4th edition

geog.1

geography for key stage 3

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Contents

Key for symbols in 'Your turn' questions

 Literacy  Numeracy

1 It's your planet!

The big picture

Welcome to Chapter 1 of *geog.1*, the first book of *geog.123*.

This chapter tells the big big story of how Earth, and we humans, got here. And it prepares you for what you'll study in geography. Here's the big picture …

- Earth is around 4.5 billion years old. (That's 4 500 000 000 years old.)
- We humans (*Homo sapiens*) have been here for only about 200 000 years. There were other species of humans before us.
- We began to spread across Earth only about 60 000 years ago, from our home in East Africa. Now we are almost everywhere.
- Earth is being changed all the time by natural processes. For example, rivers carve valleys in it.
- We change it too. For example, we build towns and cities and roads.

Did you know?
- Dinosaurs were on Earth for about 164 million years.
- That's over 800 times longer than humans (so far)!

Did you know?
- Most people accept that we're descended from an ape-like species …
- … but not everyone agrees!

Did you know?
- The Neanderthals were a species of human, quite like us.
- They died out around 45 000 years ago.

What if…
- …we were taken over by creatures from another planet?

Your goals for this chapter

By the end of this chapter, you should be able to answer these questions:

- How was Earth formed, and about how long ago?
- Around when did humans like us (*Homo sapiens*) first appear – and where?
- Around when did we first arrive in the land that's now the UK?
- What do these terms mean?
  evolution *mass extinction* *geological timescale* *eon* *fossil*
- When was the Precambrian eon, and what life existed then?
- Give one fact about each of these periods, in the geological timescale:
  Carboniferous *Permian* *Jurassic* *Quaternary*
- Give three examples of natural processes that change Earth, and three examples of ways we humans change it.
- What kinds of things will you learn about, in these branches of geography?
  physical geography *human geography* *environmental geography*

And then …

When you finish the chapter, come back to this page and see if you've met your goals!

Your chapter starter

Page 4 shows a planet. Which one?

Where in space is it?

What's keeping it there?

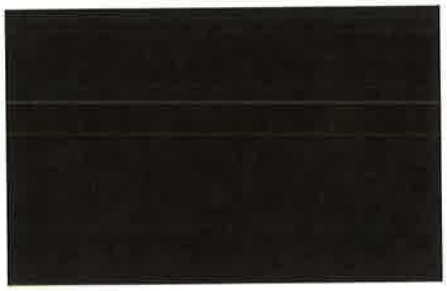
Who's on it?

What are they doing?

1.1 Earth's story: it begins with a bang

Planet Earth is your home. Here is the first part of its story – and yours!

How Earth began



Once upon a time, long long ago, there was nothing. No Universe, no stars, no Earth, no people.

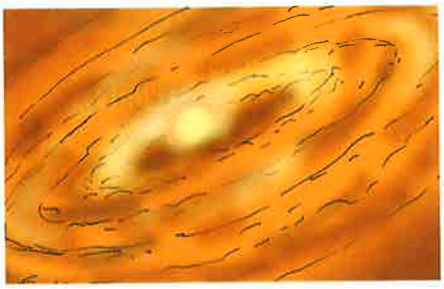
But suddenly, about 13.8 billion years ago, there was a violent explosion of energy: the **Big Bang**.

It was the start of the **Universe**! In an instant, tiny particles had formed, from which atoms would be made.

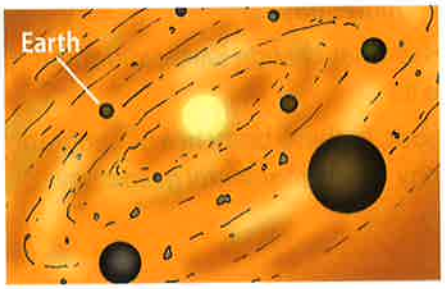
About 2 million years after the Big Bang, the first **star** appeared: a hot glowing ball of hydrogen gas.

Over time, trillions of stars formed, in groups called **galaxies**. (And died when their reactions stopped.)

About 4.6 billion years ago, in a galaxy called the Milky Way, a very special star was born: our **Sun**.



Dust and gases spun around the Sun. A force called **gravity** pulled them together to form rocks …

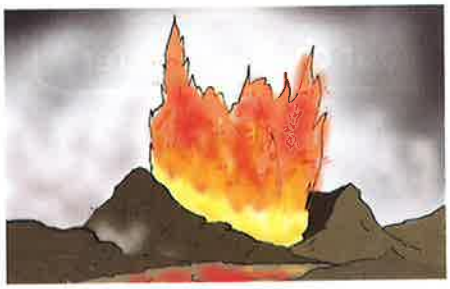


… and the rocks merged to form **planets**. One of these was **Earth**. It is around 4.5 billion years old.

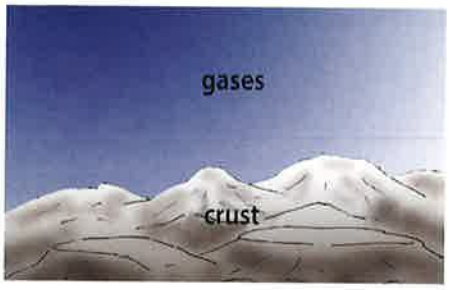
Soon after Earth formed, while it was still hot soft rock, a smaller planet struck it.

The impact flung rock and dust into space. Gravity pulled them together. The result: our **moon**!

Slowly, over millions of years, Earth's surface cooled, and a hard crust formed. But often …



… the crust was split by boiling liquid rock (lava) from below. These were the first **volcanoes**!

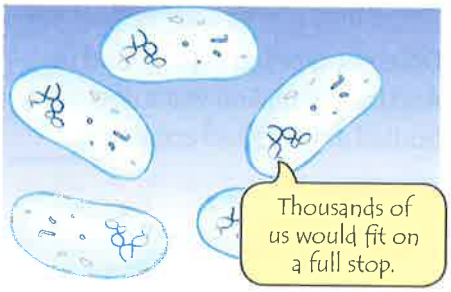


Around Earth was a layer of gases: the **atmosphere**. It had a lot of water vapour in it.

As the crust cooled, water vapour condensed to form rain. This poured down. The **ocean** began to form.

So this is Earth, 3.9 billion years ago. Soft inside. A hard crust. An ocean. And … bombarded by **meteorites**!

They fell into the ocean, carrying compounds from space. It may have been these compounds …



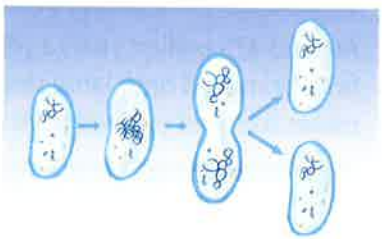
… that led to something amazing, around 3.5 billion years ago: the first tiny living **cells**.

Those first tiny cells in the ocean, far too small to see, would one day lead to someone special: **you**!

The start of life

So, around a billion years after Earth formed, there was life: tiny cells that could reproduce by splitting in two. Look at the diagram on the right.

Sometimes a daughter cell was a bit different from the parent cell. It passed the difference on when it split. In that way, cells changed or **evolved** over time. This process is called **evolution**.



▲ *A cell splitting. It gives two 'daughter' cells. Next, each of these will split.*

Where next?

All living things on Earth came from these first tiny cells, through evolution. But it was a tough journey. Several times, vast numbers of living things were wiped out. For example, during ice ages. You'll find out more in the next unit.

Did you know?

- Not everyone agrees with all the theories in this unit!

Your turn

1 What was *the Big Bang*?

2 How did Earth form?

3 Show these in a flow chart, in the order in which they happened. Start with the one that was longest ago.

our moon formed — *the Big Bang*
living cells appeared — *Earth formed*
our Sun formed — *the ocean formed*
Earth's surface cooled

You can add drawings if you like!

4 We can't say the Big Bang is a **fact** – because nobody was there to see! It is a **theory** that fits the evidence. But one day, someone might be able to prove it is wrong.
Do you think these are facts, or theories? Explain.
a The moon formed when a planet collided with Earth.
b Rain is made of water droplets.

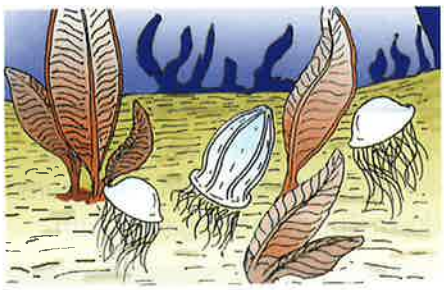
5 Many millions of people believe that God created the Universe. Is it possible to believe this, *and* the Big Bang theory? Try to explain your answer.

1.2 Earth's story: life develops

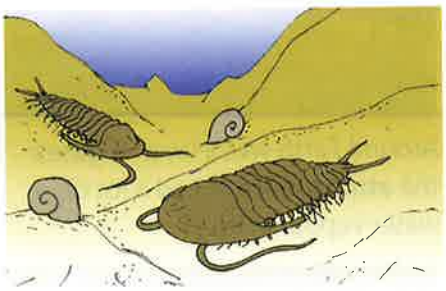
Now read about how life on Earth developed – from simple cells to us.

How life on Earth developed

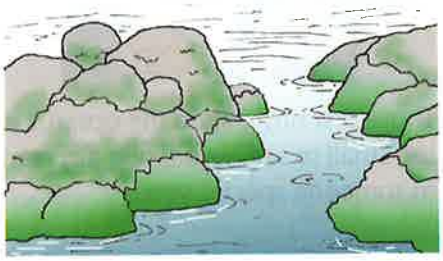
For over 2 billion years the only life on Earth was cells in the ocean. They evolved, and grew more complex.



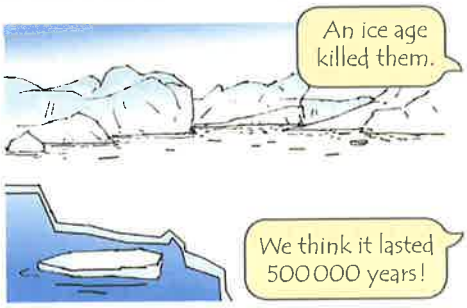
Different types of cells joined up. And by 550 million years ago, soft-bodied animals had appeared.



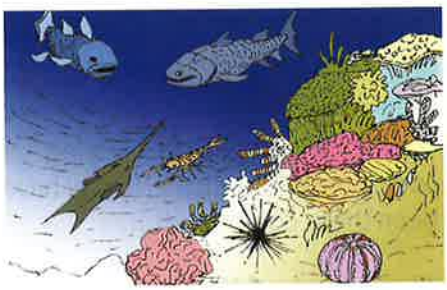
By 500 million years ago, there were animals with shells – like these trilobites and sea snails.



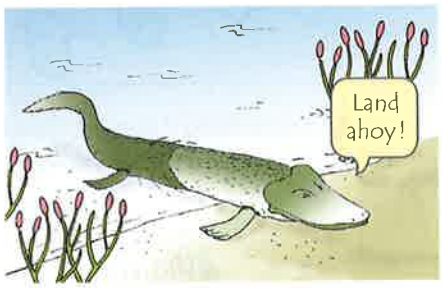
Around 475 million years ago, the first life moved onto land: simple plants that had evolved from **algae**.



About 440 million years ago came a **mass extinction**: many species died out over quite a short time.



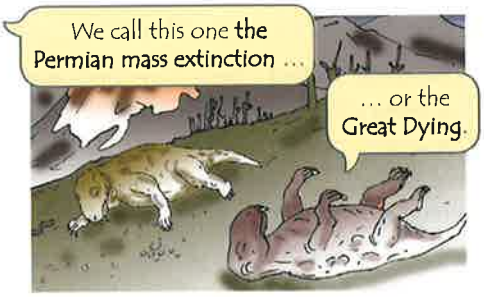
But life hung on. In the ocean, fish flourished. Bony fish with jaws appeared. On land, new plants grew.



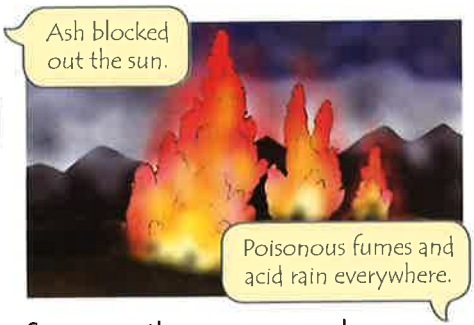
Around 395 million years ago, fish began to adapt to life on land, using fins as legs.

Then, about 360 million years ago, there was another mass extinction. Things in the ocean suffered most.

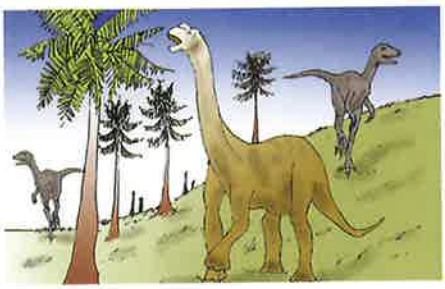
Life recovered. Thousands of new species appeared. Lush forests grew on land. But then came disasters!



First, an ice age. Next, a dry period. And then, 248 million years ago, the biggest mass extinction of all.

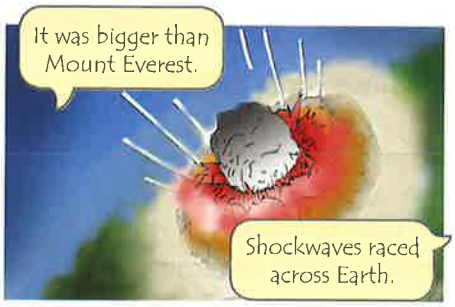


Some say the cause was a huge eruption of lava, in what is now Siberia, that lasted 1 million years!



The surviving species continued to evolve. And around 230 million years ago, the dinosaurs appeared.

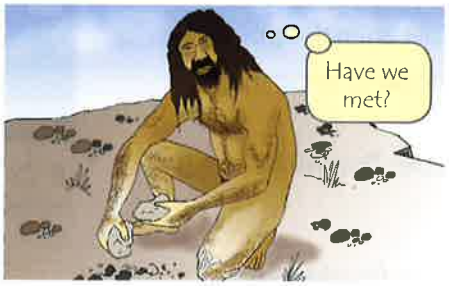
About 200 million years ago, the first small mammals appeared – in a world where the dinosaurs ruled.



Then 66 million years ago, a huge **asteroid** struck Earth. 75% of living things died. Goodbye, dinosaurs!

With the dinosaurs gone, mammals and birds flourished. Apes and many other species appeared.

By 2 million years ago, in East Africa, a species of human, related to apes, had appeared, walking upright.



Over time, other human species evolved. And about 200 000 years ago, we appeared. Homo sapiens!

We spread out from East Africa. And now we live almost everywhere on Earth. Including in your house!

So that's the story of how we came to be here. Again, it's a theory – but with lots of evidence to support it.

Clues from fossils

How can we tell when different plants and animals appeared? From **fossils**. These are the remains of ancient plants and animals, or traces such as footprints, preserved in rock. Scientists can work out the age of the rock. That tells us how old the fossils are.

Imagine a reptile living in the ocean about 200 million years ago. It dies. Its body falls to the ocean floor, and is buried under mud and sand. Later, this turns to rock. Later still, ocean floor is pushed upwards, and becomes land. And one day, a human finds the fossil, and goes 'Wow!'

▲ *The fossil of an ocean reptile or 'sea dragon' that lived around 200 million years ago. It is nearly 2 m long. Several fossils like this were found in Somerset, UK.*

Your turn

1 Below are some words from this unit. But jumbled up! Write them out properly, with their definitions.
   a **lelcs** – the units from which living things are made
   b **loveve** – to develop and change over time
   c **pessice** – a group of living things of the same type
   d **rondasusi** – these dangerous animals once roamed Earth, but are now extinct
   e **smalmam** – warm-blooded animals with hair; the mums produce milk to feed their young

2 One of the words above describes you. Which one?

3 a Dinosaurs roamed Earth for a long time. How long?
   b What do we think put an end to them?

4 You belong to the species *Homo sapiens*.
   a When did it appear? b Where did it appear?

5 What was *the Permian mass extinction*?

6 Help! Another mass extinction has begun. Write about it. What is happening? Why? How will you save yourself?

7 Evolution is still going on. So how might humans be different, 100 000 years from now? Get thinking!

1.3 Earth's story: the timescale

Read about a timescale that shows time since Earth began.

Earth's timescale

Earth is 4.5 billion years old. That length of time is hard to grasp! To make it easier, scientists divide the time into blocks, using what they learned from rocks and fossils. They call it the **geological timescale**. (*Geology* is the study of rocks.) Look at the next page.

- The scale starts at the bottom, 4.5 billion years ago.
- The first huge block of time (almost 4 billion years) is called the **Precambrian eon**. It lasts until the first simple animals appeared.
- The next is the **Phanerozoic eon**. It's the one we're living in.
- The Phanerozoic eon is divided into three **eras**.
  - In the first (shown in blue) all kinds of species flourished. We can only guess what most were like.
  - The second (in green) had the dinosaurs.
  - The third (in orange) is our era. Mammals are flourishing!
- The eras are divided into smaller blocks called **periods**.
- The drawings show how life developed, as time went on. They are not to scale.

▲ *Cheep cheep! This dinosaur lived around 66–100 million years ago, in South America. It was like a bird – but too big to fly.*

The periods

The periods are named after places where geologists studied rocks. Or after tribes who had lived in those places. Or after different kinds of rock. For example **Cambria** is the old Roman (Latin) name for Wales. See the box on the right for more.

Several periods ended with a mass extinction, or a change in climate. This then affected evolution in the next period. Only the species which survived could evolve. The rest became extinct.

The names of some periods

The **Silurian** period is named after the Silures, a Celtic tribe who lived in Wales.

Carboniferous means *'coal bearing'*. Most of our coal dates from this period, when big forests grew in swamps. Dead trees got buried in mud. Over time, the wood turned into coal.

Cretaceous is from the Latin word for chalk. A lot of chalk was formed in this period, from the shells of sea creatures.

Your turn

1. Where is today on the geological timescale: top or bottom?
2. a What is an *eon*? Glossary?
   b How long did the Precambrian eon last?
   c What kinds of life appeared during that eon?
3. Not many fossils have been found from the Precambrian eon. See if you can suggest some reasons for this.
4. a In which *era* did the dinosaurs live?
   b In which *era* are you living?
   c In which *period* are you living?
5. We still burn something that formed during the Carboniferous period, for fuel. That something is …?
6. Say which *period* is named after:
   a Wales b Devon
   c the ancient kingdom of Permia, in Russia
   d the Jura mountains in Europe
   e a tribe called the Ordovices who once lived in Wales
7. What happened to bring an end to:
   a the Permian period? b the Cretaceous period?
8. You have to explain what the geological timescale is, to a class of 9-year-olds. Write down what you will say.
9. Over 99% of all species that ever existed are now extinct. See if you can explain why.

The geological timescale

THE PHANEROZOIC EON (OURS)

Era	Period	How long ago?	The evolution of life
Cenozoic (recent life)	**Quaternary** We (*Homo sapiens*) appear and spread; ice ages come and go	today	several early human species; Neanderthals (overlapped with us); *Homo sapiens* (us)
	Neogene apes, chimpanzees, rhinos, horses, sheep … evolution continues	2.6 mya	start of the human family; mammoths; horses; elephants; great apes
	Paleogene mammals, big and small, flourish on land and in sea; birds flourish too	23 mya	giant whales; rhinos
Mesozoic (middle life)	**Cretaceous** ends with mass extinction due to asteroid; no more dinosaurs	66 mya	flowering plants; birds
	Jurassic life recovers quickly; more dinosaurs appear; first birds	145 mya	trees with cones; dinosaurs; pterosaurs
	Triassic first dinosaurs and mammals; lush forests; ends with mass extinction	200 mya	ocean reptiles; first mammals; turtles
Paleozoic (ancient life)	**Permian** ends with huge mass extinction probably due to volcanic eruption	250 mya	giant insects; first reptiles
	Carboniferous lush forests; reptiles on land; giant insects; ends with ice age	290 mya	trees in swamps – will become coal
	Devonian first animals on land; ends with mass extinction, cause unknown	300 mya	first insects; vertebrates invade land
	Silurian first bony fish; more land plants	420 mya	first fish with jaws (the start of our jaws!)
	Ordovician first land plants; ends with mass extinction, due to ice age	445 mya	algae in the ocean; first land plants; first fish – the first vertebrates (animals with backbones)
	Cambrian life begins to flourish; first animals with shells appear	485 mya	trilobites; first animals with shells
		540 mya	

THE PRECAMBRIAN EON

covers most of the time since Earth began

600 mya	soft-bodies animals
4.5 bya	single cells appear; over time they evolve into more complex cells

mya	millions of years ago
bya	billions of years ago

1.4 Our time on Earth

We humans have been on Earth for only a very short time. Find out more here!

Did you know?
- *Homo sapiens* is Latin for *wise man*!

Did you know?
- We were in the Stone Age until about 4000 years ago.
- We made tools and weapons from stone.

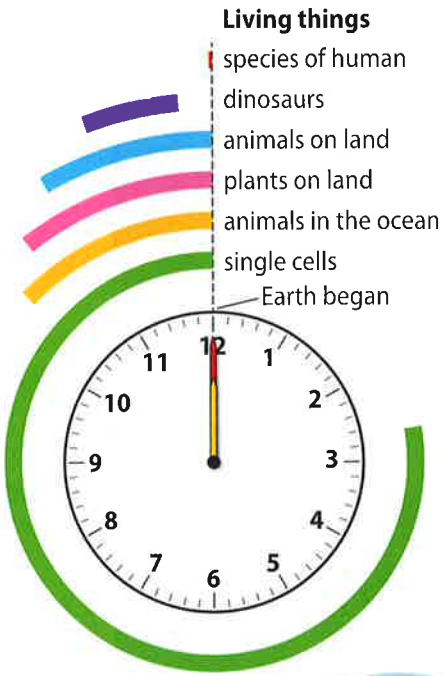
The Earth clock

Look at the clock below. The twelve hours represent Earth's age: 4.5 billion years. So each hour is 375 million years!

Earth formed at noon on the clock. Now it is midnight.

Look at the green band. It shows that single living cells first appeared on Earth before 3 o'clock in the afternoon – and are still here, at midnight. (Bacteria are single cells, and there are lots of them everywhere!)

For most of the time, single cells were the only life on Earth. This table gives the times when different things appeared:



On the Earth clock	
Living things	**When they appeared**
first single cells	2.40 pm (afternoon)
first animals in the ocean	10.24 pm (night)
first plants on land	10.44 pm
first animals on land	11.02 pm
first dinosaurs	11.23 pm
first species of human	20 seconds to midnight
us (*Homo sapiens*)	2 seconds to midnight

So humans have been here almost no time at all, in Earth's long story. At the beginning, there were only a few of us. Today there are over 7 billion. Some experts think there will be 11 billion by 2050!

Read page 13. Then try 'Your turn'.

Did you know?
- Early human species knew how to make fire ... as long as 400 000 years ago!

Your turn

1 Look at the clock above.
- a Where did animals appear first: in water, or on land?
- b Which have been here for longer: plants, or us?
- c Which living things have been here longest?

2 We have not been here long, compared to Earth – but we have done a lot!
- a See if you can come up with a list of ten important things humans have done, to improve our lives. (No silly ones!)
- b Then compare your list with your partner's.

3 a Look at the map on page 13. What does *40 tya* mean?
- b Which of these two *continents* did we reach first:
  - i Europe, or N. America? ii Oceania, or S. America?
- c Which did we reach first: Australia, or Britain?

4 a What is a *land bridge*?
- b Look at the land bridge at **A** on the map on page 13. Today, it's under water again. Turn to page 141 and see if you can find out what that stretch of water is called.

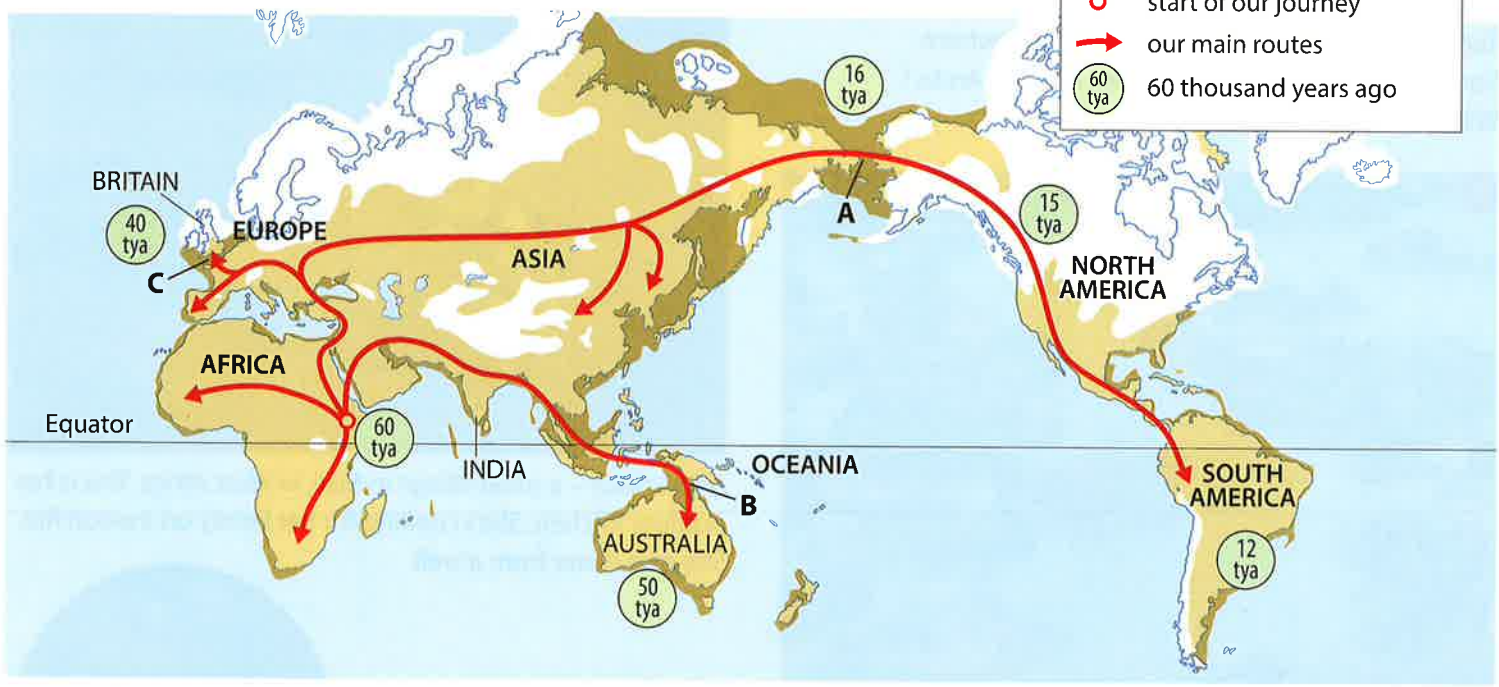
5 Say how each of these land bridges helped us, on our journey.
- a the one at **B** on the map b the one at **C**

(Check pages 140 – 141?)

