294 ÷ 7 = £42
Each pound is worth 7 Brazilian real, so to find how many pounds, you need to find how many 7s there are in 294
This is 294 ÷ 7

Practice 2.2B

1 The currency in Australia is the Australian dollar ($). £1 = $1.80

a How many Australian dollars can you buy with

i £50 **ii** £200 **iii** £500?

b Benji converts £3 to Australian dollars on his calculator.

He writes

Why has Benji's teacher marked his answer wrong?

c How many pounds can you buy with

i $180 **ii** $720 **iii** $45.90?

2 The currency in the Czech Republic is the koruna (CZK). £1 = 30 CZK

a How many Czech koruna can you buy for

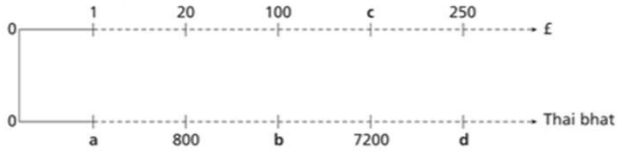
i £40 **ii** £90 **iii** £250?

b How many pounds can you buy with

i 9000 CZK **ii** 15 CZK **iii** 17 400 CZK?

Maths

3 The double number line shows money in British pounds and Thai bhat.
Find the missing numbers.



4 The currency in India is the rupee. £1 = 93 rupees

Ed uses £1 = 90 rupees to estimate how many rupees he can buy for £700.

a What is Ed's estimate for the number of rupees he can buy?

b Explain how you know his estimate is an underestimate.

c What is the actual number of rupees he can buy?

d Explain why Ed cannot get all his money in 200 rupee notes.

e What is the largest number of 200 rupee notes Ed can buy with his money?

5 Jackson bought a jacket in Belgium. He paid €319. The exchange rate is £1 = €1.10

a Work out the cost of the jacket in pounds (£).

b Jackson also bought a belt for €19.80. The same belt costs £17.50 in the UK. Is the belt cheaper in Belgium or the UK?

6 A phone costs 6120 krone in Denmark. The same phone costs £799 in the UK. The exchange rate is £1 = 8.16 Danish krone. Work out the difference in cost of the phone between Denmark and the UK, giving your answer in pounds (£).

What do you think?

1 Lydia converts £600 to euros (€) at a rate of £1 = €1.08. She spends four-fifths of her euros and converts the rest back at a rate of £1 = €1.44. How many pounds does she have now?

2 A company is considering buying office space in Italy and the USA.

The offices in Italy cost €352 000 and the offices in the USA cost $400 000

The exchange rates are £1 = €1.10 and £1 = $1.25

a Work out which offices are cheaper by converting both prices to pounds.

b Check your answer by converting both prices to

i euros **ii** US dollars.

3 The exchange rate in Paris is €1 = £0.92. The exchange rate in London is £1 = €1.10

In which city would you get more euros for your pounds? Show working to justify your answer.

Consolidate – do you need more?

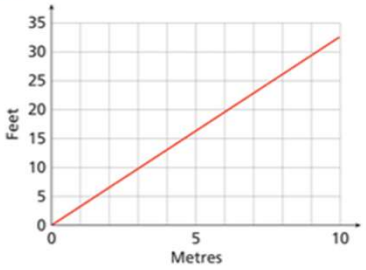
1 The conversion graph can be used to change between lengths measured in metres and feet.

a Use the graph to find the approximate conversion of

i 6 metres to feet

ii 30 feet to metres.

b How could you use the graph to help convert 50 metres to feet?



2 1 acre is about 4000 square metres.

a Use the points (0, 0) and (10, 40 000) to draw a conversion graph between acres and square metres.

b Use your graph to convert

i 8 acres to square metres **ii** 10 000 square metres to acres.

3 Flo goes on a trip to Japan. At the time of her trip, £1 = 150 Japanese yen.

a How many Japanese yen is the same as £20?

b Draw a conversion graph between pounds and yen, from 0 to £25 on the horizontal axis and 0 to 4000 yen on the vertical axis.

c Use your graph to convert

i £15 to Japanese yen **ii** 2700 Japanese yen to pounds.

4 The currency in Ethiopia is the birr. £1 = 48 birr

a How many Ethiopian birr can you buy for

i £50 **ii** £80 **iii** £2000?

b How many pounds can you buy with

i 9600 birr **ii** 12 000 birr **iii** 240 birr?

5 A family of four is going on holiday to the USA. The flights are £867 each.

They need to book two hotel rooms, which each cost $135 a night, for 14 nights.

They take a total of $1000 spending money, and spend it all.