6 It is 40 000 years ago. You have just reached Britain.
What is the landscape like?
What are you wearing? What are you carrying?
What will you eat? Where will you sleep?
Write it all down! Add drawings?

Out of Africa

As you saw on page 9, we humans first appeared in East Africa.
We began to migrate from there about 60 000 years ago.
This map shows our main routes. It took us 20 000 years to reach Britain!



Hindered by ice ...

There was one big problem as we went north: ice! 60 000 years ago, Earth was in the middle of an **ice age**. (It ended about 10 000 years ago.) White on the map shows places that were covered in sheets of ice, at the peak of the ice age.

The ice sheets grew, and retreated, time after time. So at some point we left Britain again, because of advancing ice. We went to warmer parts of Europe. Then we came back about 12 000 years ago, when the ice was melting away.

... and helped by ice!

All that water frozen into ice meant less rain. So there was less water to flow back into the ocean. Its water level fell. Some ocean floor got completely drained of water. It turned into land we could walk on.

For example, look at A on the map. We walked from Asia to North America along here, around 15 000 years ago. Exposed land like this, which is usually under water, is called a **land bridge**.

How we changed on the way

When we left Africa, we had dark skin. But as we moved north, away from the Equator, the sunlight grew weaker. Our skin changed in response, over thousands of years. So now we have a range of skin colours.

Experts think we had also developed language, before we left Africa. As we moved further away, it changed. Now there are thousands of languages.

▲ *Experts say we knew about boats before leaving Africa. So we could have made some journeys by water. Perhaps in dugouts like this one, or on rafts.*

1.5 Our place on Earth

**We have spread over most of Earth's land.
Here you can look at some of the places we live in.**

Where did we end up?

Today, we humans are living almost everywhere.
Some of us even live in the desert, and the Arctic!
We all have a place. Let's look at a few.

A

Hassan's place. He is a Marsh Arab. He and his family live on an island of reeds in the marshes in southern Iraq. They go everywhere by boat.

B

Adja's place – a small village in Mali, in West Africa. This is her outdoor kitchen. She's cooking for her family on a wood fire. She gets water from a well.

C

Alona's winter place. Her family are reindeer herders, in Siberia in Russia. They move around the tundra with their reindeer and tents, to the best grazing places.

D

Vitor's place – on the street in Recife, in Brazil. That's him front left. His mum died and now he is homeless. He's made friends with the other street children.

E

Emi's place. She lives in an apartment on the 31st floor, in Tokyo, Japan. Tokyo is the world's largest city. At night she looks down on the bright city lights.

F

Sela's place. She lives in Tonga, a country of 169 islands, in the Pacific Ocean. It has 117 000 people. And like the UK, it has a Royal Family.

So what's *your* place like?

Your place is a tiny dot on the planet. Billions of people may never even have heard of it.

But you have memories of it, and feelings about it, and pictures of it in your mind. It's home – at least for now.

Did you know?

- The Neanderthals had left Africa long before us.
- We think the last of them died out in the area that's now Spain.

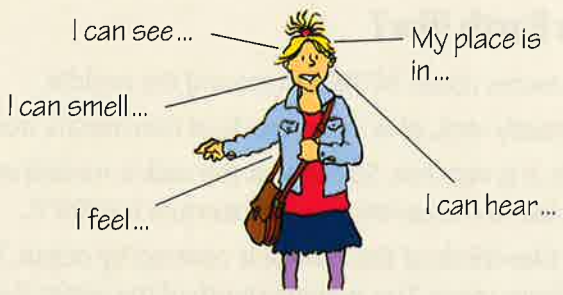
Your turn

1 Look at the six photos of places.
   - a Which place would you most like to spend time in? Why?
   - b Which would you least like to spend time in? Why?
   - c Rank the places in order of preference, with your most preferred place first.

2 Now choose one of the six places. (It need not be your favourite.) Imagine you are there, looking around you. Take your time. Relax. Now:
   - a What can you see?
   - b What can you hear?
   - c What can you smell?
   - d How do you feel about this place?

3 In geography, we always like to know where on Earth places are.
So turn to the world map on pages 140 – 141.
It shows the countries we've divided Earth into.
For each of the six photos, find the country where it was taken. Then say which continent it is in.

4 Now imagine you are standing outside *your* home.
Which country are you in? And which continent?
What can you see around you?
What can you hear?
What can you smell? Anything?
How do you feel about this place?
You could show your answer as notes on a drawing.
For example, like this:



5 Think of a place you have never been to, that you want to visit one day. (A town? A mountain? A country?)
What do you think it will be like? Do a drawing!

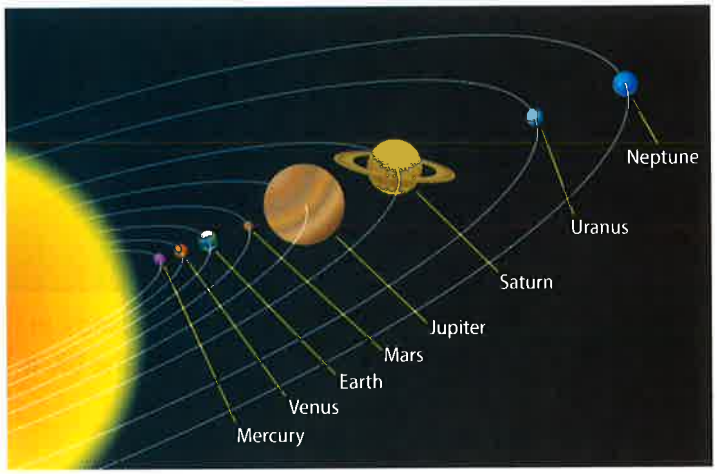
1.6 Earth: a very special planet

You know a lot about Earth already. You live on it!
But let's step back and take a broader look at our planet.

Did you know?
- A force called gravity keeps planets and moons in place.
- It also stops you flying off Earth!

Earth's place in the solar system

As you saw on page 6, Earth formed from dust and gases spinning around the new Sun.



Earth is one of eight planets that circle the Sun, non-stop.
It is the third one out from the Sun.
It is one of the four inner rocky planets.
(The four outer ones are mainly gas or ice.)

As you saw on page 6, the Moon was formed when a smaller planet struck Earth. It circles Earth non-stop. Six of the eight planets have moons. (Mercury and Venus have none.) Jupiter has the most moons: 67!

As well as the planets and their moons, other objects are on the move too. For example, there are many thousands of **asteroids** and **comets.** Asteroids are big chunks of rock. Comets are rock, ice, and frozen gases. The Sun, planets, moons, and these other objects form **the solar system**.

Did you know?
- Bits of asteroids and comets often fall to Earth.
- We call the bits meteorites.

What if...
- ... Earth stopped spinning?

Earth's journey around the Sun

- Earth travels non-stop around the Sun, taking you along for the ride. One full orbit takes a year – and gives us our seasons.
- It spins as it goes, like a spinning top. A full spin takes a day – and gives us day and night. When your place is turned away from the Sun, it's night time.

Did you know?
- Earth travels around the Sun at 108 000 km an hour.
- That's over 100 times faster than a jumbo jet.

Why...
- ... don't we feel Earth speeding around the Sun?

What's Earth like?

- It measures about 40 000 km around the middle.
- It is mostly rock, plus a core made of two metals, iron and nickel.
- Inside, it is very hot. So hot that the rock is melted enough to flow like very thick tar. At the centre, the temperature is 6000 °C.
- Over two-thirds of the surface is covered by ocean. That's why Earth looks blue from space. The average depth of the water is about 4 km.
- Around Earth is a layer of gas, that travels with it. It is the **atmosphere**. It is about 100 km deep, but most of the gas is towards the bottom. It is all around you. You breathe it in. You call it **air**.

What's so special about Earth?

There's one thing that makes Earth very special. As far as we can tell, it's the only planet in the solar system that carries life.

And what rich life! Today there are about 1.2 million *known* species, on Earth. They are all descended from those first living cells. Here are three of them:

Jellyfish. They first appeared over 500 million years ago. There are hundreds of different kinds, and you find them in every ocean.

The African elephant, our largest land animal. It first appeared over 7 million years ago. There are only about 700 000 left. (Why?)

And this species: around for only 200 000 years. As you saw on page 12, there are over 7 billion of us – and the number is growing fast.

But scientists think there may be over 7.5 million species not yet discovered, on Earth. Most will be small and hidden away, for example in the deep ocean.

Earth: always changing

There's something else about Earth. It has been changing ever since it formed – and it is still changing. Because of natural processes, and because of things we humans are doing. You can find out more in the next unit.

Did you know?

- Scientists keep looking for life on other planets ...
- ... in our solar system, and in other parts of the Universe.

Your turn

1 What is *the solar system*?

2 Name a planet in the solar system that's likely to be:
a hotter than Earth **b** cooler than Earth
Give reasons for your choices.

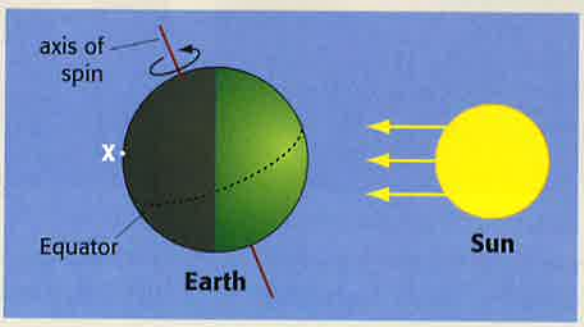
3 **a** What age are you?
b So how many times have you been around the Sun?

4 Look at the diagram on the right. It shows Earth spinning.
a It's dark at X just now. Why?
b It will be bright at X twelve hours from now. Why?

5 Of all the facts about Earth on these two pages, which one do you like best? Why?

6 See if you can write out a full address, showing where you are in the Universe. Don't forget your galaxy!

7 Suddenly, one day, we pick up radio signals from another planet, in another solar system. They were sent out by living things! Should we invite them to visit Earth? It is up to you to decide. Give us your reasons.



1.7 Changing Earth

Here you will find out how natural processes, and we humans, are changing Earth.

All change!

You might not notice that Earth is changing. But it is, all the time. It's being changed by natural processes. And by us.

1 Changed by natural processes

Deep inside Earth, currents of hot soft rock are flowing – causing earthquakes and volcanoes, and even making mountains grow.

At Earth's surface, other things are flowing: rivers, waves, glaciers, wind. They scrape and shape the land as they flow.

And everywhere, rock is being broken down to soil, in a process called **weathering**. (It is mainly due to the weather.)

2 Changed by us

As you know, humans like us appeared only about 200 000 years ago. (Or 2 seconds ago, on the Earth clock!) But we have made huge changes to Earth already.

We've cleared away most of the forests, and chased away wildlife, to set up farms. We've dug up the ground to get fuels and metals.

We have built villages, towns and cities. We have built roads all over. Now you'll find humans nearly everywhere.

We have divided Earth into over 195 countries, and put borders between them. You may need a visa (a special pass) to get through.

▲ *We cause it – and it harms us and other species. The wind carries air pollution all around the world.*

▲ *A mountain gorilla. Fewer than 900 are left, thanks to people hunting them, and chopping down their forests.*

Are the changes a problem?

Natural changes can cause big problems. For example if an earthquake strikes your place, or a river floods it.

But the changes we humans make are causing bigger problems. Like these:

- We have killed off many species of plants and animals, by destroying their habitats, and by hunting.
- Experts say we are making Earth warmer, by burning **fossil fuel** – coal, oil and gas. This **global warming** will bring disasters, such as terrible storms, floods, and famine.
- Many of the changes we make cause conflict, and even wars.
- We have created an unfair world. Many humans have plenty of everything. But many have almost nothing.

You'll find out more about these problems, and think about how we could solve them, in the rest of your course.

What if...
◆ ... we killed off all the gorillas, and pandas, and tigers, and whales, and ...?

What if...
◆ ... a new disease wiped out all the humans?

Why...
◆ ... do we humans go to war?

Your turn

1 This is about *natural* processes that are changing Earth.
   a Give two examples of changes they produce.
   b Do you think these processes went on *before* humans appeared on Earth? Explain your answer.
   c Which natural processes do you think we can control? Explain.
   d Choose one natural change that you think is helping us, and say why.

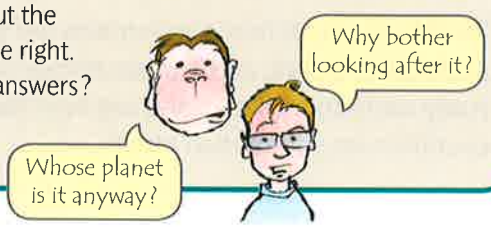
2 Now think about where you live. Do you think your area is being changed by natural processes?
Do you notice any changes?

3 When humans appeared, Earth was a wild place with many thick forests. In what ways have we changed it?
Write a list. See how much you can add to it.

4 Think about where you live. Is it being changed by humans?
What changes are going on right now?

5 Think about the problems listed on this page. Then write them in order, as short bullet points, with the most serious one first.

6 Now think about the questions on the right.
What are your answers?



1.8 It's all geography!

Find out what else you'll learn about Earth, in geography class.

Glorious geography

Geography is linked to almost everything that's going on, all over Earth. That makes it really exciting! It will help you to understand the world.

Dividing up geography

It is a big subject. So we divide it into different kinds of geography. You'll study the three kinds shown here.

1 Physical geography – what our planet is like

You'll learn about glaciers, rivers, the coast, the weather, climate, and rocks. And about earthquakes and volcanoes – and how the continents are moving around!

2 Human geography – how and where we live

You'll learn about how our numbers are growing. And where we live, and how we earn a living. You'll study some countries … and see how and why some countries are poorer than others.

3 Environmental geography – our impact on our surroundings

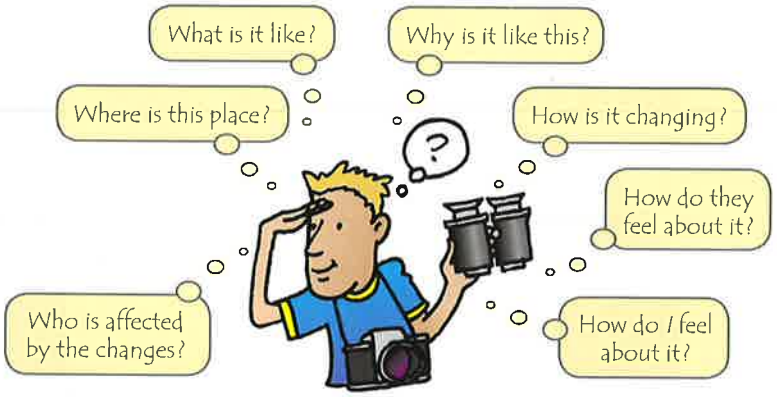
We share Earth with other living things … but we are destroying their habitats. We are polluting the air and ocean. We are making Earth warmer. What can we do? You will think about all this!

Get ready to geog!

To be good at geography, you must get nosy!

Look at places. Ask questions that begin with *Who, What, Where, How, Why, When …*
Look for clues. Find the answers.

And enjoy!



Your turn

1 Copy and complete:
Physical geography is about …
Human geography is about …
Environmental geography is about …

2 In which kind of geography might you learn about this?
- a how clouds form
- b where coffee is grown
- c protecting pandas
- d where trainers are made
- e caves
- f pollution that kills fish

3 Photo **A** below shows people on holiday.
- a Why might people choose a place like this one? List as many reasons as you can.
- b After each reason, write *(P)* if it's about physical geography, or *(H)* if it's about human geography.

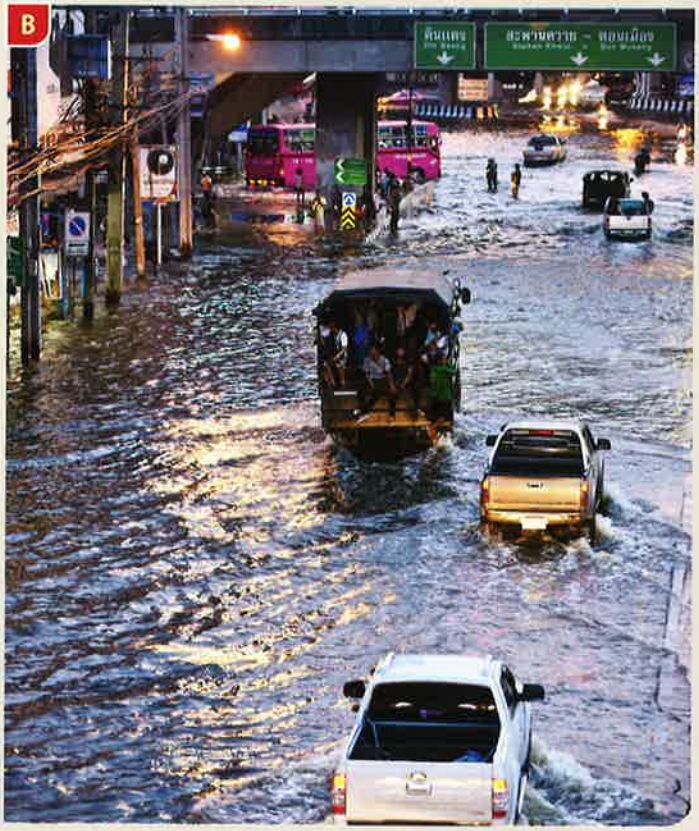
4 Time to get nosy! Study photo **B** for clues. Then answer these questions:
- a What is going on in the photo?
- b How did the place get to be like this?
- c Who do you think is responsible?

5 a Now make up three new questions about photo **B**, and what's going on there. (No silly ones!)
(Hint: *Who? What? Where? How? Why? When?*)
b Ask your partner to try to answer them.

6 Now, try to think of a change that's going on in or near your place. (For example, a new road being built.)
Make up some questions about the change, like those above. Then see how many you can answer.

A

B



2 Maps and mapping

Where is Walter?

On planet Earth, with around 7.1 billion other humans (that's 7 100 000 000), including you …

… in Europe, with around 740 million other humans (that's 740 000 000) …

… in the British Isles, with about 68 million other humans (680 000 000) …

… in Liverpool, with around 470 thousand other humans (470 000) …

… in number 181 Anfield Road, with 4 other humans …

… in this room, all alone.

The big picture

This chapter is all about maps, and how to use them. Here's the big picture …

- We humans are spread all over Earth – but we are connected to each other in many different ways.
- We use maps to show where we live, and what places are like.
- There are many different kinds of maps.
- Using maps is a key skill for a good geographer. (That's you!)

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- In what ways am I connected to people and places all over the world?
- What are mental maps, and how can I make mine better?
- What does the scale on a map tell me?
- What's the difference between a sketch map, and the maps in an atlas?
- What are grid references, and how do I use them to find places?
- How can I measure distance on a map?
- What are the compass points, and why are they useful?
- What are OS maps, and what kinds of things do they show?
- What do these terms mean?
  Equator *Prime Meridian* *latitude* *longitude*

And then …

When you finish the chapter, come back to this page and see if you've met your goals!

Did you know?
- 5000 years ago we thought Earth was flat – and you could fall off!

What if...
- ...Earth really were flat?

Did you know?
- Maps over 4500 years old, drawn on clay tablets, were found in Iraq.

What if...
- ... maps had not been invented?

Why...
- ... have atlases?

Your chapter starter

You are flying back to planet Earth to find Walter.

You have his address – but you don't want to ask for directions.

Would the images on page 22 help you to find him?

There are special drawings that would help you much more. Geographers just adore them. They're called ……?

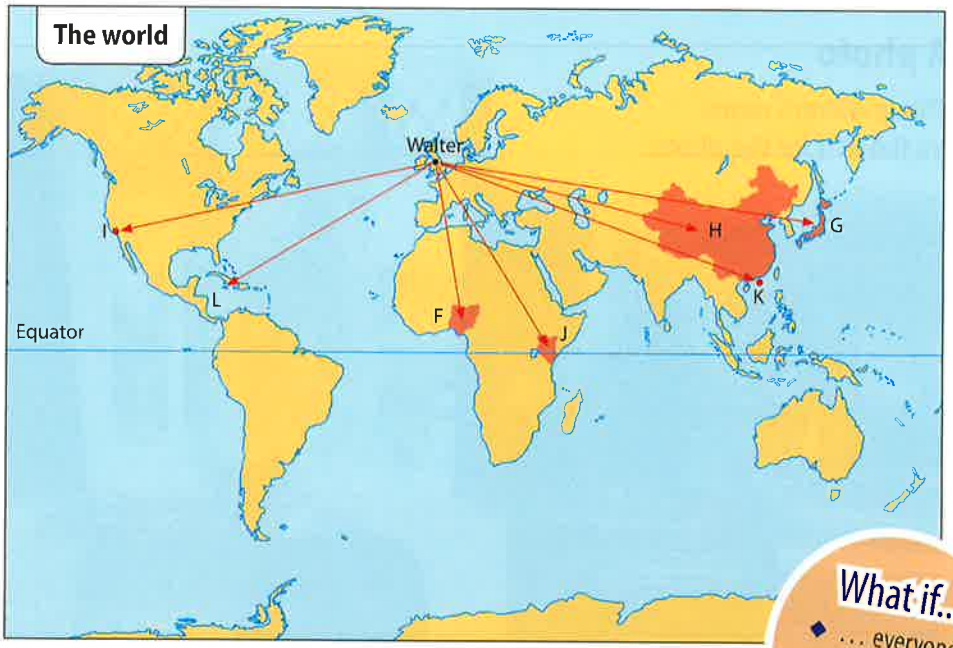
2.1 Mapping connections

Here you'll see how we are connected to people and places all over Earth – and how this can be shown using maps.

Walter connected

Walter. Alone in his room in Liverpool – but connected to people and places everywhere.

Mapping connections



What if...

◆ ... everyone in the world were on the internet?

Page 22 showed images of the world, and Europe, and the island where Walter lives. (It's *Great Britain*, or just *Britain.)* Above are maps of these places.

With maps it is easy to see where places are, and to show connections between them.

The maps above show Walter's connections from page 24. But that is just the start! All day long he is connected to hundreds of people and places – through school, the internet, the things he owns or uses, the food he eats.

It's just the same for you.

▶ *Lily in China, who sewed Walter's top.*

Your turn

1 See if you can match the letters on the maps above to the places named on page 24. Start like this: *A* = (No peeking at the maps at the back of this book!) Then give your answers to a partner to check.

2 Walter is connected to Jamaica by his CD. That's an *international* connection. Pick out:
- a two other *international* connections for him
- b two *local* connections
- c two *national* connections

(Try the glossary?)

3 You too are connected to hundreds of places.
- a Make a big table like the one started on the right.
- b Leave room for three places, for each connection. Add more types of connection. (Music? Clothes?)
- c Now fill in the table, for *you*.

4 Imagine the UK is cut off from the rest of the world. No news, or letters, or phone calls, or food, or other goods, from other countries. And no internet.
- a List all the things *you* would have to do without.
- b Which three things would you miss most?

Places I am connected to

Place	Connection
London	I've been there.
... ...	Friends/relatives live there.
... ...	I eat food that was grown there.

2.2 A plan of Walter's room

Here you will learn what a plan is, and what a scale tells you.

A photo

This is Walter's room.
He tidied it for the photo.

A plan

This is a **plan** of Walter's room – a drawing of what you would see looking down from the ceiling.

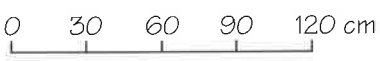
A plan is really a map of a small area – for example a room, or a house, or your school.

The scale

The plan is a view of the room, but shrunk. In fact 1 cm on the plan stands for 30 cm in the room. That is the **scale** of the plan.

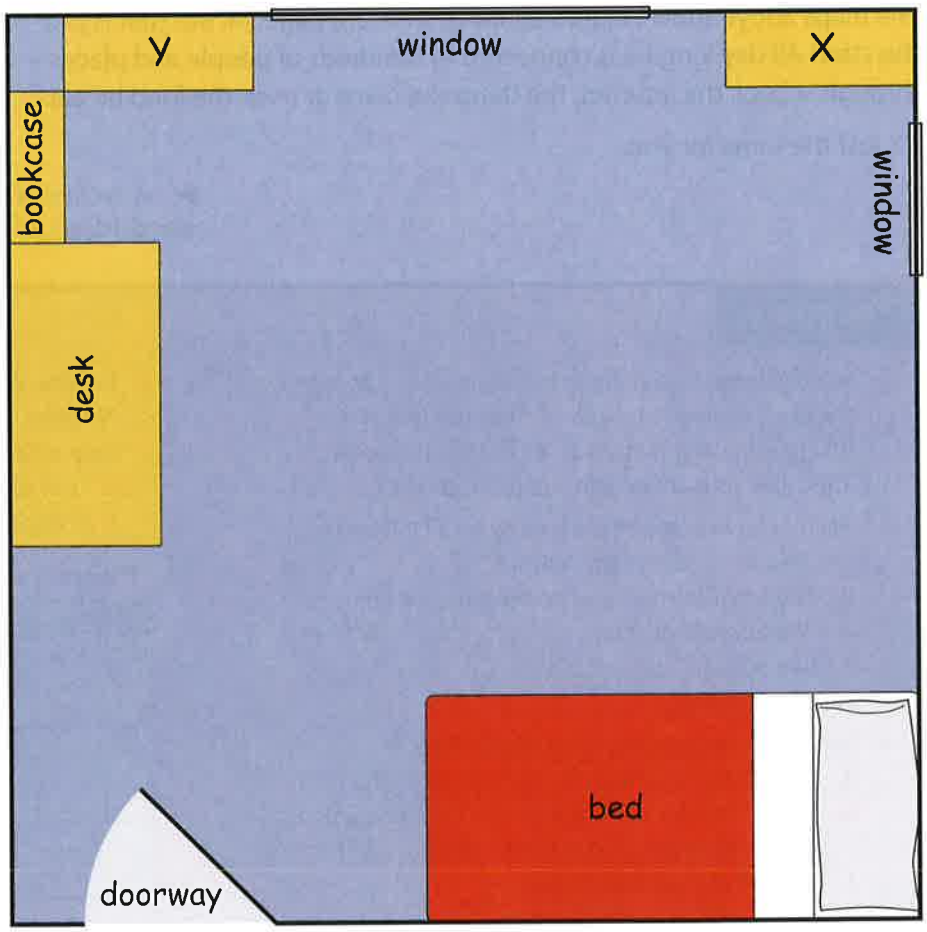
You can show scale in three ways:

1. In words: **1 cm to 30 cm**
2. As a ratio: **1 : 30**
   (say it as *1 to 30*)
3. As a line divided into cm, then labelled, like this:



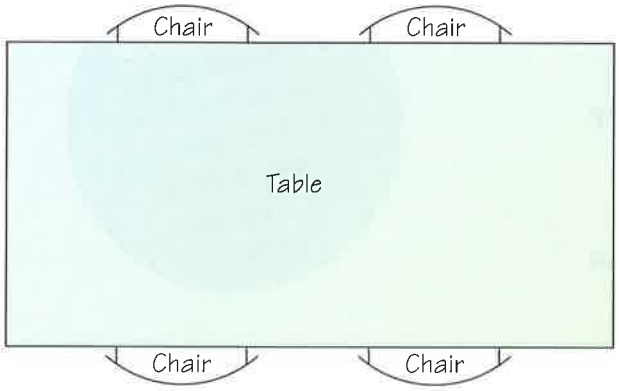
The scale is always marked on a plan, so that people can tell the size in real life.

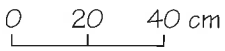
Plan of Walter's room — Scale: 1 cm to 30 cm



Working out scale

This is the plan of a table in Walter's kitchen. The table is 8 cm long in the plan. It is 160 cm long in real life.



- 8 cm on the plan represents 160 cm in real life.
- So 1 cm on the plan represents 20 cm in real life.
- So you can write the scale as:
  1 : 20 or 1 cm to 20 cm or 

Be careful with units!

Look at this scale.

Here 1 cm represents 2 metres.
You can write this as **1 : 200**.

The 2 metres has been changed to centimetres.
That's because *you must use the same units on each side of the symbol ':'*

1 : 200 means **1 cm to 200 cm** or **1 cm to 2 m**.

Your turn

You will need a ruler for these questions.

1 Look at the plan of Walter's room. What do **X** and **Y** represent? (Check the photo!)

2 On a plan, one wall of a room is shown like this:

The plan uses 1 cm to represent 60 cm in real life.
So the scale is 1 : 60. How long is the wall in real life?

3 Below are walls from another plan. The scale is 1 : 50.
How long is each wall in real life?
a
b

4 Using a scale of 1 cm to 20 cm, draw a line to represent:
a 40 cm b 80 cm c 2 metres (that's 200 cm)
Write the scale beside your lines.

5 If the scale is 1 : 300, what length does each line represent?
See if you can give your answer in metres.
a
b
c

6 1 kilometre is 1000 metres. See if you can draw a line to represent 1 kilometre using each of these scales:
1 cm to 1 km 1 cm to 200 m 1 cm to 100 m
Write the scale beside each line, in any form you wish.

7 Make a chart like this and fill it in for Walter's room.

Walter's room	On the plan	In real life
How wide is it? Measure the wall by the desk.		
How long?		
How long is the bed?		
How wide is the big window?		
How wide is the doorway?		

8 This is a new chest of drawers for Walter's room:

a To draw a plan of it, which surface will you use?
the top the side the front
b Draw the plan, to the same scale as Walter's room.
c Will the chest of drawers fit through the doorway?

9 Find three things in the photo of Walter's room that are not shown on the plan. Why are they not shown?

10 How would you draw a plan for *your* room?
See if you can write a set of instructions to follow.

2.3 Your mental maps

You are a map maker! You have made lots of maps in your head. Here you'll think about them – and get a chance to sketch one.

Mental maps

A mental map is a map that you make, and carry around, in your head.

It is really a sequence of images, like a movie. It helps you find your way.

You have lots of mental maps. You use them without even thinking.

For example you have one of your home, that helps you get from your bedroom to the bathroom or kitchen, even in the dark. And one of your route from home to school, and to shops you like.

Did you know?

- Every year, swallows fly from Southern Africa to the UK and back ...
- ... nearly 20 000 km ...
- ... and don't get lost!

Sketching a mental map

It's fun to 'see' your mental map in your head, then draw it on paper.

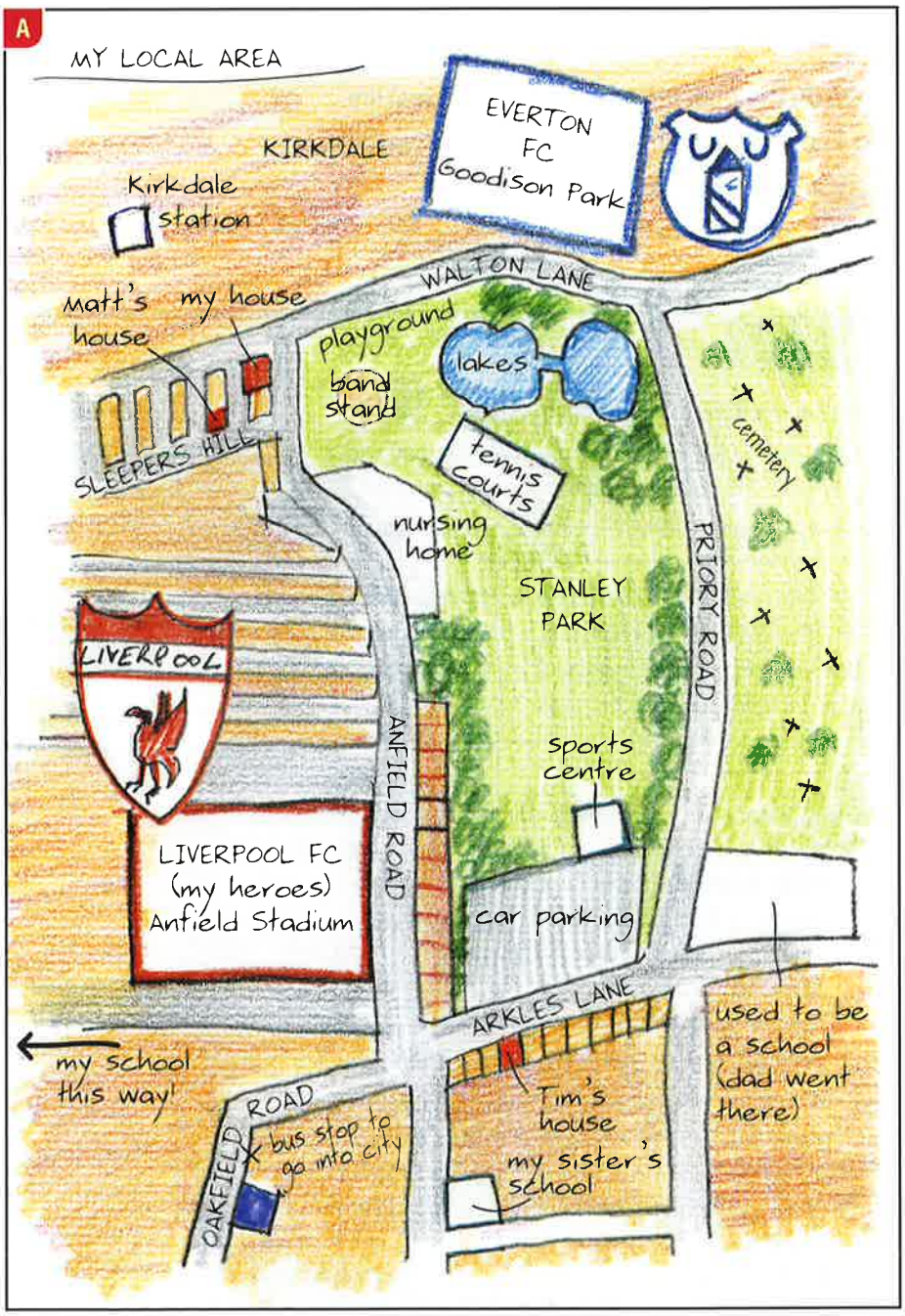
You end up with a rough map or **sketch map**.

Look at the sketch map on the right. Walter drew it from his mental map for his local area in Liverpool.

Do you think you'd find this map easy to follow?

▲ *Walter follows his mental map to the post office, with a parcel for Violet.*

A



Your own mental maps

You have mental maps of your home, and your local area.

But that's not all. You have mental maps of other places you visit, and places you see on TV. You have mental maps of the UK, and even the world.

On the right is Walter's sketch map of Britain, drawn from his mental map. What do you think of it?

They are gappy

Our mental maps show things that are important to us. Such as paths we use, shops we like, places we have fun.

But they leave out lots of things. Some have big big gaps. Some are quite wrong, and can get you lost.

You can make them better

You can make your mental maps better and better. The secret is: Look around. Keep your eyes open. Observe!

It's fun to build up your mental maps, and fill in places. It's like a game.

The better your mental maps are, the better your grasp of your world.

▲ *How Walter 'sees' Britain.*

What if...

◆ ... your mental maps were almost blank?

Your turn

1 What is a *mental map*?

2 Think about your mental maps. See how many you can list. For example, do you have one of your route from home to school?

3 Look at Walter's sketch map **A**, on page 28.
   a List the things he marked on it.
   b Beside each, say why you think he picked it.

4 Is Walter's sketch map easy to follow? Let's see! Give directions to get by road:
   a from Walter's front door, on Anfield Road, to Tim's house. You could start like this:
      • *Go out front door and turn right.*
      • *Walk along ____ ____ until ...*
      • *Then ...*
   b from Tim's house to the bus stop into town
   c from the corner of Walton Lane and Priory Road, to Anfield Stadium

5 a Now, take a few minutes to picture the area around your school, in your head.
   b Using your mental map, draw a sketch map of the area. You can colour it in if you like.
   c Compare your sketch map with your partner's.
      i Do both show the same things?
      ii Do you think everyone's mental maps are different? Is that a good thing or a bad thing?

6 Look at **B**, Walter's sketch map of Britain. Compare it with the atlas map on page 139. Is the shape roughly right? Are his towns and cities in the right places? Give him a score out of 10.

7 Over the next week, pay special attention to the area around school. Look around. Keep your eyes open. Note the names of streets and roads. Observe! Then check: Is your mental map of the area changing?

2.4 Real maps

Here you'll compare a photo, a sketch map, and maps drawn to scale.

First, the photo

This photo shows Warkworth in Northumberland, where Walter's cousin Violet lives.

It's an **aerial photo** – taken from the air. Look at the loop of the river, and the Norman castle.

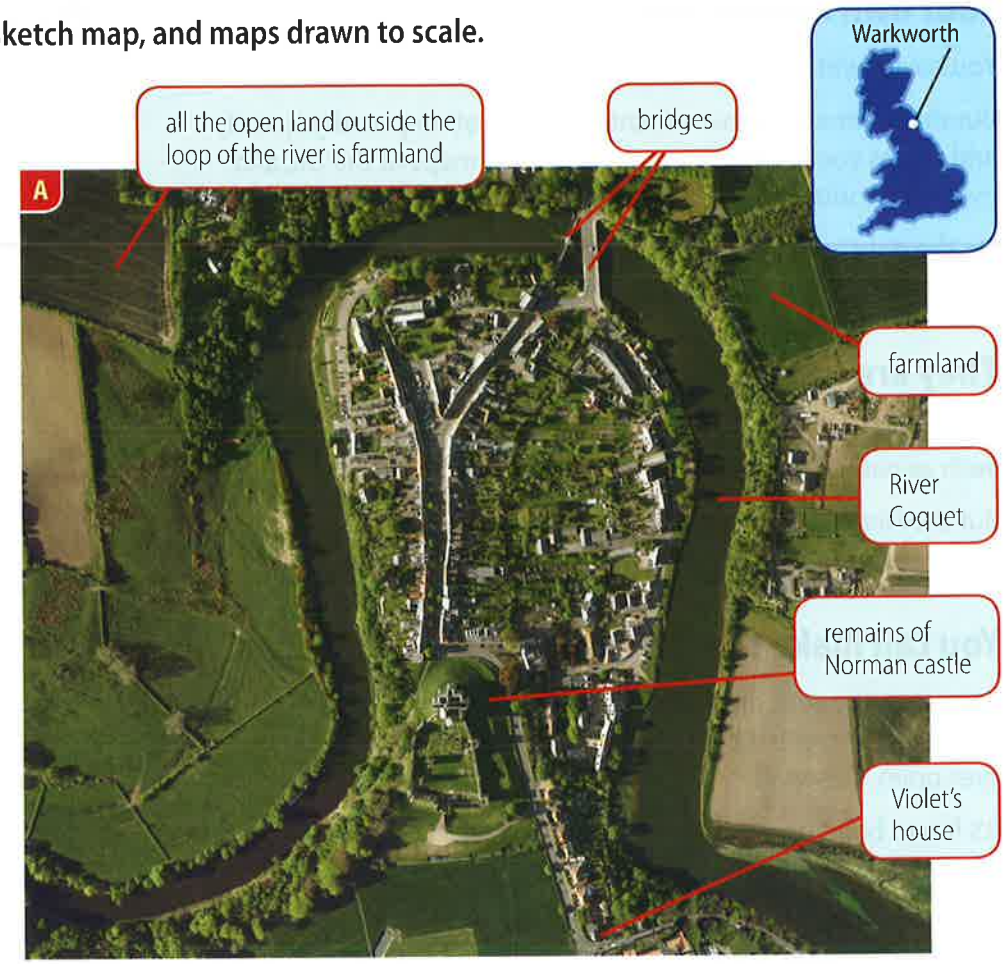
Next, the sketch map

Below is a sketch map of the same place, which Walter started. He drew it from the photo. (You'll do that too.)

Note that his sketch map has:

- a title, a frame, and a key
- some labels and annotations (notes)
- just enough detail to show the shape and layout of Warkworth. (Not each building and tree!)

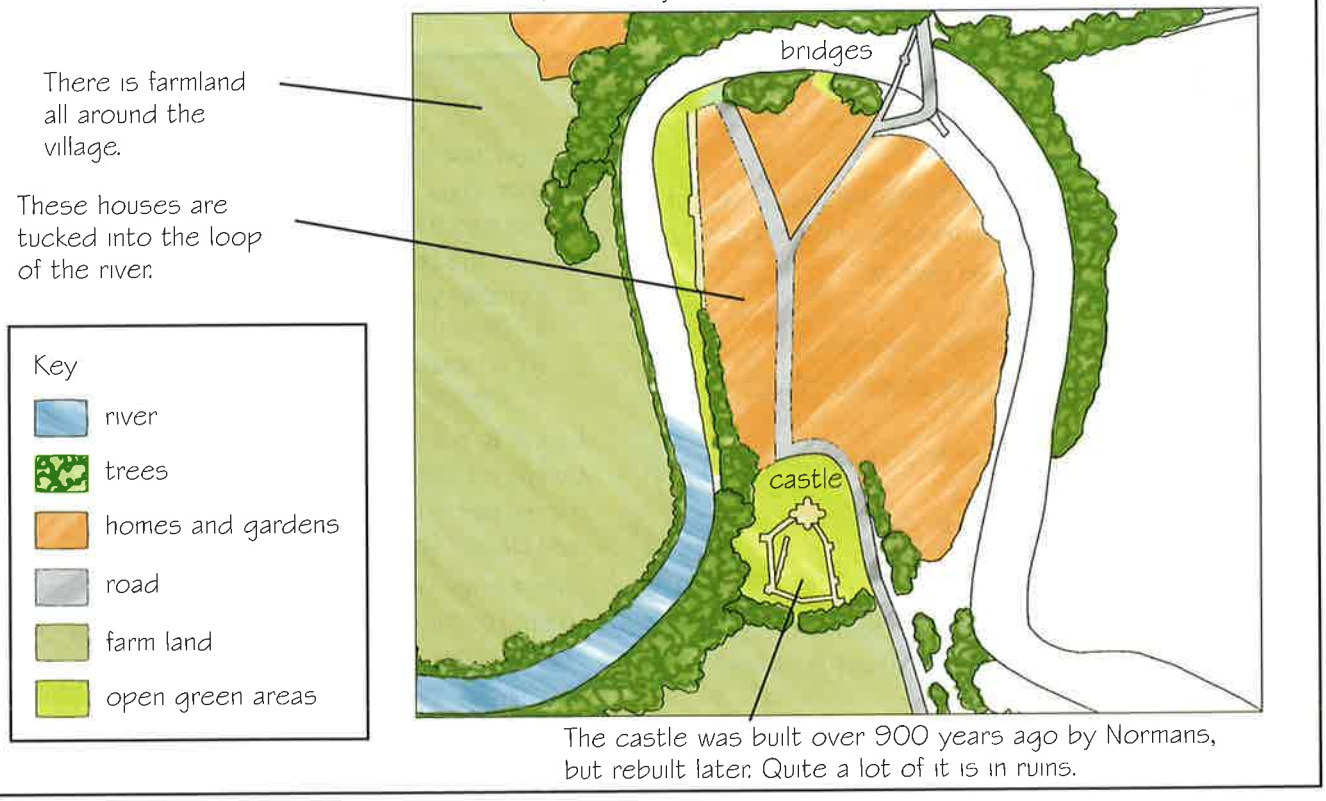
A



▲ *Warkworth, from the air.*

B

Warkworth, where my cousin Violet lives. (Not to scale.)



Now, a map drawn to scale

Look at this map of Warkworth.

It is not a sketch map. It is an accurate map, drawn to scale. See the scale below.

It uses symbols to show things. They are given in the key.

Key

	main street		woods
	street		buildings
	road/path	+	church
	footpath	PO	post office
	river	cemy	cemetery

The same map with a grid

Here is the same map again. But this time, **grid lines** have been added.

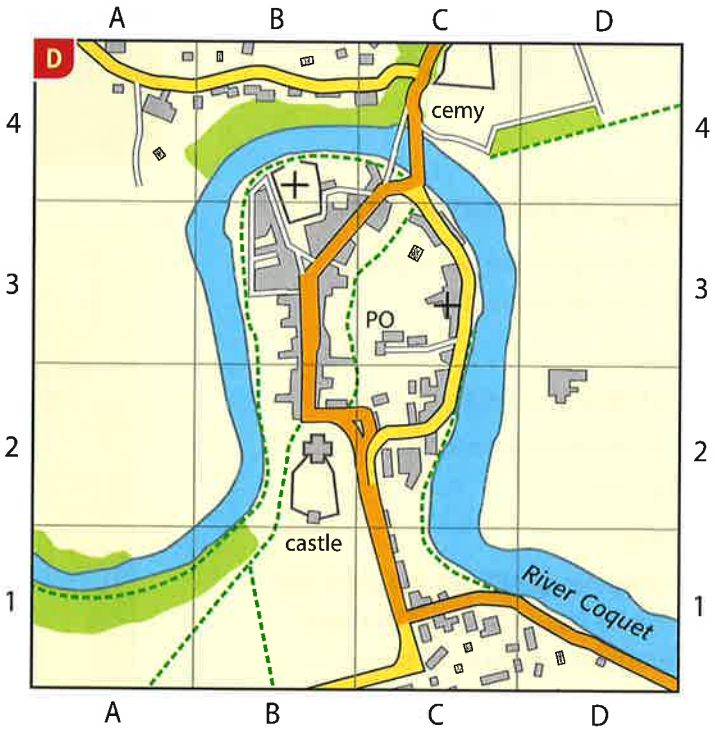
The grid lines divide the map into squares.

The columns and rows of squares have been labelled (A, B … and 1, 2 …).

The post office is in square C3.

The cemetery is in square C4.

You always give the letter for the column first.



0 500 m

Your turn

1 Draw a sketch map (like the one Walter started) for photo **A** on page 30. Keep it simple. And don't forget:
- a title, a frame, and a key
- labels and annotations

2 Now swop sketch maps with your partner.
- **a** See if you can agree on a fair way to score them. For example a mark out of 10 for the shape, 1 mark for each correct label, and so on. Write a list.
- **b** Then give each other's maps a score.

3 Next, look at map **C** above. In which ways is it:
- **a** like your sketch map? **b** different from it?

4 Where is the castle, in map **C**? Tell us in words.

5 **a** On map **D**, the post office is in square C3. Give the square for: **i** the castle **ii** the bridges
- **b** What is in: **i** square B4? **ii** square C1?

6 Do you think the grid lines in map **D** are a good idea, or a nuisance? Explain your answer.

2.5 Using grid references

In this unit you will learn how to find places on a map, using grid lines with numbers on.

A photo

This aerial photo shows part of the River Mole valley in Surrey.

In the top right is the village of Mickleham.

Walter went fishing in the Mole when he visited his cousin Kim. (The fish fled.)

Did you know?

- The first ever aerial photo was taken in 1858, over Paris, from a hot air balloon.

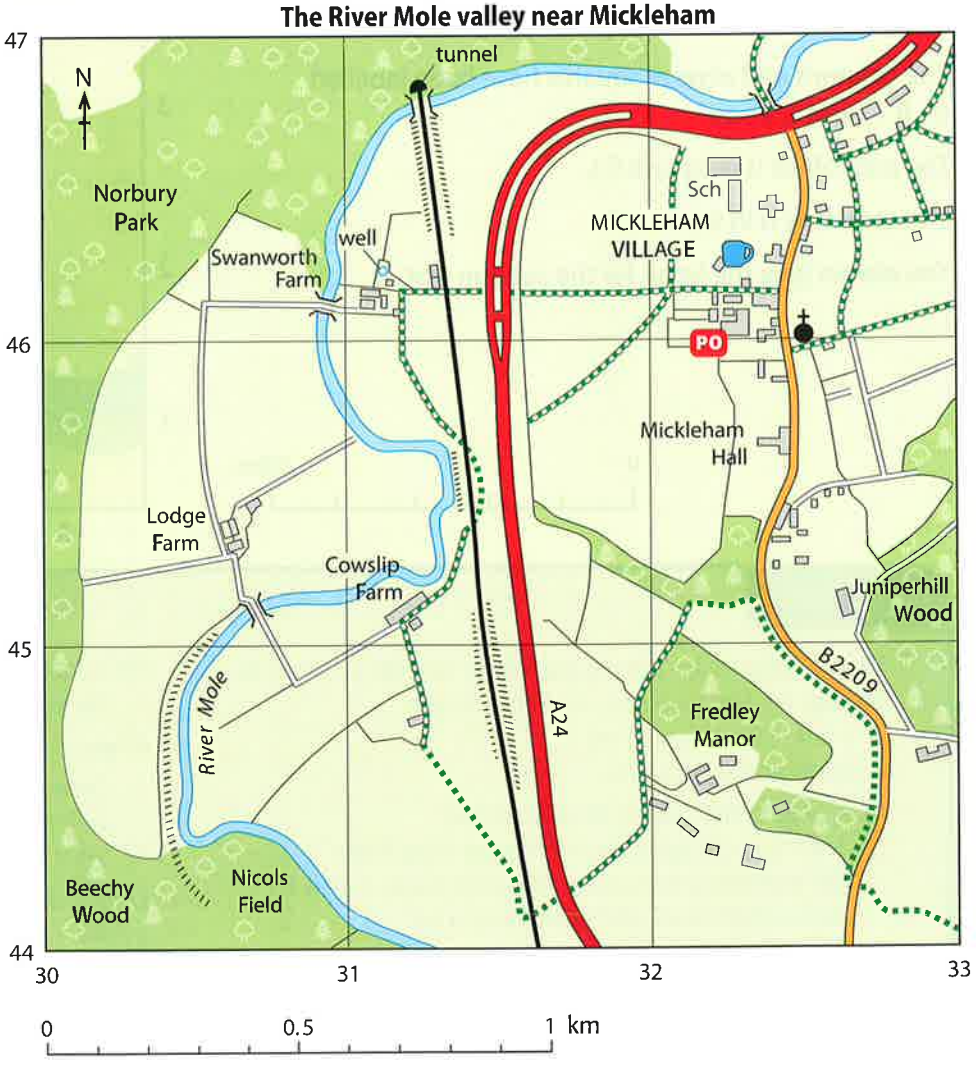
The River Mole valley near Mickleham

A map of the same place

This is a map of the same place. Like all good maps, it has:

- a title
- a frame around it
- an arrow to show north
- a scale
- a key.

The map has **grid lines** too. And this time each has a number. (So that's different from map **D** on page 31.)

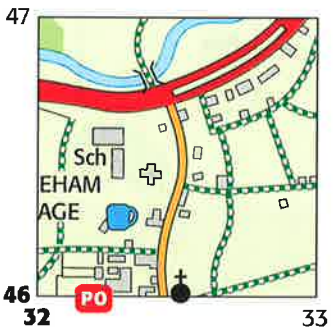


Key

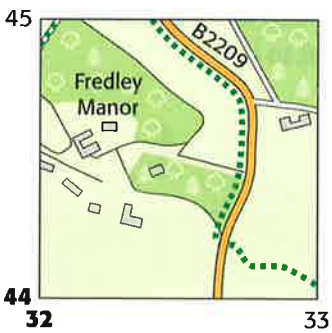
- river
- railway
- main road
- secondary road
- track/drive
- public path
- raised bank (embankment)
- bridge
- church
- pub
- post office
- school
- buildings
- woods
- fields

Four-figure grid references

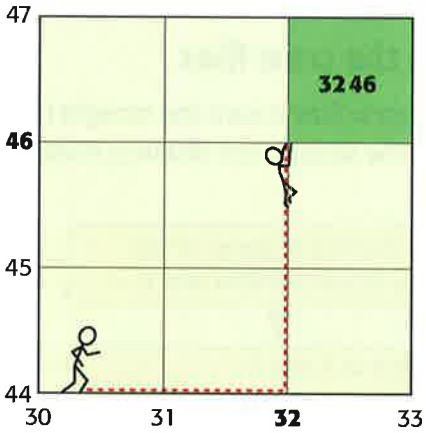
Grid references are made from the numbers on the grid lines.
They help you to find a place quickly.
The school is at grid reference 3246. Fredley Manor is at 3244. Look:



To find the school, go to the square where grid lines 32 and 46 meet in the lower left corner. Then look for the label 'Sch'.



To find Fredley Manor, go to the square where grid lines 32 and 44 meet in the lower left corner. Then look for the manor.



A grid reference always gives the number along the bottom first. This drawing shows how to find square 3246. *Walk before you climb!*

The grid references above are called **four-figure**. Why?

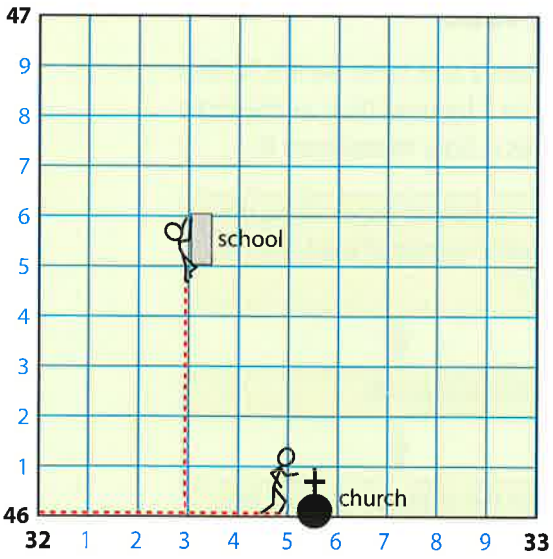
Six-figure grid references

There is a school *and* a church in square 3246. You can add two extra numbers to say *where* each one is in the square. Like this:

- Divide the sides of the square into ten parts, in your head, as shown on the right.
- Count how many parts you must walk along to reach the building, and how many parts you must climb.

For the school you go 3 parts along and 5 parts up.
So its **six-figure grid reference** is 323465.
The one for the church is 325460. Do you agree?

We usually show all six numbers black.