Using £1 = $1.25, work out the total cost of the holiday in pounds.

Maths

anding

2.4 Scale diagrams and maps

Small steps

- Draw and interpret scale diagrams
- Interpret maps using scale factors and ratios

Key words

Scale – the ratio of the length in a drawing or a model to the actual object

Scale drawing – a diagram that represents a real object with accurate sizes reduced or enlarged by a ratio

Map – a diagram of a place, such as a town or a country

Are you ready?

1 How many centimetres are there in

a 1 m **b** 6 m **c** 6.5 m **d** 0.24 m?

2 Convert these measurements to metres.

a 400 cm **b** 40 cm **c** 4 cm **d** 1000 mm

3 The ratio of adults to children on a school trip is 1 : 12

a How many children can go on a trip with 50 adults?

b How many adults are needed for a year group with 348 students?

4 The ratio of cordial to water in a drink is 1 : 8

a How much water do you need with 20 ml of cordial?

b How much cordial do you need for 500 ml of water?

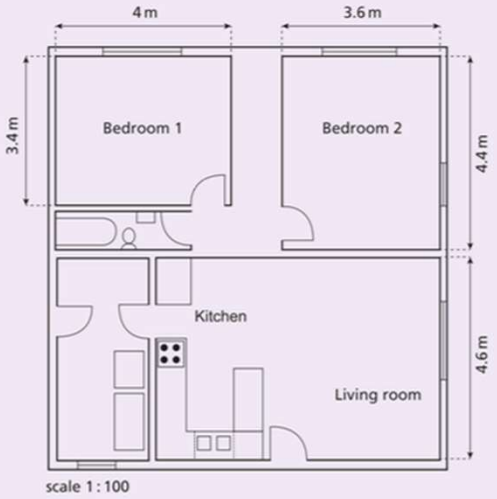
Maths

Models and representations

A **scale drawing** represents real objects so that you can see the relative size of each object.

This scale drawing is the floor plan of an apartment. You can see which rooms are larger and smaller than other rooms.

The **scale** is 1 : 100
Each cm on the scale represents 100 cm (or 1 m) in the real apartment.



scale 1 : 100

A **map** is a scale diagram of a place. Here are three maps of a region in the UK to different scales.

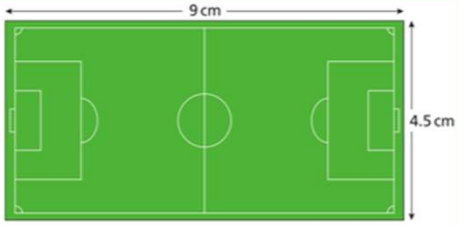
Example 1

Here is a scale drawing of a football field.

a Find the length of the field in metres.

b Find the width of the field in metres.

c How many metres does each centimetre on the diagram represent?



Scale 1 : 1000

a Length of field on drawing = 9 cm
Actual length = 9 × 1000 = 9000 cm
9000 cm = 90 m

First measure the length with a ruler.
As the scale is 1 : 1000, each 1 cm represents 1000 cm, so 9 cm represents 9 × 1000 cm
Change your answer to the most appropriate unit.

b Width of field on drawing = 4.5 cm
Actual width = 4.5 × 1000 = 4500 cm
4500 cm = 45 m

Work through in the same way as part **a**.

c 1 cm represents 1000 cm, which is 10 m

A scale of 1 : 1000 means 1 cm represents 10 m.

Example 2

A model boat is made to a scale of 1 : 200

a The model is 38 cm long. How long is the real boat? Give your answer in metres.

b The mast of the boat is 12 m tall. How tall is the mast on the model? Give your answer in centimetres.

c How many metres does each centimetre on the model represent?

a 38 × 200 = 7600 cm
7600 ÷ 100 = 76 m

The actual boat is 200 times longer, so multiply the length by 200
You convert cm to m by dividing by 100

b 12 ÷ 200 = 0.06 m
0.06 × 100 = 6 cm

The mast on the model boat is 200 times smaller, so divide the length by 200
You convert m to cm by dividing by 100

c 1 cm represents 200 cm, which is 2 m

Practice 2.4A

1 Here is a sketch of a rectangle.

a Make an accurate scale drawing of the rectangle using a scale of

i 1 cm to 1 m **ii** 1 cm to 2 m **iii** 1 : 400

Maths

b Find the dimensions of the scale drawing of the rectangle if you use a scale of

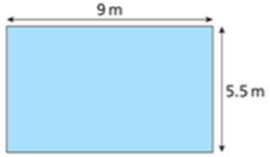
i 1:4 **ii** 1:1000

c

If I use a scale of 2 cm to 1 m, the scale drawing of the rectangle will be 8 ÷ 2 = 4 cm by 4 ÷ 2 = 2 cm

Explain why Flo is wrong and find the correct measurements of the scale drawing using a scale of 2 cm to 1 m.