Your turn

1 Look back at the map on page 32. Name *two* things you can see in the square with this grid reference:
a 3245 b 3246 c 3046 d 3144

2 Give a four-figure grid reference for:
a Lodge Farm b Cowslip Farm c Nicols Field

3 What is at this grid reference on the map?
a 312468 b 308448 c 309461

4 See if you can give a six-figure grid reference for:
a Mickleham Hall b the post office c the pub

5 You can't see the river on the photo. How can you tell where it is?

6 Describe what you will see, if you stand at 313453 facing south. (With your back to the north!)

7 How far is it from Lodge Farm to Cowslip Farm, along the track? See if you can think of a way to measure it, using the scale. (Would thread or paper help?)

8 In what way are six-figure grid references better than four-figure grid references?

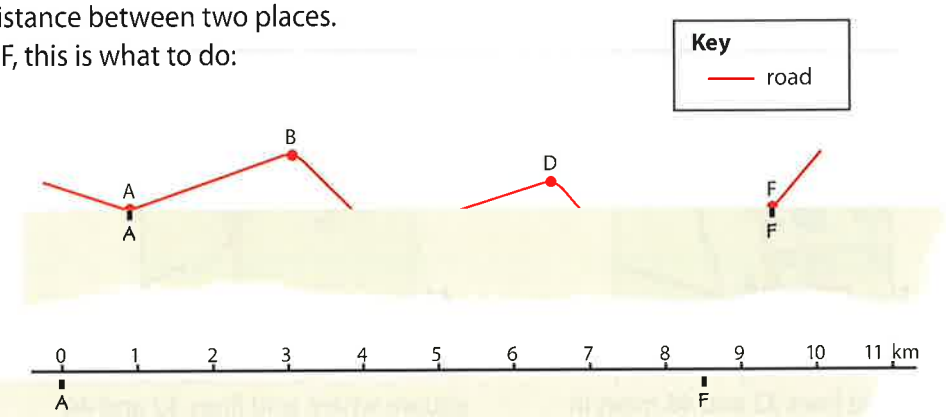
2.6 How far?

Here you'll learn how to find the distance between two places, on a map.
You will need a strip of paper with a straight edge.

1 As the crow flies

'As the crow flies' means the straight line distance between two places.
To find the straight line distance from A to F, this is what to do:

1. Lay the strip of paper on the map, to join points A and F.
2. Mark it at A and F.
3. Now lay the paper along the scale line to find the distance AF.

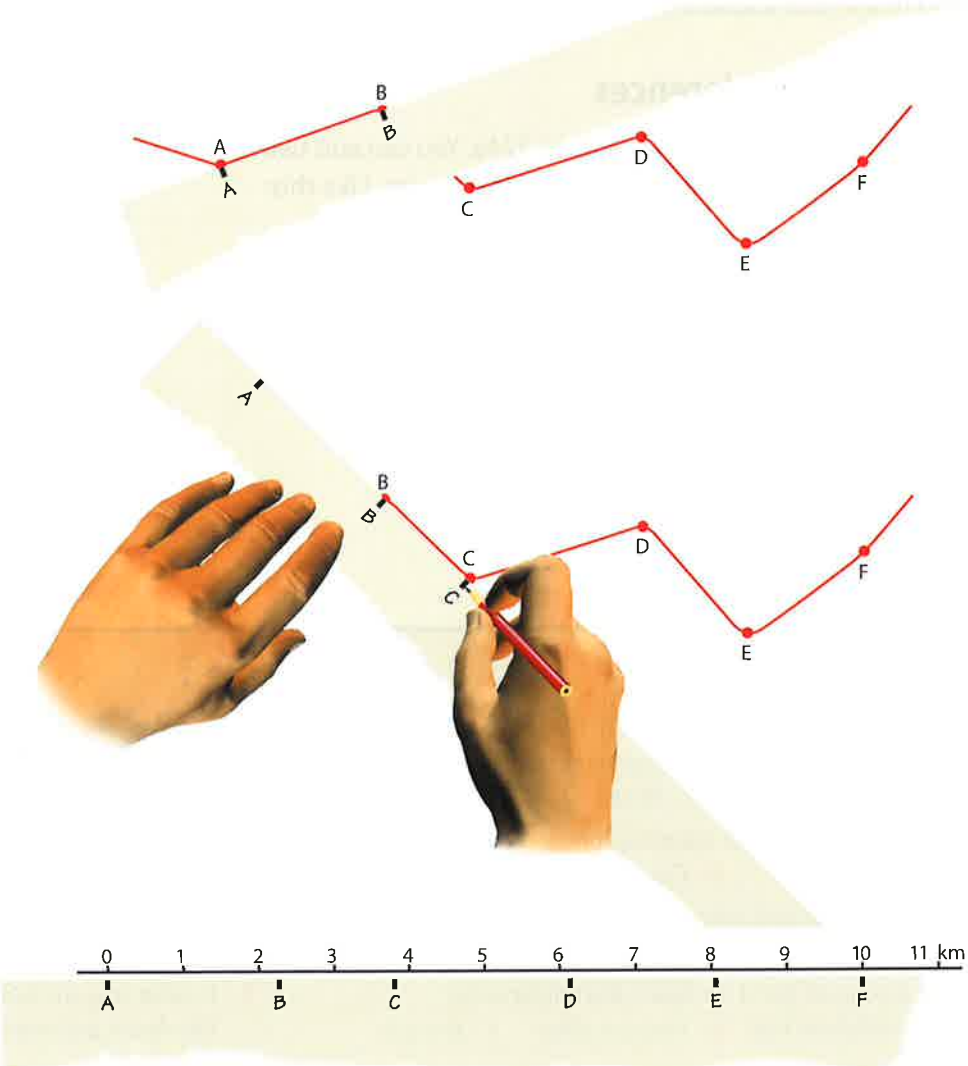


From A to F as the crow flies is 8.5 km

2 By road

Roads bend and twist. So it is further from A to F by road than as the crow flies. This is how to measure it:

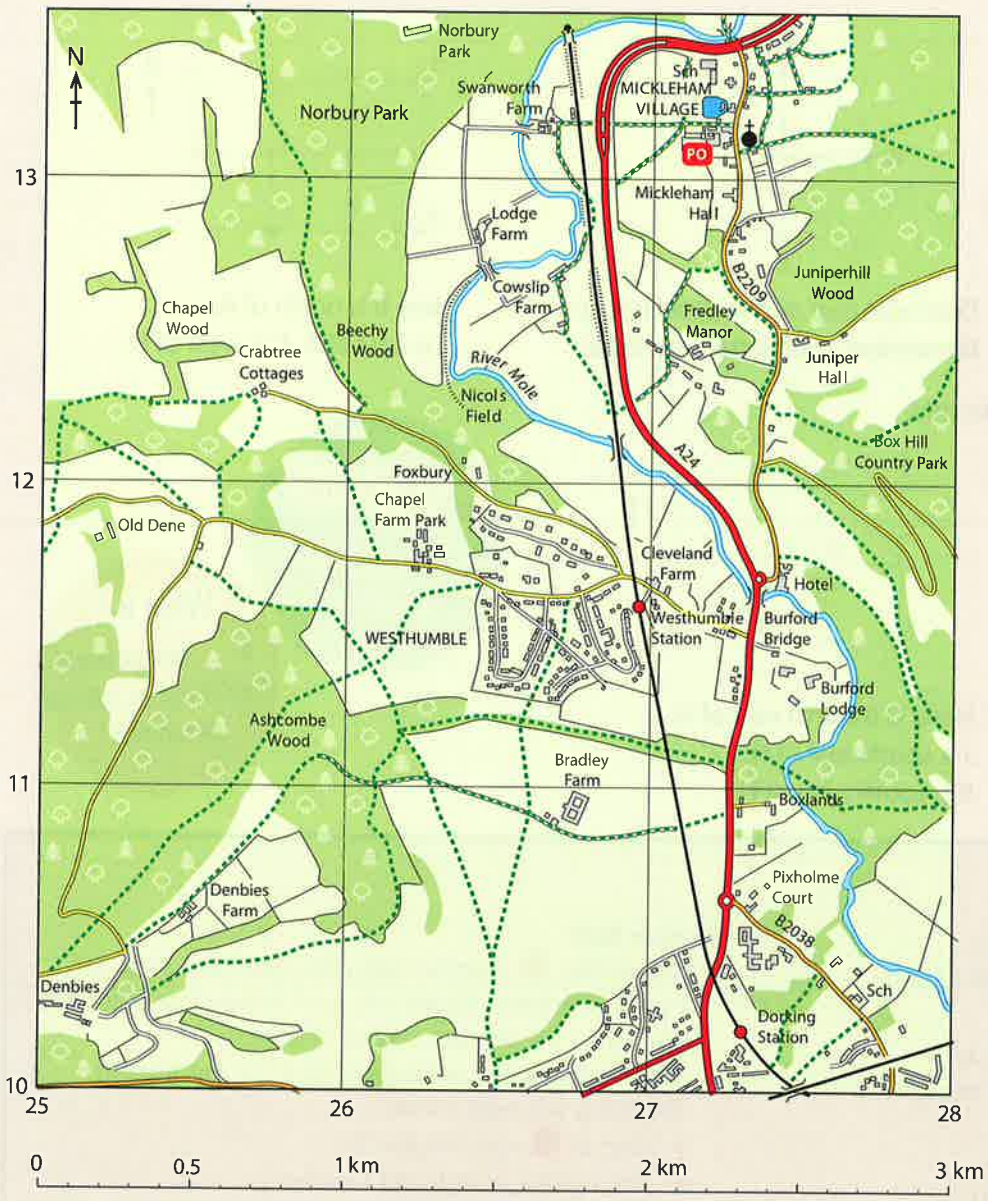
1. Lay the strip of paper along the straight section of road from A to B.
2. Mark it at A and B.
3. Pivot the paper at B until it lies along the next straight section, B to C. Mark it at C.
4. Now pivot it at C so that it lies along the next straight section, C to D. Mark it at D.
5. Move along the road in this way, section by section, until you reach F.
6. Place the paper along the scale line to find the distance AF.



From A to F by road is 10 km

Your turn

The photo and map on page 32 showed part of the River Mole valley in Surrey. This map shows more of the same area. (Are both maps at the same scale?)



Key

- river
- railway
- railway station
- bridge
- main road
- secondary road
- minor road
- track/drive
- public path
- raised bank (embankment)
- church
- pub
- PO post office
- Sch school
- buildings
- woods
- fields

▲ *St Michael's church, Mickleham.*

▲ *Juniper Hall.*

1 How far is it from Mickleham church to Westhumble station, as the crow flies?

2 How far is it by rail from Westhumble station to Dorking station? Measure along the railway line.

3 About how far is it by road from Mickleham Hall (273129) to the hotel at 274117?

4 Walter arrived at Westhumble station, to visit his friend. His friend had given him these directions:
Walk from the station towards Cleveland Farm.
At the junction with the minor road, turn left.
At the next fork, take the road to the left, and walk for 0.7 km.
Where does his friend live?

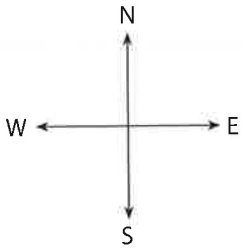
5 Every day, Kim's mother collects her from the school (Sch) at 276103 and drives her home by this route:
From the school, go right on the B2038.
At the roundabout, take the A24 north for 0.9 km.
Turn left onto the minor road, and continue for 0.5 km.
Now take the road to the right, and continue for 1.4 km.
Where does Kim live?

6 Juniper Hall and St Michael's church are shown above.
   a Find them on the map, and give six-figure grid references for them.
   b Your friend wants to walk from the church to Juniper Hall. Write instructions. Don't forget to give the distance!

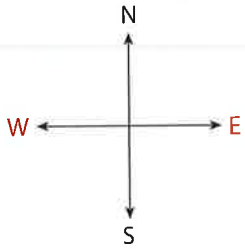
2.7 Which direction?

Here you will learn how to give and follow directions, using N, S, E and W.

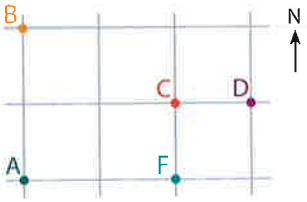
The compass points



N, S, E, W are the four compass points: north, south, east, west.

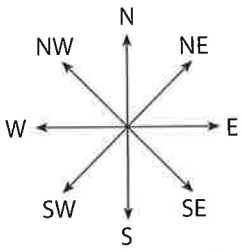


Don't get east and west mixed up. Remember, their letters spell ***we***!

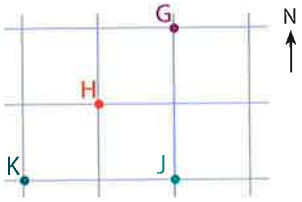


Here B is north of A.
F is east of A. C is west of D.

We can add other directions in between, like this:



NE stands for north east (or north *of* east). SW stands for south west (or south *of* west).



Here, G is north east of H.
J is south east of H.
K is south west of H.

Did you know?

- You can use a compass to tell you where N is.

What if...

- ... you got lost in a remote place, and had no compass?

Your turn

1 You are standing at C in the first grid above.
Which direction do you face when you turn towards:
a F? **b** D? **c** A? **d** B?

2 Page 37 shows where Walter went on holiday.
The bowling alley is in square D5. What is in square:
a A10? **b** F6? **c** C4? **d** F2?

3 You are at the hostel. In which direction is :
a bike hire? **b** the riding school?

4 In which direction is:
a the duck pond, from the pizza place?
b the gym, from the bowling alley?
c bike hire, from the kite shop?

5 How far is it by footpath from the door of the hostel to the door of the bike hire shop? Use your ruler, and the scale.

6 To get from the cafe to where Walter stayed:
- From the cafe door, walk 50 m SE, then 65 m N.
- Then turn right and follow the footpath for 40 m.
- Next walk 10 m SE, then 10 m SW.

Where did he stay?

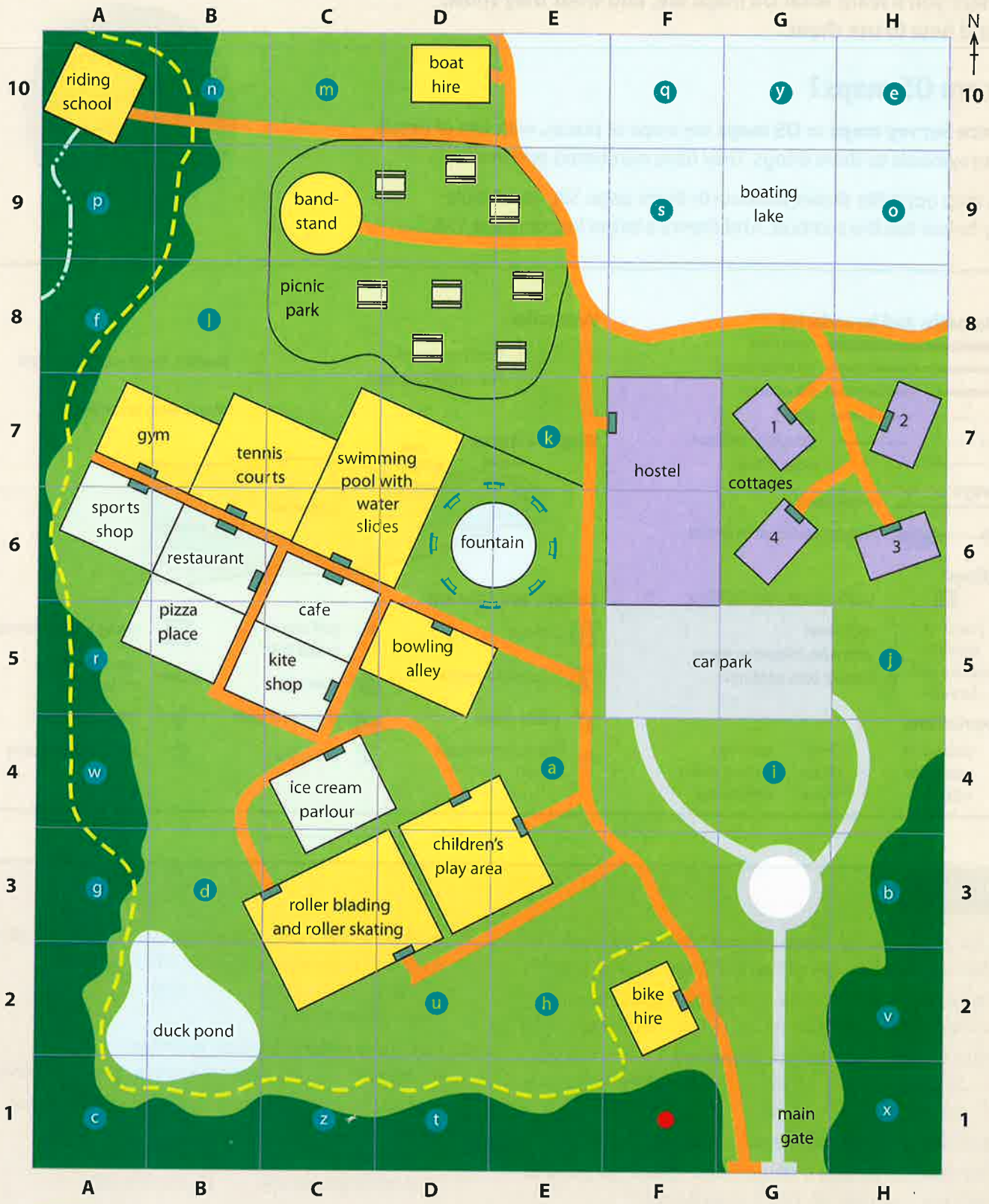
Treasure hunt

7 Look for the ● near the main gate. From here, if you go 2 squares N, then 1 square NW, you'll arrive at the letter (a).
Now follow the directions below, in order.
For each instruction, write down the letter you arrive at.
The letters will make a word.
- Start at ●. Go 2 squares W.
- Then go 8 squares N and 4 squares E.
- Then go 1 square N and 5 squares W.
- Next, go 2 squares SE then 4 squares S.
- Then go 2 squares SW and 1 square SE.
- Then 3 squares NW, followed by 4 squares E, then 3 squares NE, then 2 squares N.

What word have you made?

8 **a** Now choose your own word, with at least five letters – but not more than eight.
b Write instructions for making this word, like those in question **7**. Start from the ●.
c Ask a partner to follow the instructions.

Map of your holiday village



2.8 Ordnance Survey maps

Here you'll learn what OS maps are, and what they show, and how to use them.

What are OS maps?

Ordnance Survey maps or **OS maps** are maps of places, with lots of detail. They use symbols to show things. They have numbered grid lines.

The OS map opposite shows Warkworth (from page 30), and Amble. The key below has the symbols. And there's a larger key on page 138.

Did you know?

- The Ordnance Survey was set up in 1791, to map Britain for the army.

Key

Roads, paths and boundaries

- main road
- secondary road
- minor roads
- path
- footpath; bridleway
- edge of field

Railways

- railway track
- cutting; tunnel; embankment

Buildings

- building; important building
- places of worship (current and former): with tower; with spire, minaret or dome; without such additions

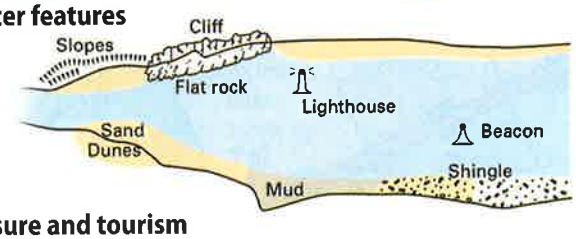
Abbreviations

CH	club house	Cemy	cemetery
PO	post office	LB Sta	lifeboat station
Sch	school	W; Spr	well; spring

Vegetation

- Coniferous trees
- Non-coniferous trees
- Bracken, rough grassland, heath
- Marsh, reeds or saltings

Water features



Leisure and tourism

- parking
- information centre
- public phone
- PC public convenience (toilet)
- golf course or golf links
- boat trips
- slipway for boat
- picnic site
- run by English Heritage
- Name used for old and ancient sites
- nature reserve
- other tourist feature

Your turn

1 Look at the OS map. Name the river that flows through Warkworth. Where does it flow to? (Page 139 may help!)

2 Find it on the map, and give its four-figure grid reference:
a Northfield b Gloster Hill c North Pier

3 What is at this grid reference on the map?
a 243045 b 277041 c 247057
d 243065 e 236058 f 275049

4 4 cm on this OS map represents ____ in real life?

5 The top of an OS map is always north. Look at the photo of Warkworth on page 30. Where is north on it?

6 Violet's house is marked on the photo on page 30. Find it on the photo. Then find it on the OS map, and see if you can write a six-figure grid reference for it.

7 Warkworth has a population of around 1600. Now look at Amble. Its population is about ... Which of these?
a 1000 b 2000 c 6000 d 9300
How did you decide?

8 How many of these are there in Amble?
a schools b places of worship c cemeteries

9 Find one of these on the map and give a six-figure grid reference for it:
a a post office b a club house
c a public phone box d an *old* bridge

10 What clues are there on the map, that Warkworth and Amble get lots of visitors? Give as many as you can.

11 Write a section for a travel website on things for tourists to do in Warkworth and Amble.


OS map showing Warkworth and Amble
Did you know?
On OS maps, 1 cm represents either
250 metres, or
500 metres.
09
08
07
06
05
04
23
24
25
26
27
Scale 1: 25 000
0
0.5
1 km
2 km
3 km
Northumberland Coast Path
St Oswalds Way
Northfield
Shortridge Hall
Buston Barns
Caravan Site
Birling Carrs
Warkworth Golf Club
Birling Links
Spinney Covert
Mill Cottage
Houndean Mill
Hermitage Farm
Birling
Church Side
WARKWORTH CP
Warkworth
Warkworth Hermitage (remains of)
The Butts
Helsay
Caravan Park
Castles Dike
Coquet Lodge
Water Works
Howlet Hall
Mill Walk Wood
Heather Leazes
Old Barns
Beal Bank Farm
Maudlin
North Pier
North Jetty
South Jetty
Pilot Beacon
Pan Rocks
Pan Point
Warkworth Harbour
Marina
The Braid
Guilder's Burn
Coquet Moor House
River Coquet
New Barns
Gloster Hill
Cup & Ring marked Rock
Morwick
Morwick Hall
Morwick Gate
Westfield
New Hall
Recreation Ground
Industrial Estate
AMBLE
KARTING
AMBLE BY THE SEA CP
Wellhaugh
The Bungalow
Morwick House
Reservoir
Sewage Works
High Hauxley

2.9 How high?

In this unit you'll learn how height is shown on an OS map.

A hilly problem

These photos show Alton Towers, where Walter spent time shrieking. So what's the land like around there? Is it flat? Or hilly?

Why...

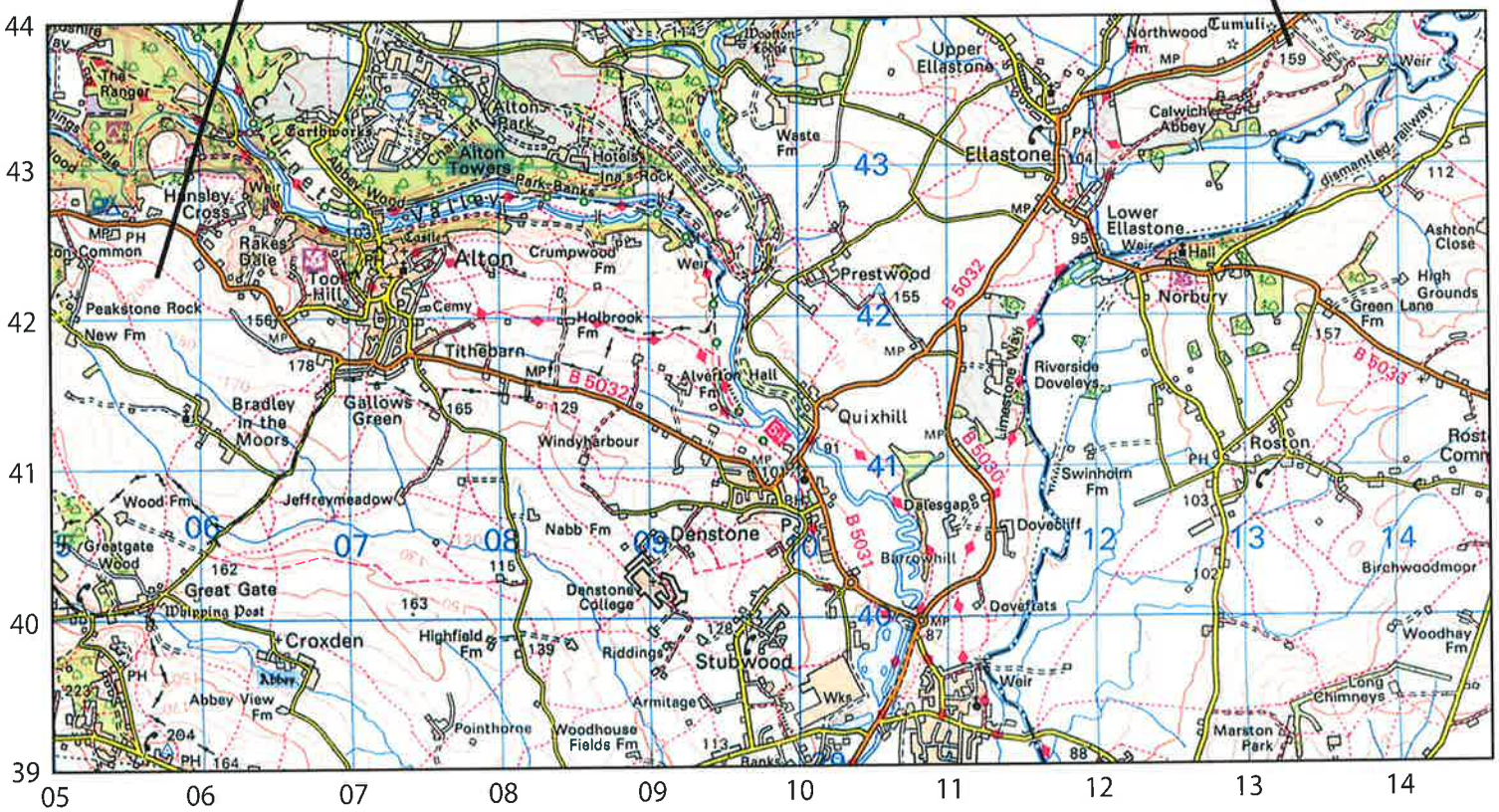
◆ ... are some places hilly and others flat?

▲ *Better before lunch?*

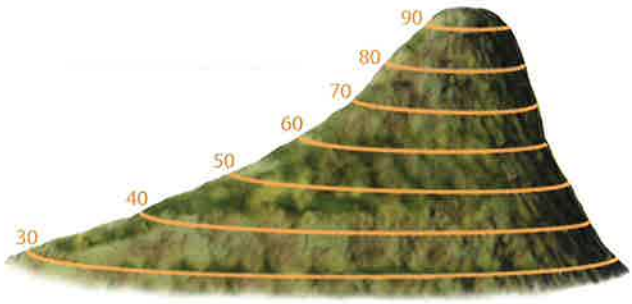
The OS map below shows the area around Alton Towers – *and* tells you how flat or hilly it is. The map shows height in two ways ...

1 Contour lines join all the places at the same height above sea level. The number on a line shows the height in metres. Here, the lines are every 10 m above sea level.

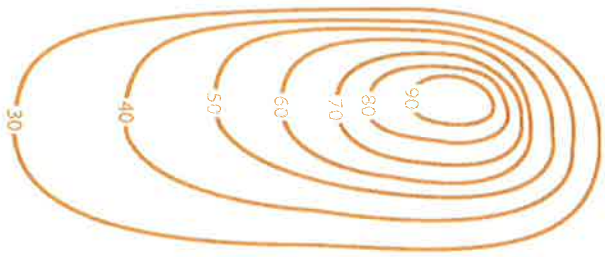
2 Spot heights give the exact height of a spot, in metres above sea level.



More about contour lines



The contour lines are marked on this hill at 10 metre intervals. On a map, you see them from above …



… like this. They are close together where the slope is steep, and further apart where it is gentle.

Remember:

- where contour lines are very far apart, it means the ground is flat.
- where they are very close together, the ground slopes steeply.

Did you know?

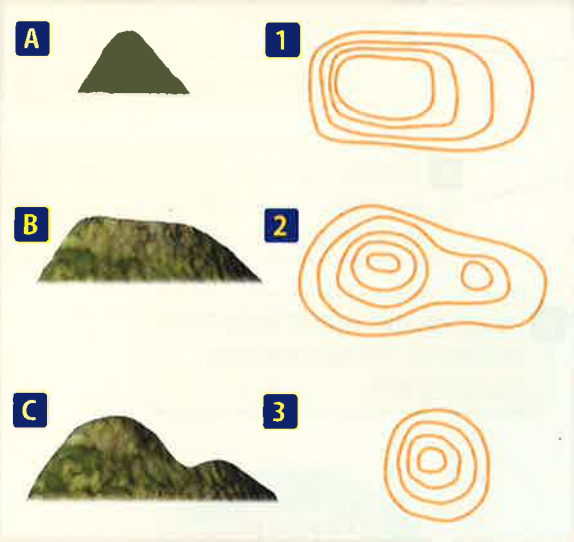
- Some places in the UK are below sea level. (See page 139.)

Why...

- ... are some places below sea level?

Your turn

1 See if you can match the drawings to the contour lines.
Start your answer like this: A =



These questions are about the OS map on page 40.

2 a In which square is the main part of Alton Towers?
b Why did they call it Alton Towers?

3 Look at the pointer from panel 1.
a It points to a contour line labelled 200.
What does the number tell you?
b Look at the next line down. What is the height here?

4 About how high above sea level is:
a Quixhill (1041)?
b Highfield Farm (0739)?
c the phone box at Stubwood (0939)?

5 a Which square on the map do you think has the steepest land? How did you decide?
b Which square has the most flat land?
Did you have any problem in deciding? Explain.

6 What can you say about the land around the Alton Towers theme park? Is it flat, or a bit hilly? Explain.

7 Say whether you go uphill, downhill or along flat land, if you go by road:
a from the phone box at 056391 to the phone box at 052400
b from the bridge at Quixhill (100412) to Prestwood (103423)
c from the roundabout at 103403 to the church at 100409

8 Look at the River Churnet, flowing past Alton.
a Is it flowing along steep land, or flat land?
Give your evidence.
b Which way is it flowing: towards the top of the map, or the bottom? How did you decide?

9 A challenge! You have to plan a walk for a group of students, starting and ending at Waste Farm (0943).
- It must be *at least* 10 km long. (Look at the scale.)
- You must keep to roads, tracks and footpaths.
- Try to make it interesting, with some variety!
For example, any rivers? woods? villages?

a Plan your route and draw a sketch map of it.
Mark in things you can see or visit on the walk.
b Work out the length of the walk, from the OS map.
c Give your sketch map a title and a north arrow, and say whether it is to scale or not.

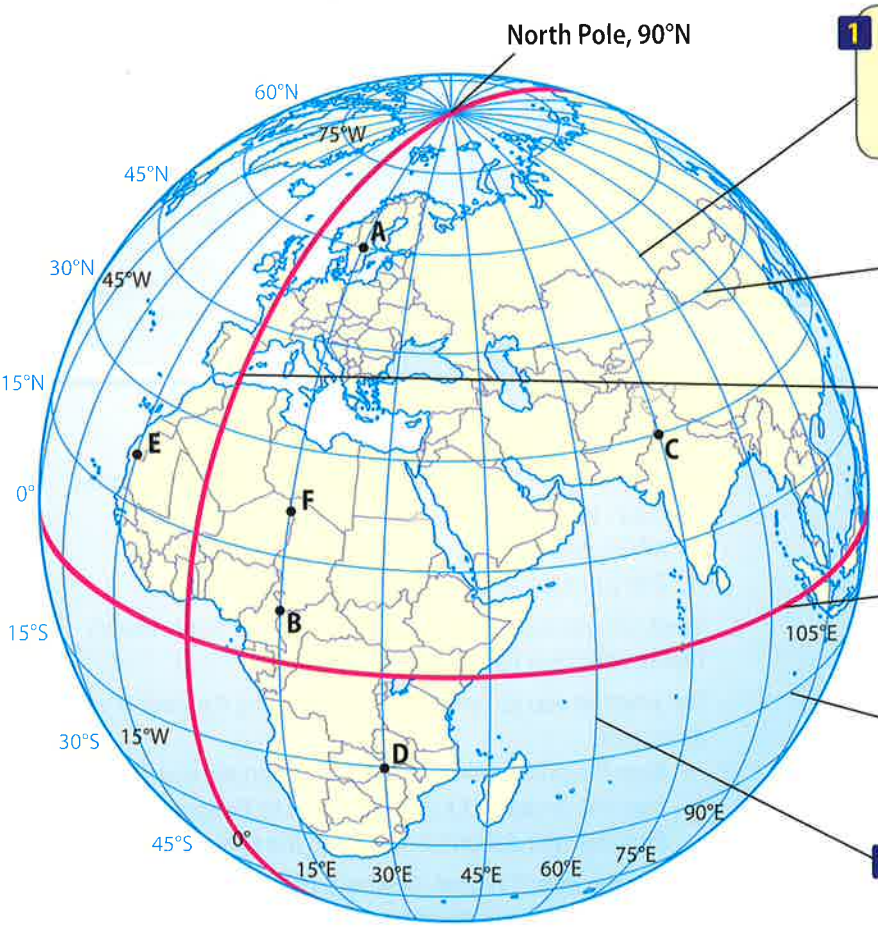
.10 Where on Earth?

Here you'll learn about the special grid lines we use to say where places are on Earth.

Why...
- ... doesn't Earth just roll around in space?

Grid lines around Earth

Earth is like a ball. So how do you say where you live, on a ball? You cover it with imaginary grid lines, and number them! This shows Earth with its grid lines.



1 The lines that circle Earth from top to bottom are called **lines of longitude**. They meet at the North and South Poles. (The South Pole is hidden on this drawing.)

2 The lines that circle Earth from side to side are **lines of latitude**.

3 This special line is **the Prime Meridian**. Its longitude is taken as 0° (nought degrees). Lines to the east of it are labelled **E**. Lines to the west are labelled **W**.

4 This special line is **the Equator**. Its latitude is 0°. Lines to the north of it are labelled **N**. Lines to the south of it are labelled **S**.

5 Latitude goes from 0° at the Equator to 90°N at the North Pole and 90°S at the South Pole. This line is 15°S.

6 Longitude goes from 0° at the Prime Meridian to 180° east and west. This line is 60°E.

Here the grid lines are shown every 15°. But you could choose any interval. For example you could show them every 20° or 30°.

Using the lines to say where a place is

Coordinates

Look at place **A** on the drawing. It is 60° north of the Equator, and 15° east of the Prime Meridian. So its **coordinates** are 60°N 15°E. You can give the position of any place on Earth using coordinates.

Degrees and minutes

Degrees are divided into **minutes**. 1 degree = 60 minutes, or 1° = 60′.

Look at **B**. It is halfway between 0° and 15° north of the Equator. So it is at 7° 30′N. Its coordinates are 7° 30′N 15° 00′E. Do you agree?

Did you know?
- Any line of longitude could be the Prime Meridian.
- Countries agreed to use the one that passes through Greenwich in London.

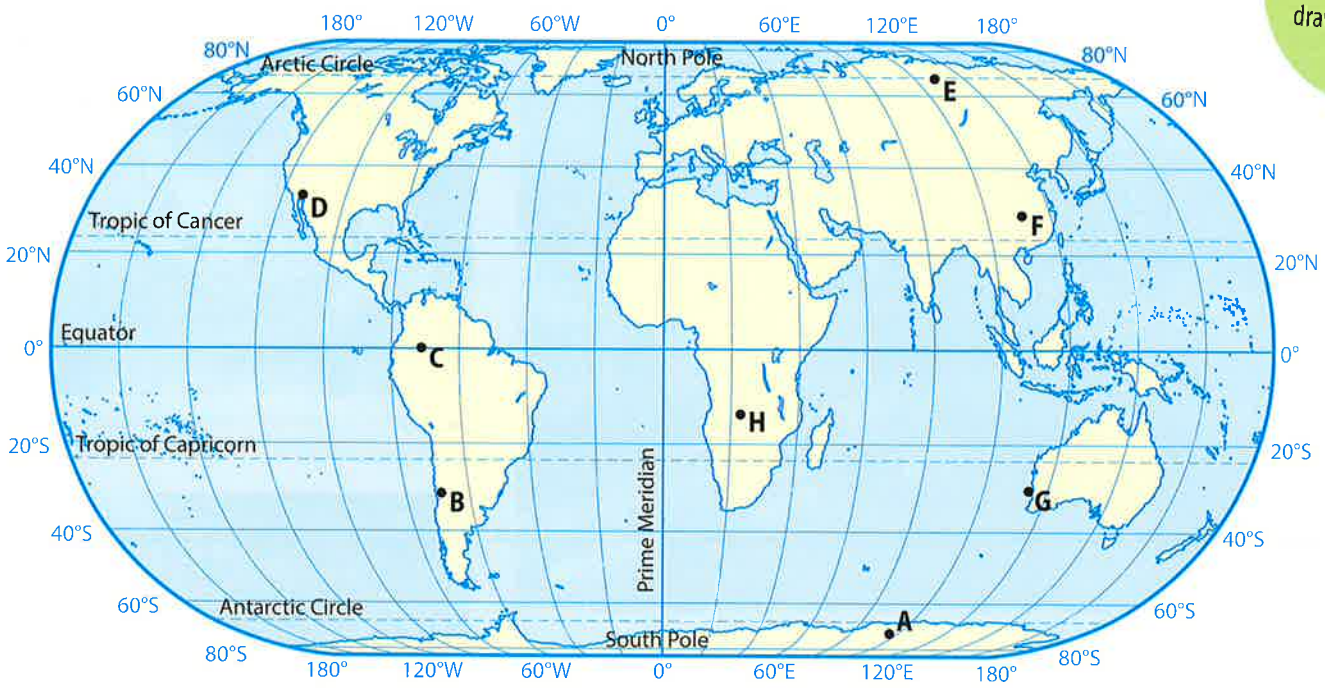
Did you know?
- For centuries, sailors had no reliable way to work out their longitude ...
- ... and this caused many shipwrecks.

Showing Earth on a map

Earth is round. So how can we show it on a flat map? There are many ways to show it – but they all cause a little distortion. Here is one example:

Why...

◆ ... is it hard to draw a flat map of Earth?



Here the land masses are the correct sizes, relative to each other.
But their shapes are a little distorted. They look a bit different on a globe.

The five main lines of latitude

Look at these lines of latitude on the map above.

Equator	0°
Tropic of Cancer	23° 26′N
Tropic of Capricorn	23° 26′S
Arctic Circle	66° 33′N
Antarctic Circle	66° 33′S

They are all linked to the Sun's position in the sky, at certain times of year.

Look at the two tropic lines. The region between them is called the **tropics**.
Look at the Arctic Circle. The region above it is called the **Arctic**.
All the land below the Antarctic Circle is part of **Antarctica**.

Looking up places in an atlas

Suppose you want to find Paris.

- First, look for Paris in the index at the back of the atlas. You will find something like this:
  Paris, France **63** 48 52N 2 20E
- The first number is the page number to go to.
- The other numbers are the coordinates for Paris.
  (The ° and ′ are often left out.)

Your turn

1 What is: a the Equator? b the Prime Meridian?

2 Look at Earth on page 42.
- a See if you can give coordinates for the place labelled:
  i **C** ii **D**
  You don't need to include minutes.
- b Which place has coordinates 22° 30'N 15° 00'W?

3 On the map above, the grid lines are every 20°.
- a Which place is at latitude: i 0°? ii 66° 33'N?
- b Which *two* places are in the tropics?
- c Which place is in Antarctica?
- d See if you can pick out the place with coordinates:
  i 34° 00'N 113° 30'W ii 29° 50'S 116° 30'E

3 About the UK

You know a lot about the UK already. You live here! See if you can answer these questions.

▲ *This city is . . . ? The river is called . . . ? The building with the big clock is . . . ?*

▲ *It's the highest mountain in the UK. It's called . . . ? And it's in . . . ?*

▲ *What is the name of this famous landmark? And where is it?*

▲ *The UK and the Republic of Ireland are separate countries. True or false?*

▲ *Is this road sign in the UK? Yes? No? Maybe?*

▲ *The UK is ruled by a monarch (queen or king). True or false?*

▲ *About how many people live in the UK? 21 million? 64 million? 97 million?*

▲ *Dinosaur footprints have been found in the UK. True or false?*

The big picture

This chapter is all about the UK … to remind you of what you know already, and to tell you some more! Here's the big picture …

- 12 000 years ago, nobody was living in the British Isles. But as the centuries went by, more and more people arrived.
- We have spread all over the British Isles, and carved them up like a jigsaw.
- Now they are home to two countries. The United Kingdom (UK) is one. It is in turn made up of four nations.
- The UK is a place of contrasts. For example some parts are colder and wetter than others. Some are more crowded.
- London is the UK's capital city – and by far its biggest city.

Did you know?

- Britain is the eighth largest island in the world.
- Greenland is the largest.

Did you know?

- The land that's now the British Isles once lay at the Equator.

Did you know?

- Britain was joined to France 20 000 years ago, when sea levels were low.
- It could happen again, one day!

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- Which countries and nations make up the British Isles?
- The UK has several mountain ranges. Where? And what are their names?
- Which are the UK's main rivers, and where are they? (Give at least six.)
- Which parts of the UK are the warmest? coldest? wettest? driest? You should be able to describe the patterns.
- Which parts of the UK are the most crowded? And least crowded?
- What do these terms mean?
  urban area *rural area* *population density*
- Which are the UK's biggest cities, and where are they? (Name at least five of the top ten.)
- See if you can give at least four facts about the UK's economy. You could mention some exports and imports.
- Give at least four geographical facts about London, the UK's capital city.

What if...

- ...Britain were still joined to France?

And then …

When you finish the chapter, come back to this page and see if you've met your goals!

Your chapter starter

Look at the photos and questions, on page 44.

See how many questions you can answer.

Choose one photo, and say a bit more about what it shows.

Then see if you can think of five other facts about the UK.

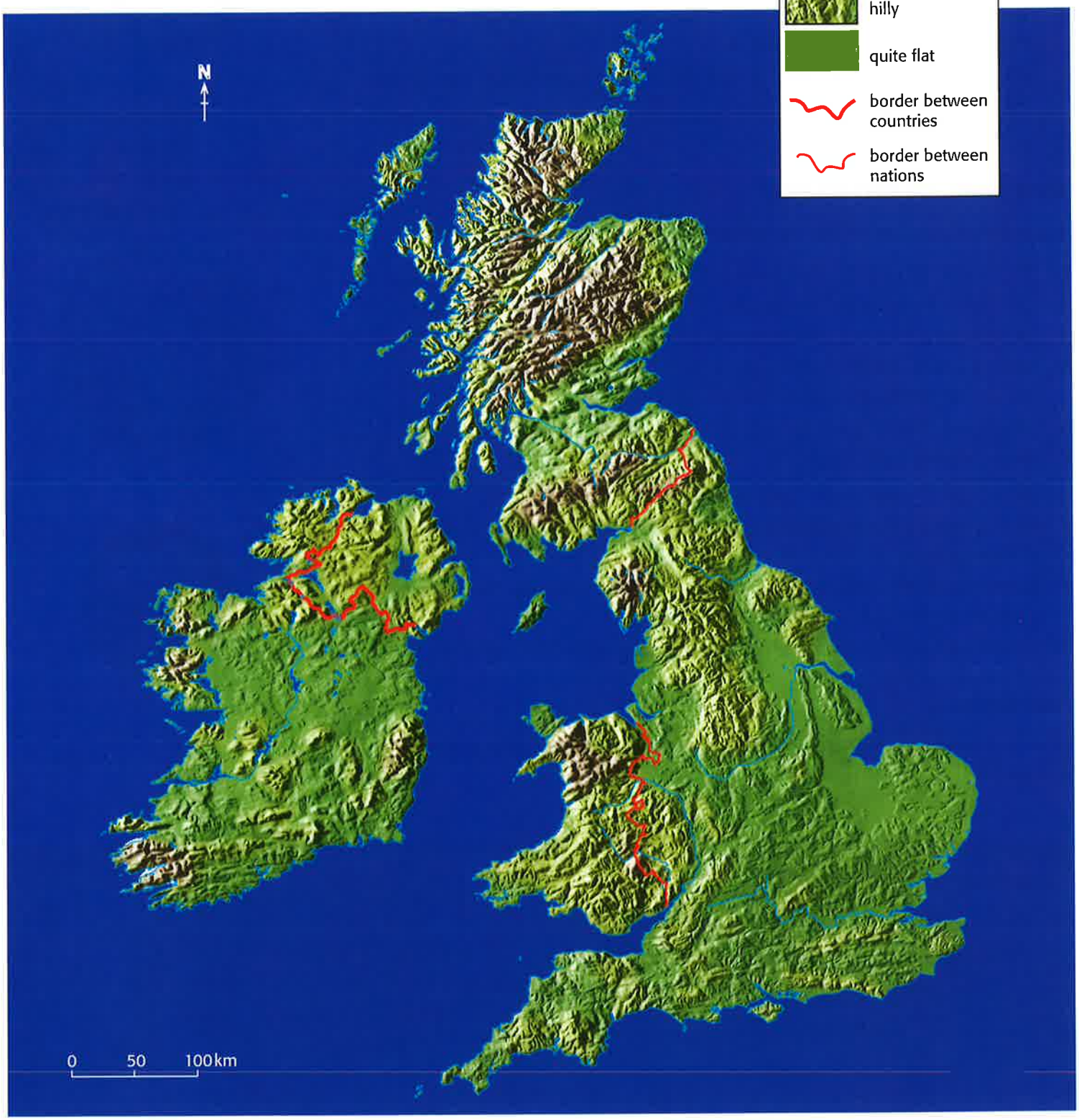
Do you think it's a good country to live in? Why? Or why not?

3.1 Your island home

This unit is about the UK's main physical features.

The British Isles

This shows the British Isles from space. (We added the red lines.)
Look how jagged that big island is. Look at all those mountainous areas!



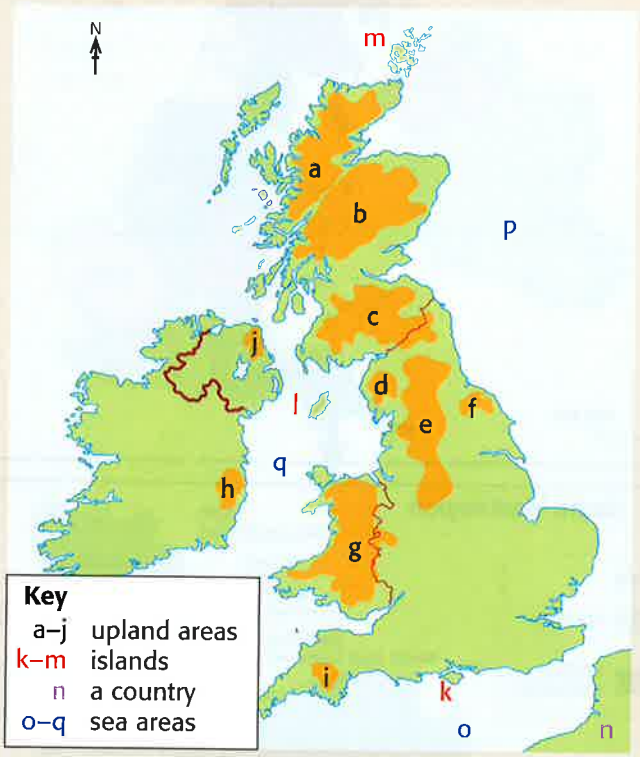
▲ *You'll find places like this in the UK …*

▲ *… and places like this.*

Your turn

1 Look at the satellite image on page 46.
- a Point to your island. What is its name?
- b See if you can show where you live on it.
- c Where are the highest mountains, on your island?
- d Where is the flattest land on it?

2 Now look at this map.
- a What do you think the orange colour shows?



- b See if you can name the places and features marked with a letter, on the map. Page 139 will help.
Start your answer like this: *a* = _____

3 There are thousands of rivers in the UK. Turn to page 139, and see if you can identify rivers **A** – **G**, from these clues.
- **A** It's the longest river in the UK. It rises in Wales.
- **B** This one flows by the Houses of Parliament.
- **C** Stoke-on-Trent sits on this river.
- **D** Newcastle sits on this one.
- **E** This one runs along part of the border between England and Scotland.
- **F** Did Aberdeen get part of its name from this?
- **G** This one flows to the Wash, on the North Sea.

4 One group of islands is not shown on the satellite image. (It's off the top of the page.) What is the missing group of islands called? Check on page 139?

5 Photos **X** and **Y** above were taken at **A** and **B** on this little map.

- a Which photo was taken at **A**? Explain your choice.
- b Now compare the two places shown in photos **X** and **Y**. Is there anything similar about them? What's different? Write your answer as a paragraph.

6 You live on an island. Is that a good thing?
- a Make a list of advantages of living on an island.
- b Now list any disadvantages you can think of.
- c Which win, the advantages or disadvantages?

7 Finally, write a paragraph saying where on Earth the British Isles are. Pages 140 – 141 will help.
Include these terms in your paragraph:

Equator	*ocean*	*continent*
Europe	*France*	*Arctic Circle*

3.2 It's a jigsaw!

In this unit you'll see how we humans have carved up the British Isles.

Building borders

20 000 years ago there were no borders in these islands – because nobody was living here.

But over time, different tribes arrived. They fought over things like land, trade, and religion.

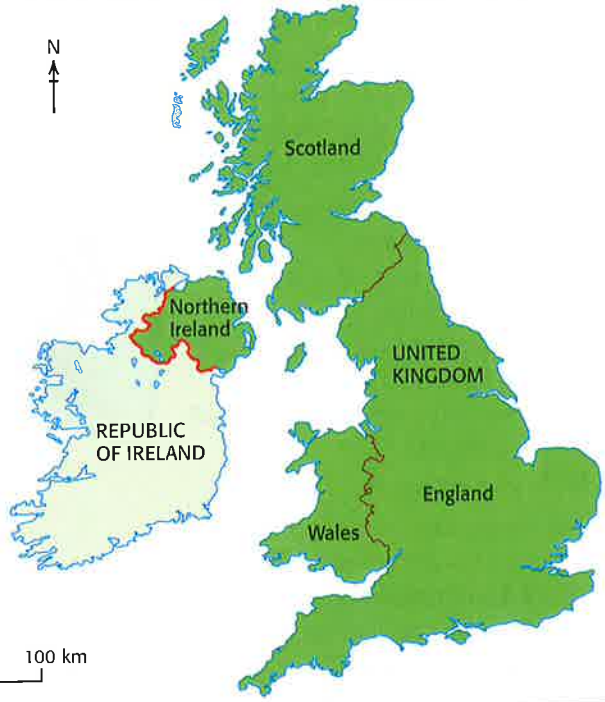
In the end, borders were built between different areas. We still have them today.

Two countries

Today, the British Isles is divided into two **countries**: the United Kingdom (UK) and the Republic of Ireland. The UK is the green part on map **A** below.

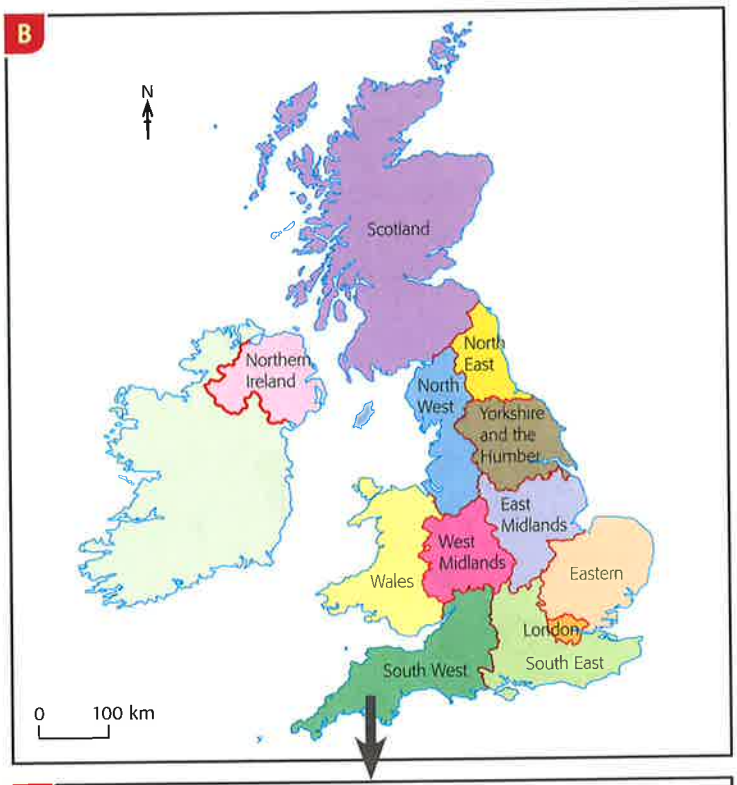
The UK is in turn made up of four **nations**: England, Scotland, Wales, and Northern Ireland.

A

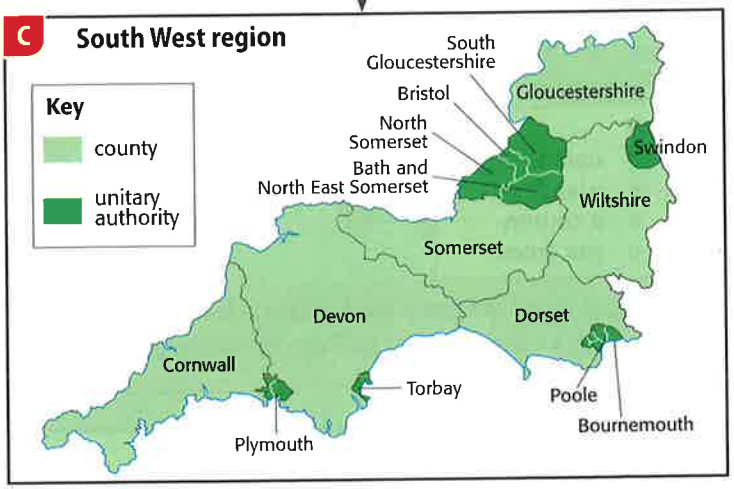


But that's just the start of the jigsaw. For example England is divided into the **regions** on map **B**. These are in turn divided into smaller areas. Look at map **C**. Each area looks after its own services, such as schools and hospitals.