2 Here is a sketch of the floor of a barn.



a Draw a scale diagram of the barn using a scale of 1:100

b Would your diagram be larger or smaller if instead you drew to a scale of 1:200? Explain your answer.

3 The goal area on a football pitch is a rectangle that measures 6 yards by 20 yards.

What would the dimensions of a scale drawing of the goal area be if drawn to a scale of

a 1 cm to 2 yards **b** 2 cm to 1 yard?

4 Write these scales as ratios in the form 1:n

a 1 cm to 50 cm **b** 1 cm to 4 m **c** 2 cm to 1 m

d 5 cm to 1 m **e** 2 cm to 5 m **f** 4 cm to 10 m

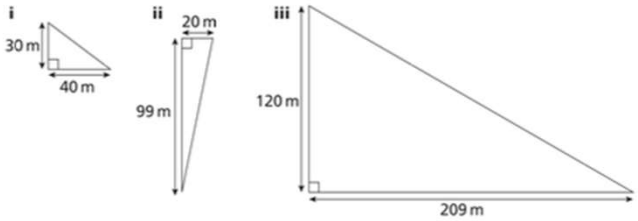
5 A garden is 36 m by 24 m. A plan of the garden is drawn using a scale of 1:400

a Find the length and width of the plan.

b On the plan, a flowerbed is 5 cm long. How long is the actual flowerbed?

6 Field hockey is played on a pitch 90 m long and 55 m wide. What scale would you use to draw a plan of a field hockey pitch in your exercise book?

7 **a** Choose an appropriate scale to draw diagrams of these right-angled triangles.



b Use your scale drawings to work out the actual lengths of the third side of each triangle.

What do you think?

1 Sometimes diagrams are labelled "Not to scale". What does this mean? Why do you think this label is given to some diagrams?

2 **a** Here are two ways of writing scales, 1:200 and 1 cm to 2 m. Are they the same or different? How do you know?

b How else could you write the scales

i 1:400 **ii** 1:150 **iii** 2 cm to 5 m?

3 An old textbook has a diagram labelled "1 inch to 1 foot". Darius thinks he cannot use the diagram as his ruler is only graduated in cm. What do you think?

4 What would be a sensible scale for drawing a diagram of

a your classroom **b** the school hall **c** the school grounds?

Example 3

The scale of a map is 1:50 000

a Two hotels are 4 cm apart on the map. What is the actual distance between the hotels? Give your answer in kilometres.

b The distance between two castles is 6.5 km. How far apart would they be on the map? Give your answer in centimetres.

a $4\text{ cm} \times 50\,000 = 200\,000\text{ cm}$
$200\,000\text{ cm} \div 100 = 2000\text{ m}$
$2000\text{ m} \div 1000 = 2\text{ km}$

Each cm is 50 000 cm, so 4 cm is 4 × 50 000 cm
To change to metres, divide the number of centimetres by 100
To change to km, divide the number of metres by 1000

b $6.5\text{ km} = 6500\text{ m} = 650\,000\text{ cm}$
$650\,000 \div 50\,000 = 13\text{ cm}$

6.5 ÷ 50 000 would give a very small decimal, so it is easier to convert to km to cm first, by multiplying by 100 and then 1000
Then you can use the scale to see how many times 50 000 divides into 650 000

Practice 2.4B

1 Here is part of a map. 1 cm on the map represents 50 km.

a Measure the distance, in centimetres, between Bedford and Cambridge on the map.

b Work out the distance, in kilometres, between Bedford and Cambridge.

c Tom is going to drive from Bedford to Cambridge. Will the distance he drives be more or less than your answer to **b**? Why?

Maths

d Investigate the distances between other towns and cities labelled on the map. Which are closest together? Which are furthest apart?

e Show that the scale of the map can be written 1 : 5 000 000

2 The scale of this map is 1 : 1 000 000

a What distance, in km, does 1 cm on the map represent?

b Measure the distance, in centimetres, between Bedford and Cambridge on the map.

c Work out the distance, in kilometres, between Bedford and Cambridge.

d Are your answers more or less accurate than your answer to question **1**? Why?

e Investigate the distances between other towns and cities labelled on the map. Can you find towns that are exactly 50 km apart? What other questions can you ask?