B



C



Remember!

the British Isles

the United Kingdom

Great Britain
(or just Britain)

Some facts about the British Isles

Flag of UK  Flag of Republic of Ireland 					
Area (square kilometres)	130 400	77 100	20 800	14 200	70 300
Population (millions)	53.5	5.3	3.1	1.8	4.6
Flag of this British nation					

History box

1801: Ireland becomes part of 'The United Kingdom of Great Britain and Ireland'.

1922: the Republic of Ireland gains independence.

1171: King Henry II of England takes control of Ireland.

1100: England, Scotland, Wales and Ireland are separate countries.

1276: King Edward I of England takes control of Wales.

1536: Henry VIII unites England and Wales.

1707: England, Scotland and Wales become 'Great Britain'.

Today: England, Scotland, Wales and Northern Ireland are still united as the UK.

Your turn

1 So – what about you?
- a Which country of the British Isles do you live in?
- b Which nation do you live in?
- c Which region do you live in? If you don't know, compare the maps on pages 48 and 139, and see if that helps.

2 This shows where Walter lives:

Show where *you* live, in the same way.
(But if you live in Liverpool, do it for someone in Land's End. See the map on page 139.)

3 a Make a bigger copy of the table on the right. (Rough maps are fine. But make sure you show the borders!)

b On your copy, colour in part of each map, to match its label. (So for the first one, colour in only Great Britain.)

c Work out the population and area for the coloured parts, using the data in the table above. Fill them in.

4 How did the British Isles end up as two countries? The history box above gives key events.
- a Draw a timeline from the year 1100 to today. (For an example, see question 2 on page 53.) You could use a full page, turned sideways.
- b On your timeline, mark in arrows at the key dates, and add labels to show the events.
- c You can add small maps or flags or other symbols to your timeline, if you like. Give it a suitable title.

	Great Britain	United Kingdom	British Isles
			
Population (millions)			
Area (_____)			

3.3 What's our weather like?

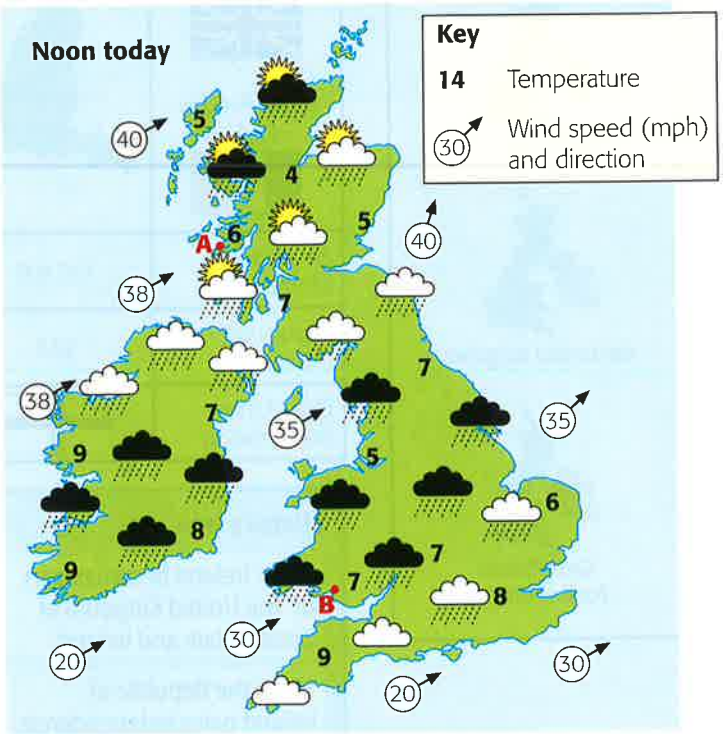
Here you'll learn about weather patterns across the UK.

What is weather?

Weather means the state of the atmosphere. Is it warm? wet? windy?

Look at the weather map on the right, for a day in October. Using the key, you can say that around **A** that day:

- it was quite cloudy and wet, but there was some sunshine.
- the temperature was around 6 °C.
- there was a south west wind (it blew *from* the south west).
- the wind was quite strong (around 38 miles per hour).



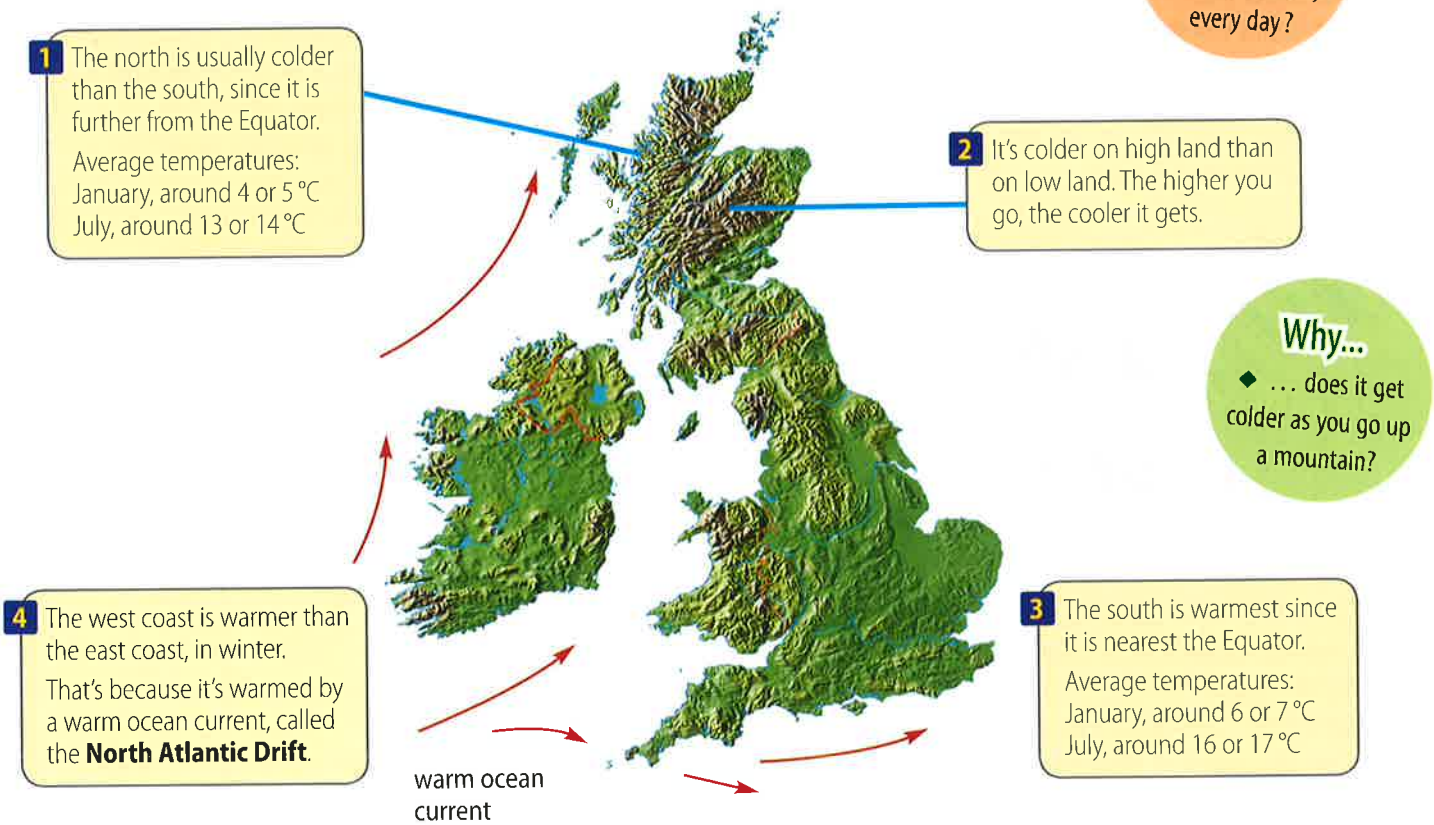
Our weather is changeable

- Our weather can change from day to day.
- It can be different in different places on the same day, as the weather map shows.

Which parts are colder? warmer?

Although the weather can change from day to day, there are patterns. For example, some areas are *usually* colder than others. Look:

What if...
◆ ...it were warm and sunny every day?

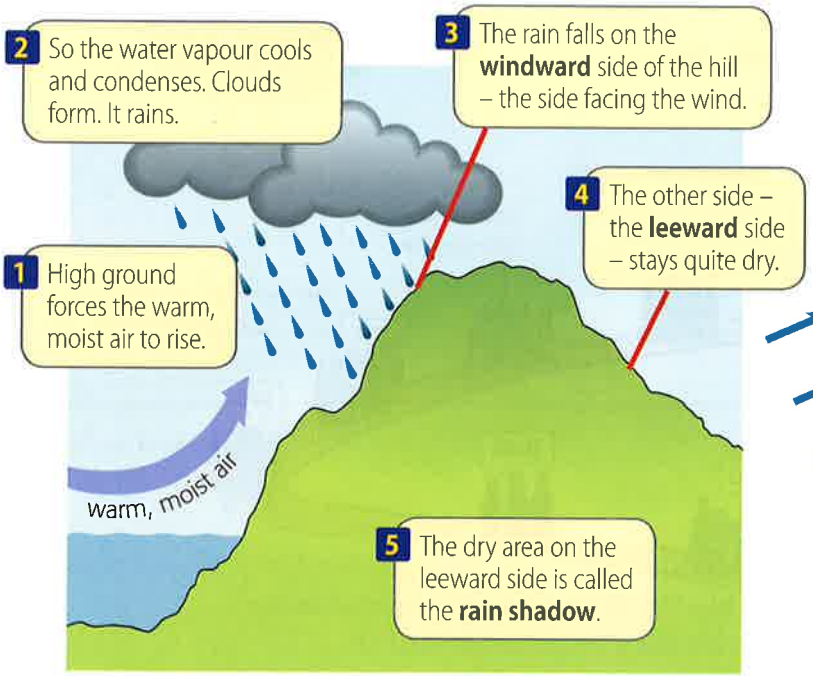


Why...
◆ ... does it get colder as you go up a mountain?

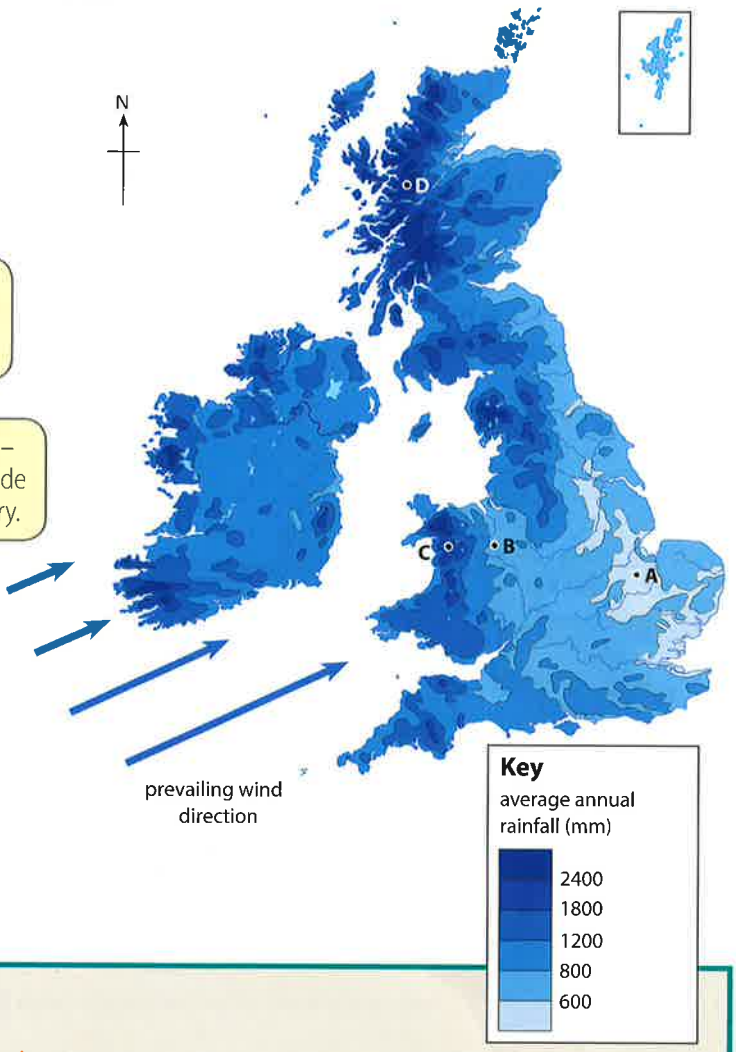
Which parts are wettest?

Look at the map on the right. It shows the average rainfall in a year, for the British Isles. Some parts get a lot more rain than others.

Overall, the higher parts are wetter.
Follow the numbers below to see why:



Average annual rainfall



Your turn

1 What's the weather like where you are today?
Describe it. You might be able to use some of these words:
sunny *cloudy* *rainy* *dry* *calm*
cold *warm* *mild* *windy* *stormy*

2 Look at the weather map at the top of page 50.
Find the place marked **B**. Say what the weather was like around **B** that day, as fully as you can.

3 Look at boxes 1 – 4 on page 50. Does the weather map match what the boxes say? Give evidence!

4 Look at the rainfall map above.
Four places are marked on it: **A**, **B**, **C** and **D**.
a Which one of them is the wettest?
b Which is driest?
c Which one may have an average annual rainfall of:
i 2000 mm? ii 500 mm?

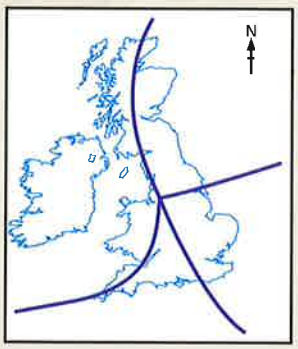
5 a What are *prevailing winds*? (Glossary.)
b In the UK, the prevailing winds blow in from the south west. (Look at the rainfall map above.)
They carry lots of moisture. Why? (Page 140?)

6 Mountains help rain to form. How do they do this?

7 a Overall, which side of Great Britain is wetter? See if you can explain why. (Page 46?)
b On the map above, **B** gets far less rain than **C**. Why?

8 And now, a challenge. On the map below, the British Isles is divided into four zones.
a Make a bigger, simpler, copy of the map.
b Colour the land in each zone in a different colour.
c Then add each label below to its correct zone.

What's our weather usually like?



warm summers, mild winters, not so wet

mild summers, mild winters, wet

mild summers, cold winters, not so wet

warm summers, cold winters, dry

3.4 Who are we?

Here you will learn that we're all descended from immigrants.

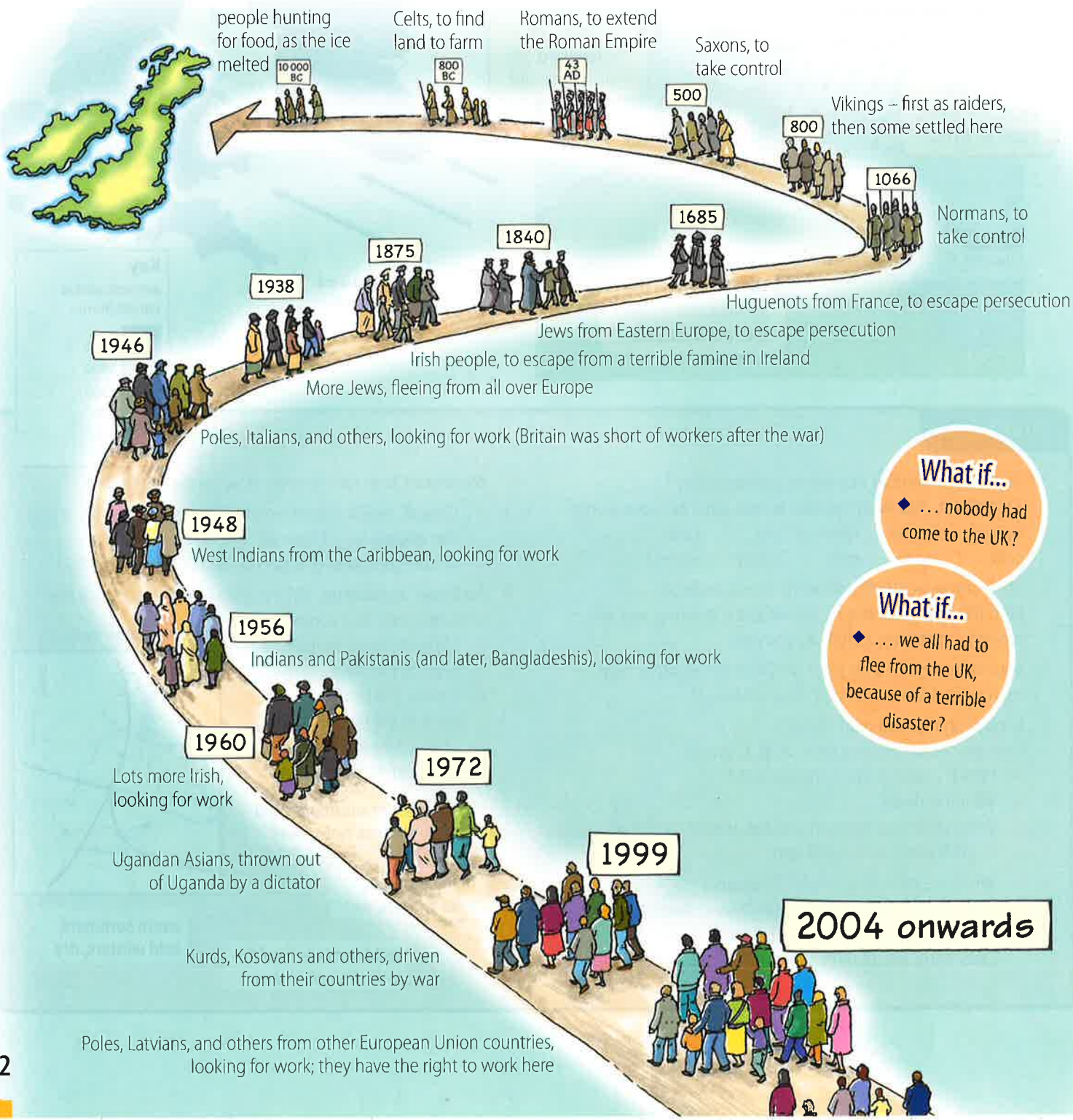
The long march

An **immigrant** is a person who moves here from another country, to live. 20 000 years ago, nobody lived here. (Much of the land was covered in ice.) So we are all descended from immigrants – even the Queen!

Over the centuries, many groups of people arrived. This drawing shows only the main groups. New groups are still arriving.

Did you know?

- London is less than 2000 years old.
- Damascus, the capital of Syria, is over 10 000 years old.



What if...

- ... nobody had come to the UK?

What if...

- ... we all had to flee from the UK, because of a terrible disaster?

All mixed up

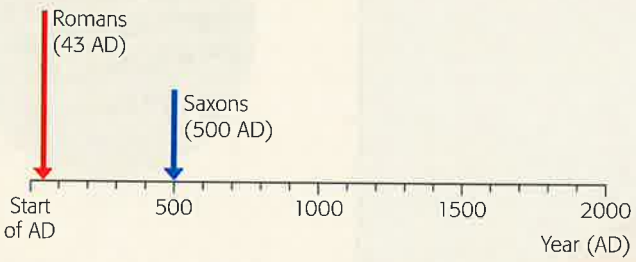
So we all carry the genes of past immigrants in our cells. How exciting! Look at these.

What about you? Who are you descended from?

Your turn

1 What is an *immigrant*?

2 This shows the start of a **timeline** for the main groups of immigrants since the year 1 AD.



Now draw your own timeline for them. Like this …

a First draw a line 21 cm long. Divide and label it, with 1 cm for each century.

b Draw an arrow for the Romans at 43 AD. Label it.

c Repeat for the other groups on page 52.
After 1900 it gets crowded – so take care.
(Try making all your arrows different lengths.)

3 Now look at your timeline.

a When was the biggest gap between new arrivals?

b In which century did most new groups arrive?

4 Look at these five terms:

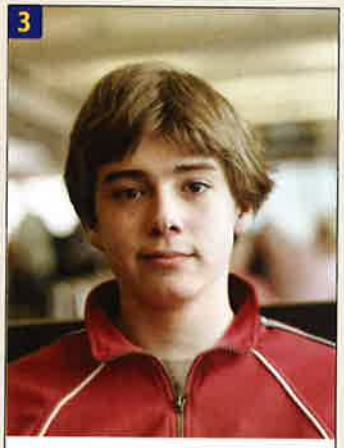
A refugee **B** invader **C** economic migrant
D emigrant **E** asylum seeker

a First, write down what each term means. (Glossary.)

b Then choose what you think is the best term for each person in the photos on the right.

William the Conqueror, the Norman who took control of England by force in 1066.

In 2012, Chya fled over the border from Mali to a camp in Mauritania, to escape rebels.



Josh. He's leaving the UK with his mum and dad today, for a new life in Australia.

Joy arriving from Jamaica in 1956. She is a nurse. She wants to find a job.

3.5 Where do we live?

Here you'll see how we are spread unevenly around the UK.

Population density

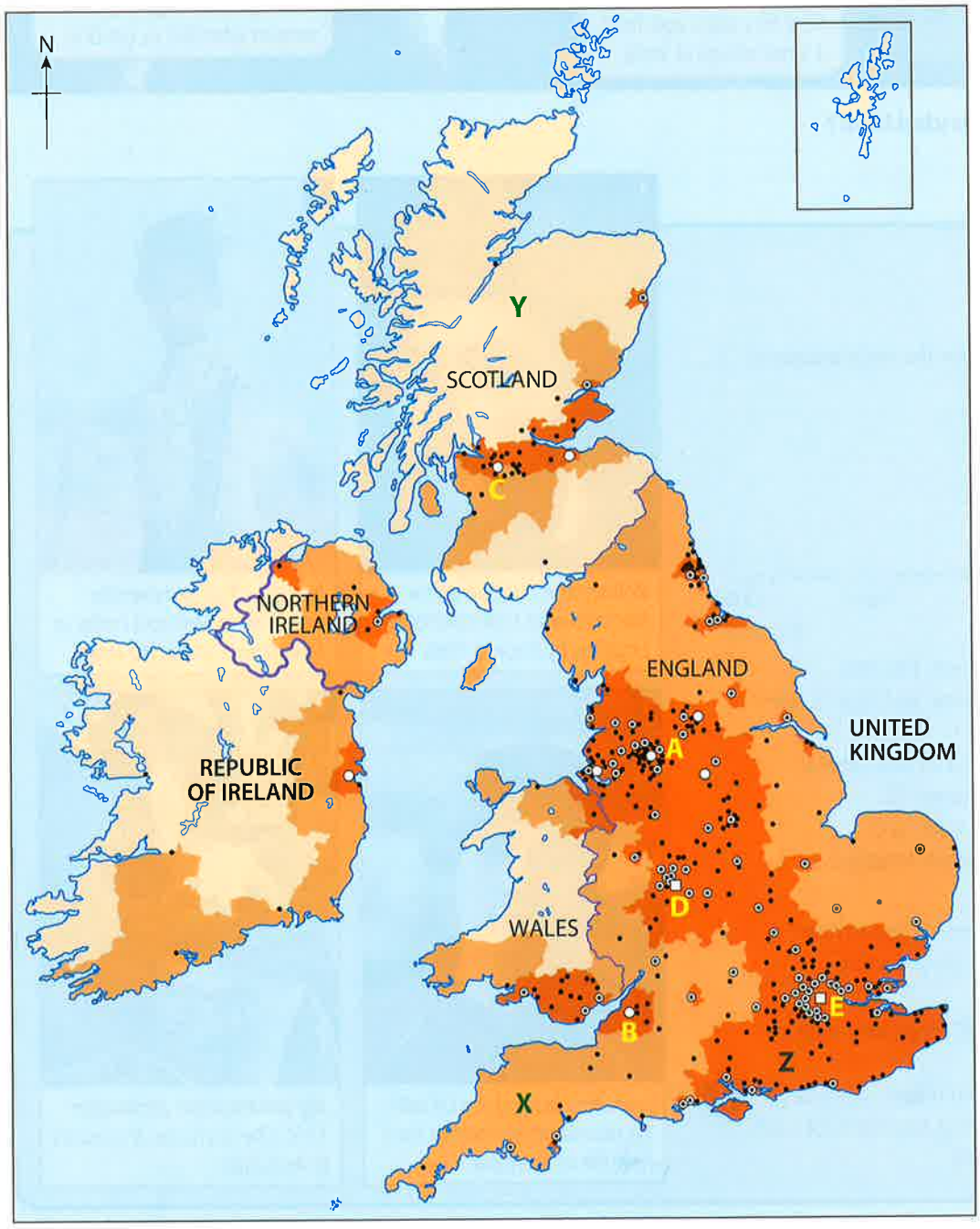
The **population** of a place means the number of people who live in it. The population of the UK is around 64 million.

Population density is the average number of people living in an area, per square kilometre. The map below shows how this changes around the British Isles.

Look at the key. The darker the shade, the more people per square kilometre. The palest areas are the least crowded.

The UK's 10 largest cities

	Name	Population (millions)
1	London	8.31
2	Birmingham	1.07
3	Leeds	0.75
4	Glasgow	0.60
5	Sheffield	0.55
6	Bradford	0.52
7	Manchester	0.51
8	Edinburgh	0.50
9	Liverpool	0.47
10	Bristol	0.43



Did you know?

- The UK is the 22nd biggest country in the world, by population.

Did you know?

- The UK has 256 people per sq km, on average.
- France has 119.
- The USA has 34!

Key

Population density
people per square kilometre

- over 250
- 50–250
- under 50

Cities and towns
population in millions

- more than 1 000 000
- 400 000 – 1 000 000
- 100 000 – 400 000
- 25 000 – 100 000

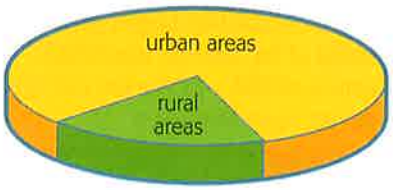
Urban or rural?

Look at photo **A** above. It shows a **rural area**. A rural area is mainly countryside, but it may have villages and small towns.

B shows an **urban area**. Urban areas are built up. They include larger towns, and cities. This city is Birmingham.

Overall, 19% of the UK's population live in rural areas.
What about you? Urban or rural?