3 The scale of this map is 1 : 500 000

a What distance, in km, does 1 cm on the map represent?

b Measure the distance, in centimetres, between Bedford and Cambridge on the map.

c Work out the distance in kilometres between Bedford and Cambridge.

d Where in Cambridge and where in Bedford did you choose to measure from?

e Investigate the distances between other towns and cities labelled on the map. How accurate are you answers now?

4 The scale of a map is 1 : 400 000

a On the map, the distance between two towns is 7.2 cm. Find the actual distance between the two towns.

b Find the distance apart on the map of two towns that are actually 100 km apart.

5 Express each scale in the form 1 : *n*

a 1 cm represents 10 m

b 1 cm represents 2 km

c 1 cm represents 40 km

d 2 cm represents 10 m

e 5 cm represents 2 km

f 4 cm represents 10 km

Maths

What do you think?

1 Emily and Jackson are going on a hike.

Emily: My map is 1:50000 so it'll be more detailed than yours.

Jackson: No, my map is more detailed because the scale is 1:25000

Who do you agree with? Why?

2 On a map of a town, a street is 12 cm long. The street is actually 240 m long.
Work out the scale of the map in the form

a 1 cm to ☐ m **b** 1 : n

3 The scale of a map is 1:40000. A square field on the map is 3 cm long.

a Work out the area of the square field as drawn on the map.

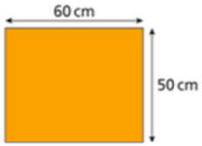
b What is the actual length of the field?

c What is the actual area of the field?

d How many times bigger than the area on the map is the actual area of the field?

Consolidate – do you need more?

1 Here is a sketch of a rectangle



a Make an accurate scale drawing of the rectangle using a scale of

i 1:10 **ii** 1:20

b Find the dimensions of a scale drawing of the rectangle if using a scale of

i 1:4 **ii** 1:100

c Which is the most appropriate scale to use for a diagram of the rectangle?

2 A warehouse is 40 m long and 15 m wide.
Work out the length and width of a scale drawing of the warehouse using a scale of

a 2 cm to 1 m **b** 1 cm to 1 m **c** 1 cm to 2 m

3 A map of a town is drawn to a scale of 1:10000

a What actual distance does 1 cm on the map represent?
Give your answer in cm, m and km.

b What actual distance does 6 cm on the map represent?
Give your answer in cm, m and km.

c What actual distance does 1 mm on the map represent?
Give your answer in cm, m and km.

d What actual distance does 1 inch on the map represent?
Give your answer in inches.

4 A room is 8 m long. On a scale drawing, the length of the room is 4 cm.
Find the scale of the drawing in the form 1 : n

Stretch – can you deepen your learning?

1 Benji, Marta and Ali draw a scale diagram of their classroom. They all use different scales.
Do you agree with Benji? Justify your answer.

Benji: All our diagrams are mathematically similar.

2 Write each scale in the form "1 cm to ☐ km"

a 1:200000 **b** 1:500000 **c** 1:50000 **d** 1:25000 **e** 1:4000

3 On a 1:40000 map, a section of road is 12 cm long. Find the length of the section of road on a 1:50000 map. How many different ways can you find to solve this problem?

4 Here is a map of a large coastal town.
What might the scale be? What features can you use to decide?

Reflect

1 What's the same and what's different about a scale and a ratio?

2 What's the same and what's different about using a map to find a real distance and working out what lengths would be on a map?

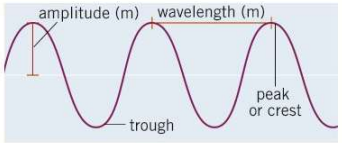
Science – Revision for AP2

Learning objectives

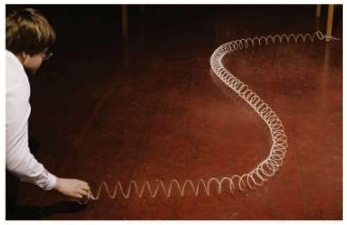
After this topic you will be able to:

- describe the different types of wave and their features
- describe what happens when water waves hit a barrier
- describe what happens when waves superpose.

Read through the key information and answer the comprehension questions (A,B,C…) and the summary questions



▲ This diagram shows the amplitude and wavelength of a wave.



▲ You can make a transverse wave on a slinky.

Mexican waves are very popular at concerts and sporting events. But what is a wave?

What is a wave?

In science a wave is an **oscillation** or **vibration** that transfers **energy** or information. A wave can also be an **undulation** on the surface of water. Matter does not get transferred. Waves have many uses, for example, microwaves cook food, and **sound** waves help you communicate.