Where the UK population lives



Your turn

1 What does *population density* mean?

2 Look at the map on page 54. It has letters marked on.
- a What can you say about the population density:
  i at **X**? ii at **Y**? iii at **Z**?
  Use the term *people per square km* in your answer.
- b The population density around **Y** is low.
  Using the image on page 46, try to explain why.

3 Look again the map on page 54.
- a Overall, which is more crowded: the UK, or the Republic of Ireland?
- b Which *nation* in the UK is the most crowded?

4 The population is divided *very* unequally among the UK's four nations: England has roughly 84% of the total; Scotland, 8%; Wales, 5%; Northern Ireland, 3%.
See if you can find a good way to show this.

5 The table on page 54 shows the UK's ten largest cities.
Five of them are marked on the map, labelled **A** to **E**.
See if you can match each letter to the correct city.
Start like this: **A** = _____ (Page 139 will help.)

6 What does this term mean? a urban area b rural area

7 Which has a higher population density: an urban area, or a rural area? Photos **A** and **B** above may help!

8 Name: a an urban area near you b a rural area near you

9 Now look at the pie chart above.
- a Which one of these statements is true?
  A Most people in the UK live in the countryside.
  B About half of us live in towns and cities.
  C Nearly 1 in 5 people in the UK live in rural areas.
- b See if you can explain the pattern in the pie chart.
  (Why might people prefer to live in urban areas?)

10 Finally, use what you've learned to write a report called *The pattern of population density in the UK*.
- Make it at least 50 words long. (Try for more!)
- Say where the most and least crowded regions are.
- Try to use all the terms from the white box below in your report.

highest land	*flat land*	*south east*	*England*
central	*coast*	*least populated*	*north*
Scotland	*Wales*	*Northern Ireland*	*cities*

3.6 How are we doing?

Here you'll look at some different aspects of the UK.

If the UK were a person ...

Imagine the UK is a person. What is that person like?

1 Over 40!
There are more people aged over 40 than under 40, in the UK.

2 But young at heart ...
Almost 1 in 4 of the population is under 20 years old. (That's over 15 million people.)

3 Smart!
The Industrial Revolution began here.
The inventor of the internet was British.
The structure of DNA was worked out here.
There are lots more examples.

4 Talented!
World-class for music ... fashion ... the media ... computer games ... and more.

5 Sporty!
World-class in some sports. (Could do better, in others.)

6 Loves ...
jeans and trainers, a cup of tea, fish and chips, ice cream vans, animals ...

7 Loved by ...
tourists from other countries. Around 30 million a year come to visit!

8 Works hard
Works in factories and on farms, producing things to sell. But mostly offers services – like teaching you, looking after you when you're ill, serving you in cafes ...

9 Sells things to other countries
Sells oil, cars, chemicals, aircraft, medical drugs ...
And services such as banking and insurance, entertainment, tourism.

10 Buys things from other countries
For example oil, coal, gas, cars, steel, goods like iPads and computers, and lots of food and clothing.
And services too ...

11 Doing fine, thanks!
The UK is the world's 7th largest economy. In other words it comes 7th for the amount of wealth it produces each year.

12 But still a little anxious!
Loses sleep over some things. Like ...
- how to improve healthcare
- terrorism
- how the government can pay back all the money it has borrowed over the years.

Differences around the UK

Overall, the UK is doing fine, compared with most countries. But it's not the same story all over the UK. There are big differences.

Some areas are wealthy, with people earning lots. Others are run down, and people may not be able to find any work at all.

What if...

- ...everyone in the UK stopped working?

Your turn

1 Look at page 56. See if you can pick out five facts about the UK that you did not know before. Write them down, *in your own words!*

2 Box **3** on page 56 mentions:
a the Industrial Revolution **b** DNA
What are these?
The glossary may help.

3 See how many examples you can give, of British musicians who are stars around the world. (Singers and/or groups.)

4 Box **5** is about sport. Which sports does the UK excel in, in your opinion? Which sports could we improve in?

5 Box **7** is about tourism. What a lot of tourists!
What do you think attracts them to the UK?
You could show your answer as a spider map.

6 Box **8** is about the work we do. Around 30 million people go out to work, in the UK. You know some of them!
List at least 15 jobs that people do.

7 Jobs can be put into groups or **sectors**.
The white box on the right shows the three main sectors.
a Read about the sectors.
b Think about each job in your list for question 6.
Then write **P**, **S** or **T** beside it, to show the sector you think it belongs to. (**P** for primary!)

8 Look at your answers for question 7b. Did you have jobs for each sector? Which sector had most?

9 **a** What does *the economy* mean? (Glossary?)
b Name three things the UK *exports*.
b Now name three things the UK *imports*.

10 Look at photos **X** and **Y** above.
a One of the two places looks quite wealthy. Which one? What is your evidence?
b The other place is quite run down. How can you tell?
c Why might an area become run down? Try to think of at least *two* reasons.

11 Now, what else would *you* add to page 56, to describe the UK? (If you think of something negative, try for something positive too!)

Job sectors

Primary: people take things from the earth and the ocean. Examples: *farmer, fisherman, miner.*
Secondary: people make things in factories, or construct things on building sites. Example: *builder.*
Tertiary: people provide services for other people. Examples: *doctor, teacher, taxi driver, hairdresser.*

3.7 London, our capital city

Here you'll learn something about London, and how its population has grown.

Our capital city

population: 8.3 million, or 13% of the UK's population
share it contributes to the UK's wealth: 19%
% of its population born outside the UK: 37%
daily commuters from outside London: around 750 000
secondary schools: around 660
hospitals: around 80
cinemas: around 110
premiership football clubs: 5
shops: thousands
places to eat: thousands

How did it start?

2000 years ago, London was just marshy ground beside a big river, the Thames. And empty except for some Britons living in huts.

Then the Romans arrived, in 43 AD. They built a wooden bridge across the Thames. They brought goods in by boat, and unloaded them beside the bridge. Soon, a small settlement grew around the bridge. They called it Londinium.

Londinium grew fast. So the Romans made it their capital.

By 407 AD, the Roman army had left Britain. Londinium went downhill. By 450 it was almost empty. By 600 AD it had started growing again … and it kept on growing.

▲ *Heading for Londinium?*

London today

- London is still the capital, long after the Romans.
- It's the biggest city in the UK by far. It has nearly 8 times more people than the next biggest city, Birmingham.
- It covers an area of 1610 sq km. That's big!
- Out of every 100 people in the UK, 13 live in London.
- Look at the **City of London** in the middle of this map. This was the extent of the city in the Middle Ages.
- Today, London's full name is **Greater London**. It's made up of the City of London, plus 32 London boroughs.
- The City of London is now a **financial centre**. The Stock Exchange is here, and all the big banks. It usually ranks as the world's top financial centre. It earns a lot of money for the UK.

What if...

◆ ...the Romans had stayed away?

Key

- Londinium was in this area
- boundary of City of London

A multicultural city

Over the centuries, people came from all over, to London. Today, it is one of the world's most cosmopolitan cities, with people of every race.

Over 300 different languages are spoken on London's streets.

▲ *One happy school.*

London's ethnic mix	
Group	**% of population**
White British	44.9
White other	14.9
Mixed race	5.0
Black Caribbean	4.2
Black African	7.0
Black other	2.1
Indian	6.6
Pakistani	2.7
Bangladeshi	2.7
Chinese	1.5
Arab	1.3
Other Asian	4.9
Other	2.2

Your turn

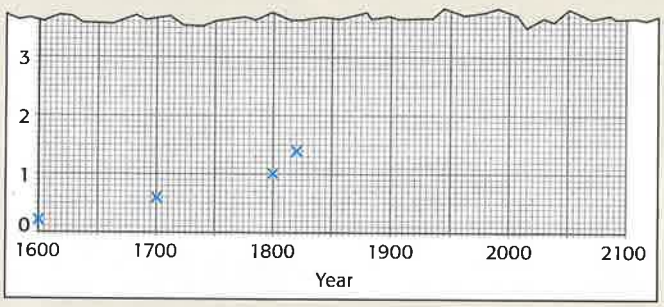
1 Where is London? Describe its location as fully as you can. (The map on page 139 will help.)

2 Which counties border London? (Look on page 58.)

3 What's the difference between the *City of London* and *Greater London*?

4 Now you are going to draw a graph of the population since the year 1600, when Elizabeth I was queen. The data is in the table on the right below. It's best to use graph paper.

a The graph has been started below, to help you. The vertical axis is for population, in millions. Continue it up to 8 million, and label it.



b On your graph, plot the points for the data. (Four points have been plotted as examples.)

c Then join the points with a smooth curve, and give your graph a title.

5 This is about the graph you drew in question 4.

a *The population of London was greatest in 2010.* Is that statement true, or false? Give your evidence!

b When did the population grow fastest? (Where is your graph line steepest?)

c The population fell after World War II but is rising again. (In 2013 it reached 8.3 million.) Where do you think the new people are coming from?

6 London is on a big river, and near the coast. These factors helped it to grow. See if you can explain why. (The maps at the back of this book may help.)

7 London is counted as one of the top world cities. Why do you think that is? See how many reasons you can give.

How the population of London has grown			
Year	**Population (millions)**	**Year**	**Population (millions)**
1600	0.2	1940	8.6
1700	0.6	1950	8.2
1800	1.0	1960	8.0
1820	1.4	1970	7.5
1840	1.9	1980	6.8
1860	2.8	1990	6.8
1880	4.8	2000	7.2
1900	6.5	2010	7.8

4 Glaciers

The big picture

This chapter is about **glaciers** – how they form, and how they shape the landscape. Here's the big picture …

- Glaciers are like rivers of ice. They flow!
- Today they cover about 10% of Earth's land.
- But in the past they covered more of Earth, during ice ages.
- Much of Britain was covered by glaciers during the last ice age, which ended about 10 000 years ago.
- Glaciers scrape and shape the land they flow over, giving special landforms.
- We can still see these landforms in Britain today.

Did you know?
- 75% of the world's fresh water is frozen in glaciers.

Did you know?
- The Antarctic ice sheet is the largest glacier on Earth.
- It covers almost 14 million square kilometres.

Did you know?
- There are glaciers on every continent …
- … and in more than 40 countries.

What if...
- … another ice age came to Britain?

What if...
- … all the glaciers melted?

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- What are glaciers made of, and how do they form?
- What's the difference between an ice sheet and a mountain glacier?
- Where would I see glaciers on Earth today?
- Where would I have seen glaciers in Britain, 20 000 years ago?
- What do these terms mean?
  glacial *glaciated* *glaciation*
- Glaciers shape the land they flow over. How do they do this?
- What do these terms mean?
  plucking *abrasion* *freeze-thaw weathering* *crevasse* *till* *moraine* *erratic* *drumlin*
- How are these formed?
  corrie *arête* *pyramidal peak* *U-shaped valley* *hanging valley*
- Which glacial landforms can I pick out, on an OS map?
- In what kinds of ways do glaciers benefit humans? (Try for at least two ways.)

And then …

When you finish the chapter, come back to this page, and see if you've met your goals!

Your chapter starter

Look at the photo on page 60.

What is that blue and white stuff?

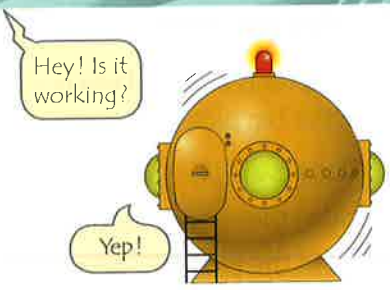
How did it get to be there?

What is happening to it – and why?

Where do you think this place is? Guess?

4.1 Your place ... 20 000 years ago!

Find out what your place was like, and why, 20 000 years ago!



It's time to travel

Climb into your time machine. Press the button. And whoosh!
Travel back in time, to see your place ... as it was 20 000 years ago.

What will you find? It depends on where in the UK you live!

If you live in the white area on the map below, you'll find a thick sheet of ice, when you arrive. There are no humans or other animals. No grass. No trees. It's brutally cold.

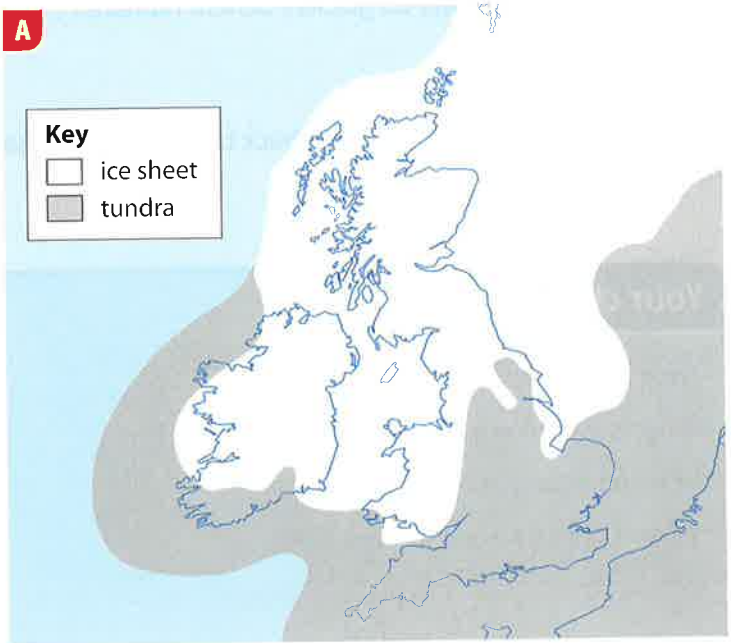
If you live in the grey area, there's no ice sheet. But it has been snowing, and it's very cold. There are no humans – but you may see woolly mammoths, and bison!

Why was it like that?

Why was your place like that, 20 000 years ago?

Because around 110 000 years ago, Earth got colder and colder. A new **ice age** began. (There had been many others before it!)

Over time, an ice sheet spread over much of northern Europe, and most of the British Isles. Look at this map and key.



It did not reach the grey areas. But these were still very cold. The ground was frozen deep down. The surface thawed only in summer, giving thin boggy soil. Then small plants grew. This type of environment is called **tundra.**

By 10 000 years ago, Earth had warmed up again. The ice age ended. The ice over the British Isles melted away. And today we have ice for only short times, in winter.

There was more land then!

During the ice age, water levels in the ocean were much lower than today. (Up to 120 m lower.) That's because so much water was locked up in ice. The water drained away from shallow parts of the ocean floor. They became land.

Look at map **B**. It shows that when water levels were low, the British Isles were joined to the rest of Europe!

What about people?

20 000 years ago, there was nobody in the British Isles.

We had turned up earlier in the ice age – 40 000 years ago. We had walked here from other parts of Europe. But as the ice sheet spread, it got too cold for us, so we left.

Then about 12 000 years ago, when the ice sheet was shrinking, we came back to the British Isles again.

The animals

But there *were* animals here, 20 000 years ago. There were woolly mammoths and bison and Arctic foxes, which could survive the tundra winter.

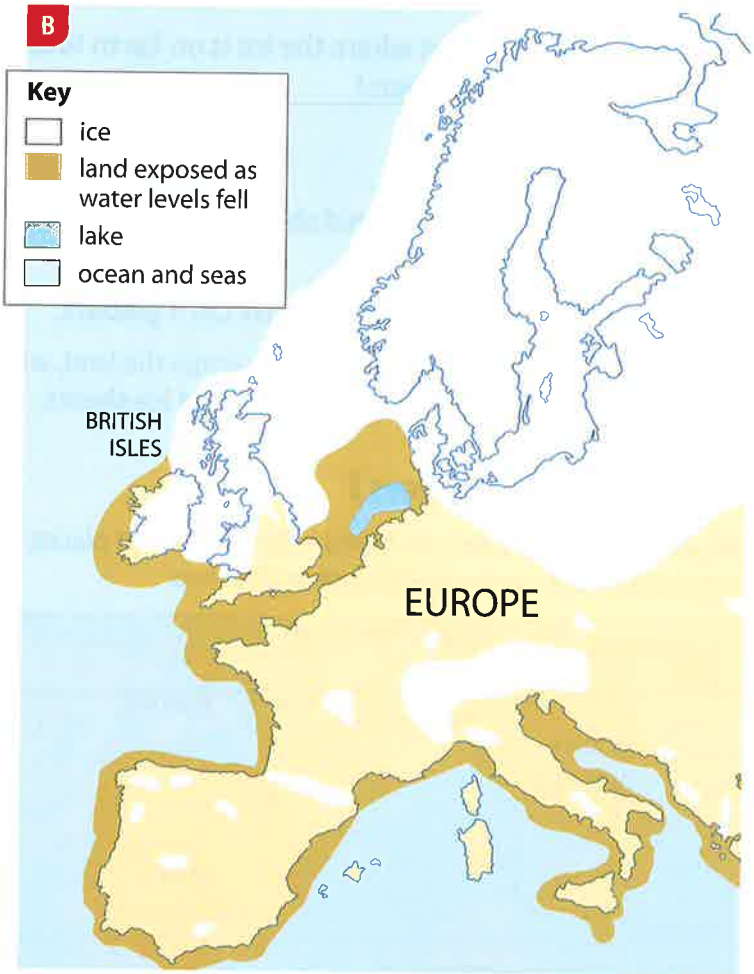
And in summer, when plants grew in the tundra, large herds of reindeer and antelope arrived from other parts of Europe, to feed.

When the ice age ended

As Earth warmed up again, the ice melted. The water levels rose again, and cut us off from the rest of Europe about 8100 years ago.

But the ice had changed the landscape – and we can still see the results today. You'll find out more on later pages.

B



▶ *Mammoth tusks could grow to over 4 metres long. Fossils like this one have been found in the UK.*

Your turn

1 What is: **a** an ice age? **b** tundra? (Try the glossary?)

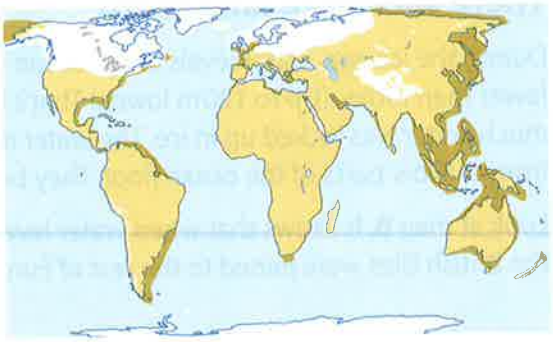
2 How long did the last ice age last? And when did it end?

3 **a** Look at map **B**. It shows that the British Isles were joined to the rest of Europe, in the last ice age. Why was this?
b Then they separated from the rest of Europe again. Why?
c Suppose they had not separated. How would your life be different today?

4 Get ready! You'll travel back 20 000 years, in your home place – and stay for three days. You can take only 20 items.
a First, pick out where you live, on map **A**. Is it in the white part or the grey part? (The map on page 139 may help.)
b Now write a list of what you will take with you. Beside each item, explain why you will take it.
c Good. You've arrived! What's it like there? Write a blog for us!

4.2 Glaciers: what and where?

Here you'll find out where the ice is on Earth today – and start learning about glaciers!



▲ *Ice over Earth during the last ice age.*

What are glaciers?

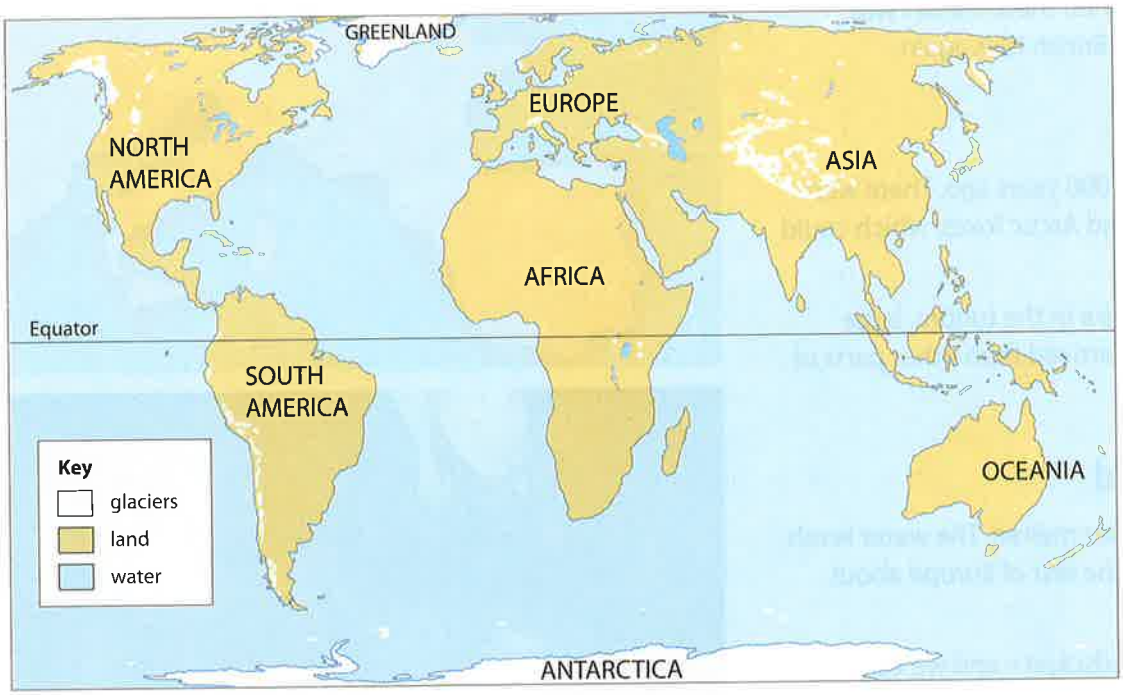
During the last ice age, ice covered about a third of Earth's land. Today, it covers about a tenth.

The ice does not just sit there. It flows! We call it **glaciers**.

Glaciers are large masses of ice, that flow across the land, and down slopes. Giant glaciers, that cover huge areas, are called **ice sheets**.

Where are the glaciers?

As you'd expect, glaciers are found in Earth's coldest places. There are some on every continent – even Africa! Look at this map:



Why...
- ... is it called Greenland?

Did you know?
- Earth is flatter at the South Pole than the North Pole ...

... because of the weight of Antarctica's ice.

1 Far from the Equator, at the top and bottom of the world, ice sheets cover Antarctica and most of Greenland. Between them, they have over 99% of Earth's ice. They are more than 4 km thick in places. Picture that!

2 Earth's other glaciers are much smaller. Most are high up in mountains, where it is also very cold. Most of Earth's big mountain ranges have glaciers. We call them **mountain glaciers** in this chapter.

Glaciers depend on snow

Rivers depend on **rain** falling from the sky. Glaciers depend on **snow**!

In those cold places, snow falls layer upon layer. Over time, the layers below get compacted to ice, like when you squeeze a snowball very hard. It could take a layer of snow 10 metres thick to make a layer of ice 1 metre thick.

As it gets thicker, the ice gets heavier and heavier. And eventually it starts to flow, under the pressure of its own weight. A glacier is born!

Did you know?
- Glaciers are only on land.
- The ice that forms when an ocean freezes over is called sea ice.

Glaciers flow

Glaciers don't just sit there. They flow.

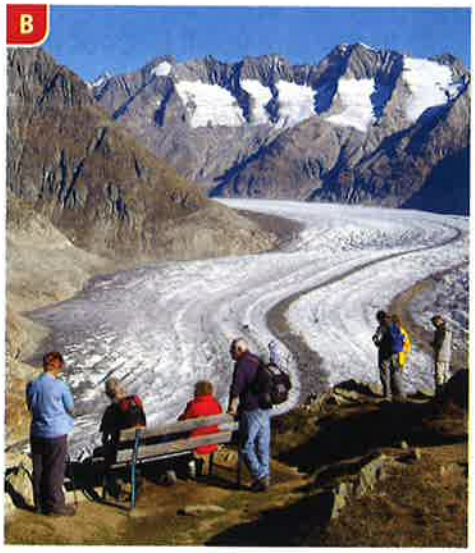
How can ice flow? First, ice flows *inside* the glacier, because the ice crystals slide over each other, under pressure. And second, the ice at the bottom of the glacier may melt; then the whole glacier slides along on the water.

Ice sheets flow just a few metres a year. Mountain glaciers flow faster down their slopes – 300 metres a year or more.

Where do they flow to?

A mountain glacier flows down the side of the mountain, in a valley. And eventually it reaches a place where it melts.

In ice sheets, the ice flows out to the thinnest parts, like when you pour syrup. In Antarctica, it flows into the ocean in places, and floats as an **ice shelf**. Bits of the ice shelf break off now and then to form **icebergs**.



▲ *Watching that river of ice flow by (very very slowly). The Aletsch Glacier in Switzerland.*

▲ *Looking down on Antarctica from space. The flat parts are ice shelves, where the ice sheet flows into the water. (We've put blue dots on them for you.)*

▲ *Made it! As a glacier flows, cracks or **crevasses** form where the ice gets squashed or stretched. For example where the glacier flows round a bend.*

Your turn

1 What is: **a** a glacier? **b** an ice sheet?

2 The UK has no glaciers today. Why not?

3 See if you can name five countries that have mountain glaciers today. The map on page 140 – 141 might help!

4 Image **A** above was taken from a satellite. Which part of Earth was the satellite over at the time?
a the North Pole **b** the South Pole **c** the UK
Explain your choice.

5 You are a scientist. Your job is to study the glacier in photo **B**.
a How could you prove that it was flowing? Tell us!
b How would you work out how fast it was flowing?
c The middle of a glacier flows faster than the edges. Think of a way to prove this too, for your glacier.

6 Crevasses can open up quickly – and close up quickly too. You are in photo **C**. You fall into the crevasse. It is 20 m deep. It creaks loudly. It is closing! What happens next?

4.3 Glaciers at work

In this unit you'll find out how glaciers shape the landscape.

Glaciers work as they flow

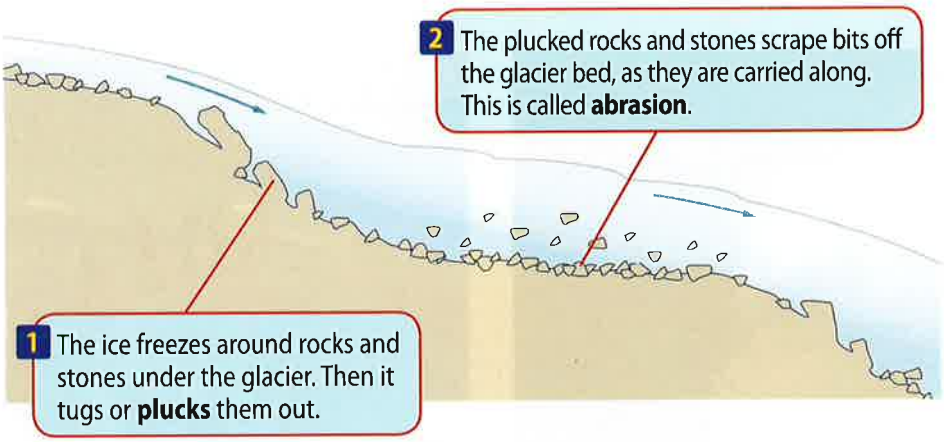
As you saw on page 65, glaciers don't just sit there. They flow. And as they flow, they scrape and shape the landcape, like giant bulldozers.