Features of a wave

All waves have three important features:

- an **amplitude**, which is the distance from the middle to the top or bottom of a wave
- a **frequency**, which is the number of waves that go past a particular point per second
- a **wavelength**, which is the distance from one point on a wave to the same point on the next wave.

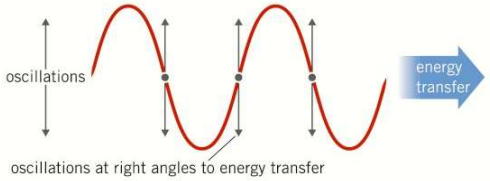
The top of a wave is called a **peak** or **crest**, and the bottom of a wave is called a **trough**.

A Name three properties of a wave.

Transverse or longitudinal?

You can send pulses down a slinky spring. You can make the pulses in two ways.

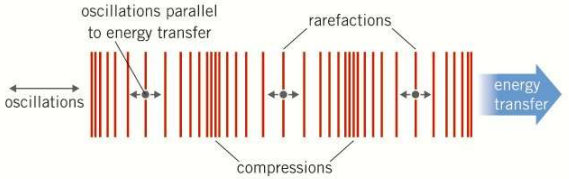
You can move your hand at right angles to the spring. This produces a **transverse** wave on the slinky. In a transverse wave the oscillation is at 90° to the direction of the wave.



▲ In a transverse wave the oscillation is at 90° to the direction of the wave.

You can also push and pull the spring. This produces a **longitudinal** wave on the slinky. The oscillation is parallel to the direction of the wave – it is in the same direction as the spring itself.

In a **compression** the coils of the spring are close together. In a **rarefaction** the coils are further apart. Sound is a longitudinal wave and light is a transverse wave.



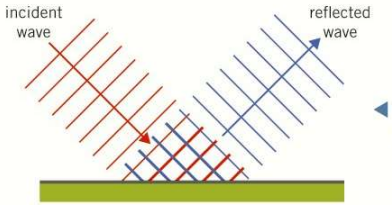
▲ In a longitudinal wave the oscillation is parallel to the direction of the wave.

B State the direction of the oscillation of a longitudinal wave.

Reflecting waves

Waves bounce off surfaces and barriers, just like a football bounces off a wall. This is called **reflection**.

The wave coming into the barrier is called the **incident wave**. The wave bouncing off is called the **reflected wave**.



◀ A wave reflects off a barrier.

C State the name of the wave that hits the barrier.

Adding waves

When waves are put together they **superpose**. This means that they add up or they cancel out.

If the waves are in step they will add up. You get more than you had before. If they are not in step then they cancel out and you get less than you had before.

Spot the word

Write the word from each of these definitions:

a the distance from the top to the bottom of a wave

b where the links of a spring are squashed together

▲ You can make a longitudinal wave on a slinky.

Summary Questions

1 Copy the sentences below, choosing the correct bold words.

A wave is an oscillation or vibration that transfers **energy**/**matter**. The distance from the centre to the top of the wave is the **amplitude**/**wavelength**. The distance from one crest to the next crest is the **amplitude**/**wavelength**. Waves can **reflect**/**superpose** when they hit a barrier, and cancel out or add up when they **reflect**/**superpose**.

(5 marks)

2 Describe the difference between a compression and a rarefaction in a longitudinal wave on a spring.

(2 marks)

3 Explain in detail the difference between longitudinal and transverse waves, giving examples of each.

(6 marks QWC)

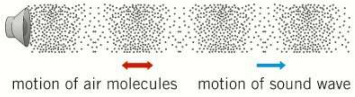
Science – Revision for AP2

Learning objectives

After this topic you will be able to:

- describe how sound is produced and travels
- explain why the speed of sound is different in different materials
- contrast the speed of sound and the speed of light.

▲ The ends of a tuning fork are vibrating.



▲ Air molecules move backwards and forwards.

Read through the key information and answer the comprehension questions (A,B,C…) and the summary questions

If you very gently press the front of your throat while you are talking you will feel a vibration. This is your vocal chords vibrating. The vibration produces the sound waves that travel through the air from your mouth.

What is a sound wave?

A **vibration** produces a sound wave. All speakers, like the ones in your headphones, have something that moves backwards and forwards, or vibrates. This makes the air molecules move backwards and forwards, which produces a sound wave.

Some people think that sound just 'dies away'. It doesn't. It spreads out as it moves away from the source.

A State what produces a sound wave.

What does sound travel through?

Dolphins and whales use sound waves to communicate underwater. Elephants stamp their feet when a predator comes near – the warning travels through the ground to other elephants. Sound needs a **medium** like a solid, liquid, or gas to travel through. It cannot travel through empty space, a **vacuum**, because there are no air molecules to vibrate.

How fast does sound travel?

Sound travels at 340 m/s in air. Sound travels much faster in liquids, about 1500 m/s. Sound travels fastest in solids. In metals like steel it can travel at 5000 m/s. You can explain why a sound wave travels faster in a solid than in a gas if you think about particles. The particles in a solid are very close together, so the vibration is passed along more quickly than in a gas.

▲ The arrangement of particles explains the speed of sound in different materials.

Some people talk about the 'sound barrier'. There is no difference between travelling at or beyond the **speed of sound**.

Felix Baumgartner found this out when he became the first human to travel faster than the speed of sound when he jumped from a balloon 24 miles above the surface of the Earth.

◀ Felix Baumgartner travelled faster than sound.

B State the speed of sound.

How fast?

A student uses some secondary sources of information to make a list of the speed of sound in different materials.

a Draw a suitable table that she could use to record the data.

b State and explain which type of graph she could plot to show the data.

C Name the three types of medium that sound can travel through.

Which is faster: sound or light?

Light travels much faster than sound. The **speed of light** is 300 000 000 m/s, so it is almost a million times faster than sound. You notice this difference during a thunderstorm. The thunder and lightning are produced at the same time. You see the lightning immediately but it takes time for the sound of thunder to reach you.

Light can travel through a vacuum. It doesn't need a medium to travel through.

Key Words

vibration, medium, vacuum, speed of sound, speed of light

Stormy night

A girl sees a flash of lightning and then hears the thunder four seconds later.

a How far away is the storm? State your answer in kilometres.

b What would she notice about the thunder and lightning when the storm is directly overhead?

Summary Questions

1 Copy and complete the sentences below.

Sound is produced by objects that are _____ . This makes the air molecules _____ and produces a sound wave. Sound travels fastest in _____ and slowest in _____, and it cannot travel through a _____.

(5 marks)

2 Explain why sound travels slower in a gas compared to a liquid.

(2 marks)

3 Compare the time it takes the light to travel from your teacher to your eye with the time it takes sound to travel the same distance.

(6 marks QWC)

Geography

Guided Reading: The Beast from the East – A Winter Storm in the UK

In late February 2018, the United Kingdom was hit by an extreme weather event that came to be known as the Beast from the East. This name, popularised by the media, referred to a wave of bitterly cold air and heavy snow that swept in from Siberia, a region in northern Russia. The weather event began around 25 February 2018 and lasted into early March, with the most serious impacts occurring between the 26th of February and the 2nd of March. What made this event unusual and severe was the direction and source of the cold air. Normally, the UK receives mild and wet weather from the west, carried by Atlantic winds. However, during the Beast from the East, these usual patterns were disrupted. A rare event called sudden stratospheric warming took place above the Arctic, rapidly increasing temperatures high in the atmosphere. This change disrupted the jet stream, a powerful air current that normally controls weather patterns in Europe. As a result, freezing air from Siberia was pulled westwards across Europe and into the UK.As this icy air moved across the country, it collided with moist air from the Atlantic Ocean. When cold, dry air meets moist air, it often leads to heavy snowfall, and that's exactly what happened. Snow began falling in many parts of the UK, particularly in the east and south. Then, on the 1st of March, a second storm system called Storm Emma arrived from the south. This storm added more snow, strong winds, and freezing rain to the already severe conditions, creating blizzards and reducing visibility on roads.The effects of the Beast from the East were widespread and serious. Transport networks across the country struggled to cope. Trains were cancelled, airports shut down, and motorways became blocked, with some drivers stranded in their cars overnight. It became difficult for emergency services and delivery vehicles to travel. At the same time, many schools and workplaces closed as people were unable to get there safely. In some areas, shops ran out of bread, milk, and other essentials.The weather had tragic consequences as well. At least 17 people lost their lives, either due to accidents on icy roads or from exposure to the bitter cold. Hospitals were extremely busy, and some staff had to walk long distances or be driven by 4x4 vehicles just to reach their patients. The freezing temperatures also caused water pipes to burst, leading to power cuts and water shortages in several towns and cities. The UK's emergency response was swift in many areas. The Met Office issued severe weather warnings, including rare Red Warnings, to let people know the situation was dangerous and they should avoid travel. Local councils opened emergency shelters to protect vulnerable people, especially the homeless. In some places, the Army was called in to help move NHS staff and patients safely. Communities across the UK pulled together, with neighbours helping one another by clearing snow or checking in on the elderly. The economic impact of the storm was also significant. The disruption cost the UK millions of pounds, as businesses lost income and deliveries were delayed. Many people were unable to work, and tourism slowed. However, the sense of community spirit and resilience shown by people during this time was a powerful reminder of how the country can come together in a crisis.

Comprehension Questions

1.What was the "Beast from the East" and when did it occur?
2.Where did the cold air that caused the storm come from?
3.What weather phenomenon disturbed the jet stream before the storm?
4.What happened when Storm Emma arrived?
5.Name three effects of the storm on transport in the UK.
6.How did the storm affect schools and workplaces?
7.What were two health and safety issues caused by the storm?
8.How did the Beast from the East affect the UK economy?
9.What role did the Met Office play during the storm?
10.What kinds of help did communities and authorities provide?

Challenge Questions

11.Why did the Beast from the East cause more disruption than regular winter weather?
12.Explain how the interaction between dry air from the east and moist Atlantic air caused snow.
13.How can the UK prepare better for future extreme weather events like this one?
14.In what ways did Storm Emma make the situation worse?

Geography

Guided Reading: Microclimates and the Urban Heat Island Effect

Have you ever noticed how it feels warmer in a city than in the countryside, even if they're only a few miles apart? Or that it's cooler in a forest than on a playground, even on the same day? This happens because of something geographers call microclimates and the urban heat island effect.

What is a Microclimate? A microclimate is the climate of a small area that is different from the climate around it. While we usually think about weather and climate on a national or global scale, microclimates focus on local areas—like your school grounds, a park, or even a garden. These small places can be warmer, colder, wetter, drier, windier, or calmer than the wider region. For example: A shady forest might stay cool and damp, even on a hot day. A south-facing wall can be much warmer than a nearby field because it gets more sunlight. A valley might be colder in the early morning because cold air sinks. Microclimates are affected by a few key factors: Shelter: Buildings, trees, and walls can block wind and trap heat. Surface materials: Dark surfaces like tarmac or concrete absorb more heat than grass or soil. Water: Areas near rivers or lakes are often cooler because water absorbs and releases heat slowly. Aspect: This means the direction a slope or surface faces. In the UK, south-facing areas get more sunlight. Even your school likely has different microclimates—the sunny playground may feel very different from the shaded area under the trees.

What Is the Urban Heat Island Effect? Now imagine a whole city being warmer than the countryside around it. That's called the Urban Heat Island (UHI) effect. It happens because cities are full of buildings, roads, and concrete, which absorb and store heat during the day. At night, this heat is slowly released, so the city doesn't cool down as quickly as rural areas. This means that temperatures in cities can be 2–4°C warmer than surrounding countryside—especially in summer. This may not sound like a lot, but it can cause more heat-related illness, increase energy use (as people turn on fans or air conditioning), and even make air pollution worse. Several factors contribute to the Urban Heat Island effect: Buildings and roads absorb and give off heat. Lack of greenery means less shade and less cooling from plants. Air pollution traps heat in the atmosphere. Heat from vehicles and air conditioners adds to the warmth. The UHI effect is strongest in the late afternoon and evening, and in cities with lots of buildings and few trees. Large cities like London and Manchester often feel the effect more than smaller towns.

How Can We Reduce These Effects? Luckily, there are ways to reduce the impacts of microclimates and the urban heat island effect. Here are some strategies: Plant more trees and green spaces: Trees provide shade and cool the air through a process called evapotranspiration. Use lighter-coloured materials for roads and buildings so they reflect, rather than absorb, sunlight. Create green roofs: These are gardens on top of buildings that help absorb rain and cool the air. Improve city design: Making streets windier and more open can help air flow and reduce heat. Understanding microclimates and the UHI effect helps geographers and planners design better, more comfortable places to live—

1. What is a microclimate?
2. Give two examples of places where you might find a microclimate.
3. What are four factors that can affect a microclimate?
4. Why might a forest be cooler than a playground?
5. What does "aspect" mean in geography?
6. What is the Urban Heat Island effect?
7. How much warmer can a city be compared to the countryside due to UHI?
8. Name three things in cities that contribute to the Urban Heat Island effect.
9. Why can the UHI effect be a problem for people living in cities?
10. What time of day is the Urban Heat Island effect usually strongest?

Challenge Questions (11–15)

11. Why do cities stay warmer at night compared to the countryside?
12. How does planting trees help reduce the effects of urban heat?
13. Why is the colour of buildings and roads important in controlling heat?
14. What is a green roof, and how does it help?
15. Imagine you are designing a new school in a city—what would you do to reduce the effects of microclimates and urban heat?

History

Queen Elizabeth chartered Sir Walter Raleigh to create a settlement in North America. She gave him the right to take a part of the continent, with which he could do as he pleased in the name of England.

Sir Walter Raleigh sent an expedition to Virginia before establishing his colony. English explorers sailed to Virginia and met Indigenous peoples; the Secotans and the Croatans. They brought two Croatan men back to England with them to report to Raleigh about the geography and peoples of Virginia.

Using this information, Raleigh decided to colonise a place called Roanoke Island. A small colony was founded in 1585, but this colony was wiped out through fighting with the Indigenous peoples. By 1587, there was a new colony of 108 people (mostly men) living on the island in a small fort. Ralph Lane went with him, and in the source below is describing the experience...

SOURCE 1: Excerpt from Ralph Lane's letter 3rd September 1585 ...

"we have discovered the main to be the goodliest soil under the scope of heaven, so abounding with sweet trees, that bring such rich and pleasant gums, grapes of such greatness, yet wild, as France, Spain nor Italy have no greater. Maize and wheat, whose ear yielded corn for bread 400. Cane makes very good and perfect sugar. Besides that, it is the **goodliest and most pleasing Territory of the world**: for the continent is of a huge and unknown greatness, and very well peopled and towed, though savagely, and the climate so wholesome, that we had not one sick since we touched the land here. To conclude, if Virginia had but horses and people in some reasonable proportion, I assure myself that no realm in Europe were comparable to it. For this already we find that what commodities Spain, France, Italy, or the East has, in wines of all sorts, in oils, in flax, in roses, pitch, frankincense, currants, sugars, and such like, these parts do abound with the growth of them all! But being Savages that possesses the land, they know no use of the same. And other rich commodities, that no parts of the world, be they the West or East Indies, have, here we find great abundance of. The people naturally are most courteous and want to have clothes, but especially of course cloth rather than silk, coarse canvas they also like well of, but copper carries the greatest price of all, so it be made red."

Q1. Make a list of all the things that Lane thinks are good about the new country.
Q2. If you received this letter, would you think Roanoke was a good or bad place to live? Remember to give reasons for your answer
FINAL TASK: Your next job is to design a tourism brochure for Roanoke, based on the knowledge we have at the moment.

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Source 2: Roanoke: What went wrong with England's First Colony?

The chief decided that there was only one solution – to wipe out the English settlement. Wingina ordered his men to destroy the fish traps they had set for the colonists. With the colonists now weakened, the chief planned his attack on the English fort.

Ralph Lane heard about Wingina's planned attack from a Native American who was friendly to the English colonists. Lane decided to attack first. Kist after dawn on 1 June 1586 he led 27 men across the water towards Wingina's mainland settlement. He pretended that he simply wanted to talk with Wingina. When Lane and the English soldiers entered the village they saw Wingina and several village elders sitting around the campfire. The soldiers fired their muskets straight into the group of men.

Wingina was the first to be hit. The colonists thought he was dead, but the chief suddenly sprang to his feet and ran into the forest. A band of soldiers set off after him. One of the soldiers caught sight of Wingina and fired his pistol. He hit the chief on the buttocks, but Wingina was not badly injured and he ran on. He had now shaken off all but two of the soldiers and they were finding it difficult to run through the forest in their heavy clothes.

Ralph Lane waited anxiously in the village. He had no idea whether Wingina was alive or dead. After a long time, the two exhausted soldiers emerged from the forest. Lane saw that one of them was clutching something in his hand – the bloody head of the Chief Wingina. The colony was now safe, but there would never be friendship with the native people.

Read the source carefully and then answer the questions.

Q1. Describe how the English acted. Were they respectful and honest to the native people?

Q2. Using the above and your other knowledge explain why did the colony at Roanoke fail?

Spanish

Complete as many of the tasks shown in the boxes on your worksheet. You can work in pairs.

List 6 school subjects in Spanish.	**List six school facilities (canteen etc)** in Spanish.	**Order the days of the week:** domingo, miércoles, lunes, sábado, viernes, martes, jueves
Translate the descriptions Tengo los ojos verdes, soy alto y Delgado, tengo el pelo rubio, tiene el pelo gris, soy pelirrojo.	**Translate these activities:** Hago gimnasia, Hago equitación, Toco la guitarra, Juego al fútbol	**Give an opinion for each smiley:** ☺ ☺☺ ☺ ☹ ☹ ☹
List 6 family members in Spanish.	**Translate adjectives**	**List 4 weathers** in Spanish.
List 6 family member in Spanish		

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