They do three jobs:
1 They pick up or **erode** material.
2 They carry it away, or **transport** it.
3 Then they drop or **deposit** it.

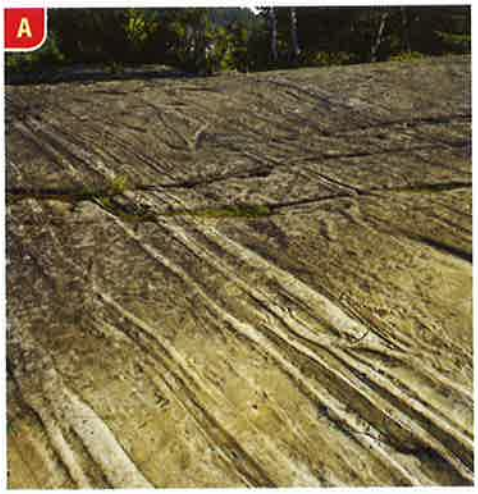
Let's look at these processes in more detail, for mountain glaciers.

1 Erosion

Glaciers pick up material in two ways.



Freeze-thaw weathering makes plucking easier. First, water under the glacier freezes in cracks in the rock. As it freezes it expands, so the cracks get bigger. Then the ice thaws. The cracks fill with water. It freezes again. The ice thaws again. And so on … until the cracks are so big that the rock breaks up.

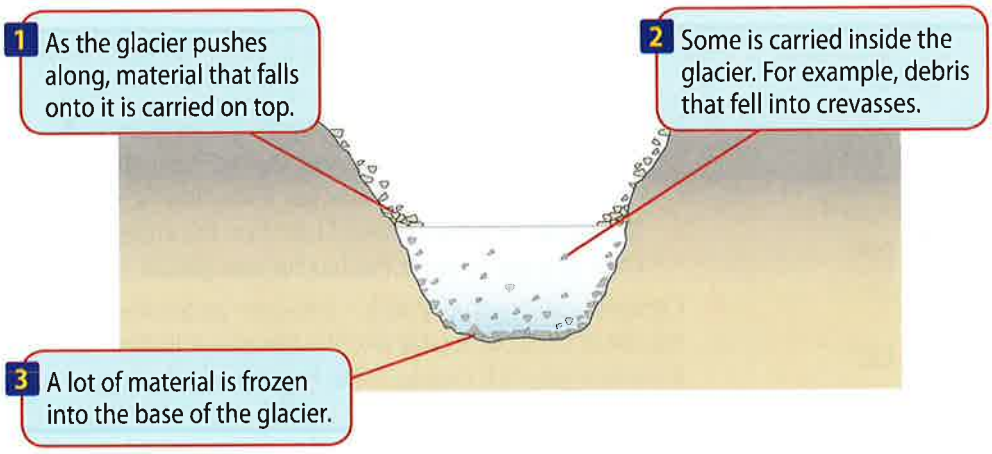


▲ *A glacier went this way! These deep scratches in the rock are the result of abrasion. They are called **striations**.*

▼ *Another glacier in the Alps. Look at the debris on it. Glaciers often look very dirty.*

2 Transport

The glacier then carries away the material it has eroded. This drawing shows a slice through the glacier. Look how the material is carried.



3 Deposition

As you go down a mountain, it gets warmer. So eventually the front of the glacier reaches a place where it melts. Look at this photo.

As the ice melts, the load it is carrying falls to the ground – as rocks, stones, sand, and clay, all mixed up together. This mixture is called **glacial till**.

The water from the melting ice is called **meltwater**. It runs off, and will feed a river or lake.

Meanwhile, higher up the mountain, snow keeps on feeding the glacier. So the glacier keeps on flowing down to the place where it melts.

▲ *An Alpine glacier melting. The end of a glacier is called its* ***snout****. The meltwater looks milky, because it carries lots of tiny particles produced by abrasion.*

Glacial landforms

The result of all this work by glaciers is **glacial landforms**. (*Landforms* are features in the landscape.)

The UK has glacial landforms in the areas that were **glaciated** during the last ice age. You can see them in England, and Scotland, and Wales, and Northern Ireland. (Look at the white areas in map **A** on page 62.)

There are many good examples in **the Lake District** in England. So we will visit the Lake District often in the rest of this chapter.

Words to remember

glacial – to do with glaciers
That's a glacial landform!

glaciated – covered and shaped by glaciers, now or in the past
Most of Ireland was glaciated during the last ice age.

glaciation – the process or results of being covered by glaciers
We're studying glaciation this week.

Your turn

1 A glacier is like a great big bulldozer. Explain why.

2 a Start two lists, with headings **Processes** and **Features**. Then put each term below in the correct list.

glacial till	*striations*	*melting*
abrasion	*meltwater*	*plucking*

b Now do two or three drawings with the terms in italics as labels, to show that you understand what they mean.

3 Look at photo **A**. What does it show? Describe it as fully as you can. Use the correct terms from this unit.

4 Look at all the debris on top of the glacier, in photo **B**. How did it get there?

5 Now look at photo **C**.
a What is the liquid, and why does it look milky?
b Why is it appearing here?

6 Freeze-thaw weathering breaks up rock.
a See if you can write a set of bullet points to explain how it works. Add drawings if you like!
b It makes erosion easier, for the glacier. Why?

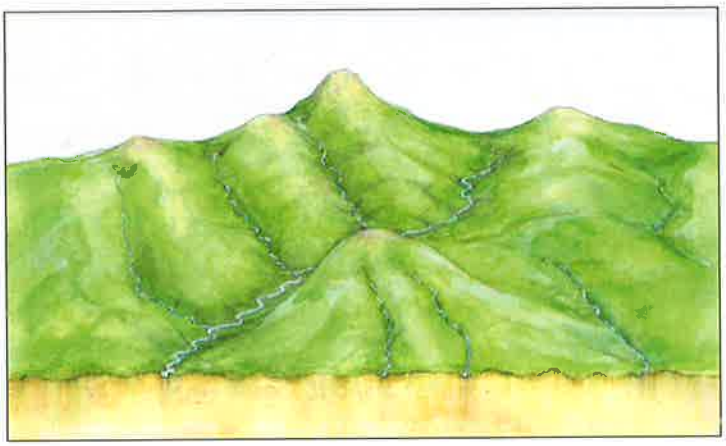
7 Now it's time to start your own **glossary** about glaciation. You'll need at least two pages. To make your glossary:
a list all the words you met about glaciation so far
b beside each word, write its definition.

4.4 Landforms shaped by erosion – part 1

Here you'll get an overview of the glacial landforms shaped by erosion – and a closer look at three of them.

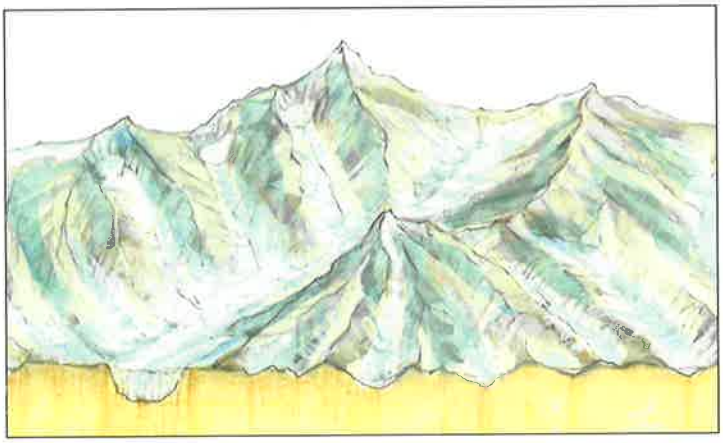
First, an overview

Let's compare a landscape before and after it had glaciers, to see how they changed it.

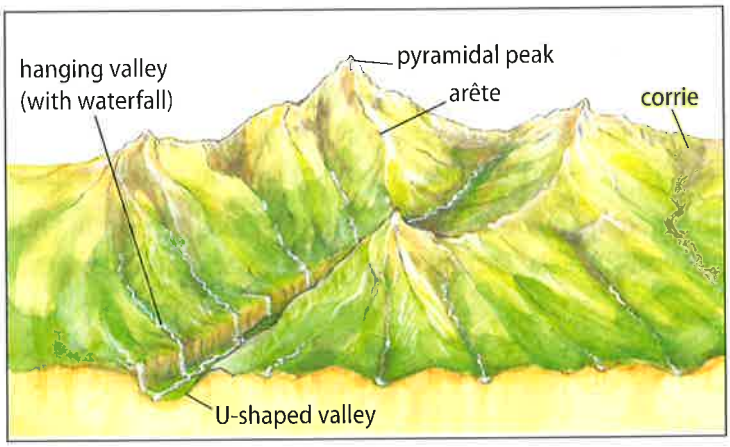


1 Look at this landscape. A mountain, rivers, and valleys carved out by the rivers. This area has a mild climate. It gets plenty of rain – but very little snow.

2 Then the climate changes. Heavy snow falls year after year. Lower down, most of it melts away again. But high in the mountain, it builds up. Mountain glaciers start to form.



3 Thousands of years later, the ice age has settled in. The glaciers have grown, and flowed down the valleys. They have joined to form a big glacier on lower land.



4 Now the ice age is over. The glaciers have melted. But they have left a changed landscape. Look at the features named here. They were all created by **erosion**.

A

▲ *A classic corrie in the Lake District. Its tarn is called Blea Water.*

B

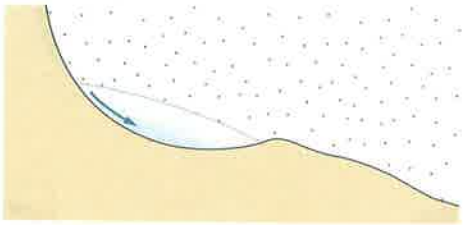
▶ *And another. That's Bleaberry Tarn. The long lake is Crummock Water.*

A closer look at corries, arêtes and pyramidal peaks

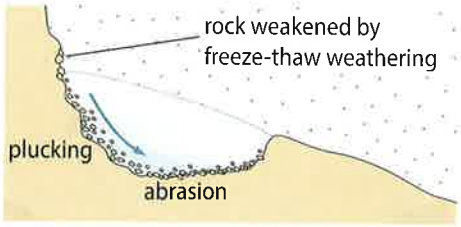
The last drawing on page 68 showed the three features below. Look back at it!

Corrie

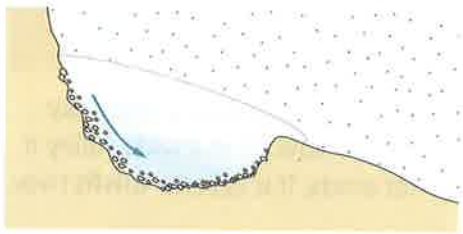
A **corrie** begins as a sheltered hollow, where snow builds up year after year.



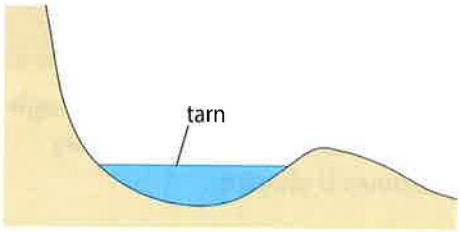
1 The snow compacts to ice. When the ice is thick enough, it starts to flow. Now it's a glacier! First it flows within the hollow.



2 Through plucking and abrasion, the hollow grows deeper, and the walls steeper. Freeze-thaw weathering helps.

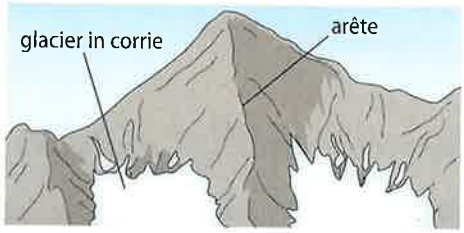


3 Eventually the glacier is big enough to flow over the edge of the corrie. It's off on its journey down the mountain.



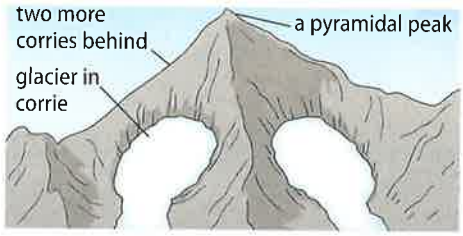
4 Later, when the glacier melts, the corrie is revealed. It may have a lake in it. These corrie lakes are often called **tarns**.

Arête



Sometimes two corries form side by side. The glaciers erode the rock between them, leaving a sharp ridge of rock. It is called an **arête**.

Pyramidal peak

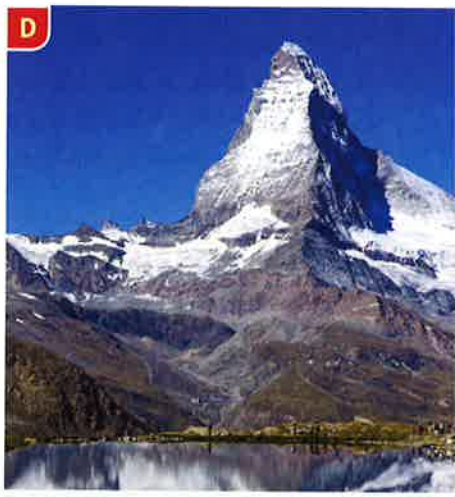


Imagine three or four corries around a mountain top. The glaciers erode their back walls, cutting into the mountain top. It becomes a **pyramidal peak**.

C

▲ *This famous arête in the Lake District is called Striding Edge. The lake on the left is called Red Tarn.*

D



▲ *A famous pyramidal peak: the Matterhorn, in the Alps. It has four faces. Look how steep and pointed it is. Over 500 climbers have died on it.*

Your turn

1 Study the drawings on page 68. Then decide whether this statement is true, or false. If it's false, write a correct one.
   - a Glaciers tend to flow down river valleys.
   - b A glacier has no effect on the shape of a river valley.
   - c Glaciers make a landscape smoother than it was before.

2 Now choose photo **A** or **B** on page 68.
   - a Draw a sketch of the scene, and add labels and notes.
   - b Draw a set of diagrams to show how the corrie formed.

3 Next, choose either photo **C** or **D**.
   - a Draw a sketch of it, and add labels and notes.
   - b Now draw a diagram to show how the landform (arête or pyramidal peak) formed.
   - c Imagine you are right there, in the photo you chose. Look around. What do you see? How do you feel? Is it an exciting place to be? Write the answer as a blog for your new geography website.

4.5 Landforms shaped by erosion – part 2

Here we look at two more glacial landforms, from the drawing on page 68.

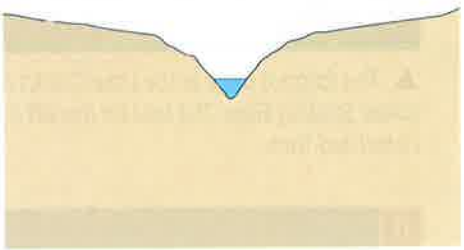
Did you know?
- The famous fjords of Norway are valleys carved out by glaciers.
- Then sea levels rose.

Two more landforms shaped by erosion

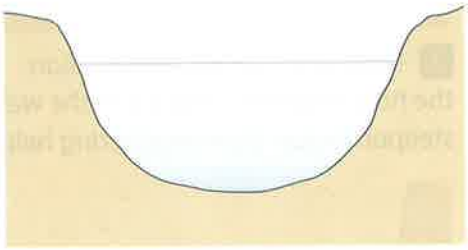
The last drawing on page 68 showed U-shaped valleys, and hanging valleys. Like the other landforms, these were shaped by erosion. Let's see how.

U-shaped valley

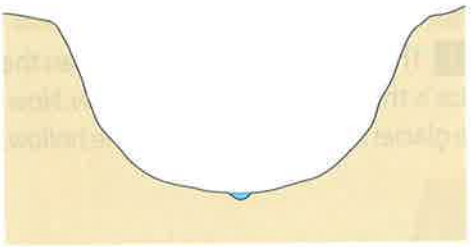
Glaciers take the easy route down a mountain. They follow old river valleys.



Up in the mountains, a river carves out a V-shaped valley. But when a glacier bulldozes its way down the valley …



… it widens and deepens it, through abrasion and plucking. The valley becomes U-shaped.



When the glacier melts, a river may flow again. Now it's in a wide valley it did not erode. It is called a **misfit** river.

Compare the two photos below. The first shows a V-shaped river valley. The second shows a U-shaped valley carved out by a glacier. A wide valley like this is a very big clue that a glacier has passed through. The Lake District has lots of U-shaped valleys.

A

▲ *A V-shaped valley in Wales, cut out by the River Twymyn.*

B

▶ *The U-shaped valley seen from Newlands Hause in the Lake District. The little misfit river to the right of the road is Keskadale Beck.*

C

◀ *Two ribbon lakes in the Lake District. The nearest is Buttermere.*

▼ *This is Scale Force, the highest waterfall in the Lake District. (Almost 52 metres.)*

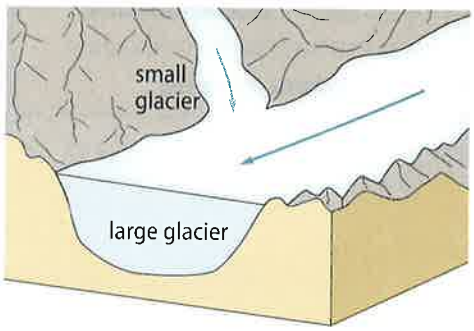
D

Now look at the photo above. It shows two *lakes* in a U-shaped valley. Long thin lakes like these are called **ribbon lakes**.

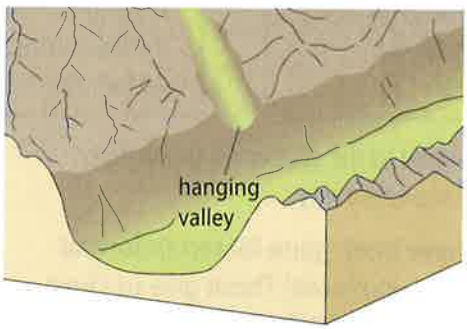
Imagine a glacier scraping along the valley. It reaches a place with softer rock, so it digs this out more deeply, making a trough. When the glacier melts, the trough fills up with water. That's how a ribbon lake begins.

Hanging valley

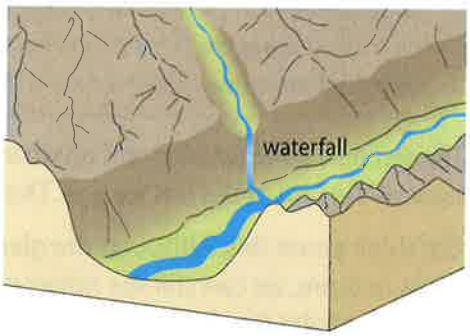
A **hanging valley** is a small valley that hangs above a larger one.



Imagine a large deep glacier moving along a valley. A smaller one joins it. The smaller one is much less deep.



Then, when the ice melts, it reveals the smaller valley hanging above the larger one.



If a river flows in the smaller valley, it will splash into the larger valley as a waterfall. (Look at photo **D** above.)

Your turn

1 Look at photo **B** on page 70.
   a How was this landform formed? Explain in 30 words (not copied from the page).
   b Now draw a sketch from the photo, and add notes and labels. Don't forget a note about the river and road.

2 Look at Scale Force in photo **D** above.
How was it formed? To answer this, do some drawings. Add notes to them, *in your own words*.

3 Look again at photo **D**. Imagine you were here 20 000 years ago. Would you have been able to stand where the man is standing? Explain your answer.

4 a What is a *ribbon lake*? Why do you think it is called that?
   b These drawings show how a ribbon lake forms. Make larger copies. Add labels and notes to explain what is going on.

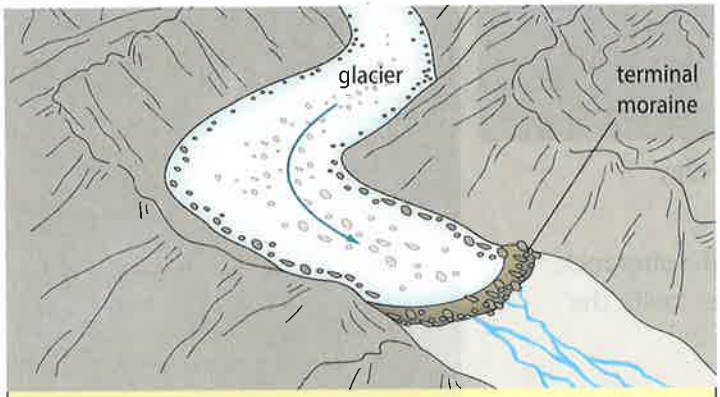
5 Now choose one photo from this unit. Imagine you are in that place. What can you see, hear, smell? How do you feel about that place? Tell all!

4.6 Landforms created by deposition

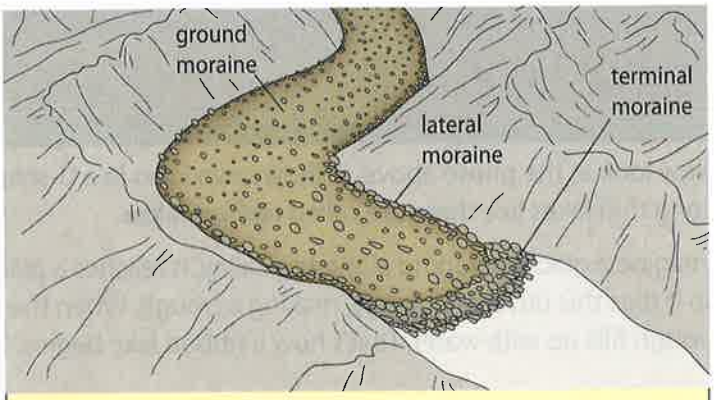
Here you will learn about landforms created when a glacier melts.

Moraines

As you go down a mountain, it gets warmer. So as a glacier flows down a mountain, it reaches a point where it will melt. But it may melt even at the top of the mountain if the climate warms up! Look at these diagrams.



1 A glacier flows non-stop, carrying its load of rocks, stones, sand, and clay. When the front reaches a place where it melts, everything falls to the ground as till. The deposited till is called **moraine**. It builds up into a ridge called a **terminal moraine**. (*Terminal* means *at the end*.)



2 But suppose the climate changes and the whole glacier melts. Material that was on top, along the edges, drops to the ground. It forms a ridge called a **lateral moraine**. (*Lateral* means *side*.) Material that was frozen into the base falls all over the valley floor, as **ground moraine**.

The second diagram above sums up what happened to the glaciers in the British Isles, at the end of the last ice age. They just melted away.

But think about this. Although the glaciers have been gone for ten thousand years or more, we can still see ridges of moraine in places! These give us clues about the routes the glaciers took, and where they got to. Look at photo **A** below.

▲ *A glacier stopped here! A terminal moraine at Borrowdale in the Lake District. Now it's covered in grass and ferns and bushes.*

▲ *Ground moraine is a thick layer of till deposited along the melted glacier's route. Today it may be gently rolling farmland.*

Erratics

A glacier can carry huge rocks. When it melts, the rocks are dropped.

They may be a long way from where they started – and very different from the other rocks around them. They look clearly out of place.

These stray rocks are called **erratics**.

▶ *An erratic in a field in Kentmere, in the Lake District.*

Drumlins

Drumlins are another sign that an area has been glaciated.

Drumlins are low hills, shaped like the back of a spoon.

Experts are not sure how they formed. But all agree that the smooth shape is due to a glacier flowing over deposited material.

▶ *Drumlins in the Yorkshire Dales – not far from the Lake District.*

Your turn

1 What is: **a** till? **b** moraine?
Answer *in your own words*!

2 Which type of moraine is found:
a along the edges of a glacier's route?
b all along the glacier's route?

3 Look at photo **A** on page 72.
a How did that ridge form?
b What would you expect to find, if you dug down into it?
c Why might the farmer feel this way about it?

4 Now look at photo **C**.
a How did this big boulder get here?
b An *error* is a mistake. Boulders like this one are called *erratics*. See if you can explain why.

5 Drumlins are shaped like the back of a spoon.
Look at this diagram.

Now look at photo **D** above. In which direction do you think that glacier travelled, thousands of years ago?
a from X to Y **b** from Y to X

6 Moraines, erratics and drumlins have something in common. They are the result of *tpoionesdi* by *csgleari*.
See if you can unjumble the two jumbled words.

7 And now … if you began your own glossary for glaciation (in question 7 on page 67), it's time to update it.

4.7 Glacial landforms on an OS map

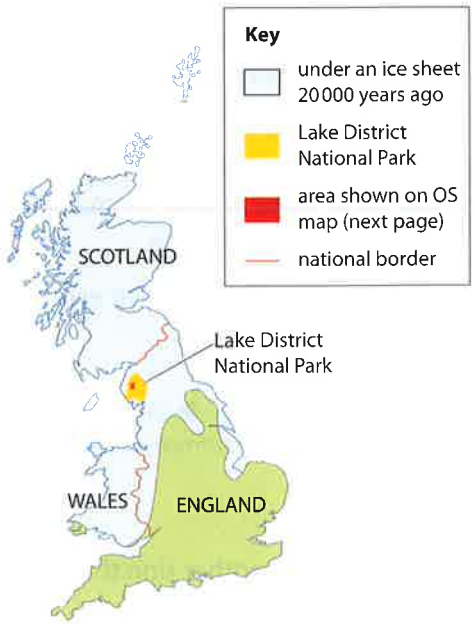
Here you'll explore an OS map for part of the Lake District, and look for signs of glaciation.

The Lake District

The OS map opposite shows part of the Lake District National Park.
20 000 years ago, during the last ice age, this area was under an ice sheet.

As temperatures fell …
- Glaciers formed on the highest land first, since it was coldest, with most snow.
- They flowed down the valleys to the low land, where they all fused together.
- The ice spread. And eventually, it became part of the ice sheet that covered much of northern Europe. (Look back at the map on page 63.)

Then Earth began to warm up, and the glaciers melted away.



Clues from the OS map

The contour lines on the map give lots of clues about the landforms the glaciers left behind. Look at the two examples below. Then try the 'Your turn' questions.

U-shaped valley

1 The sides of the valley are steep, so the contour lines are close together.

2 But the bottom of the valley is quite flat, so the contour lines are far apart.

3 There may be a ribbon lake in the valley – as here – or a misfit river.

Corrie

1 A corrie is rounded, so the contour lines are curved, a bit like a horseshoe.

2 Its sides are steep, so the contour lines are close together.

3 It may have a lake in it – which may be labelled 'tarn' on the map.

Your turn

1 U-shaped valleys are a sign that an area was once glaciated. Look back at the U-shaped valley in photo **B** on page 70. Then find it on the OS map. Where was the photographer standing? See if you can give a four-figure grid reference.

2 The map shows three lakes (and part of a fourth).
- **a** They are r_____ lakes. Complete the word. (Page 71?)
- **b** Which is deeper, Crummock Water or Buttermere? What is your evidence? (Blue lines?)
- **c** About how long is Crummock Water, in km? (Scale!)

3 Now look back at photo **C** on page 71. The photographer was standing in one of these squares. Which one?
a 1714 **b** 1913 **c** 1914 **d** 1813

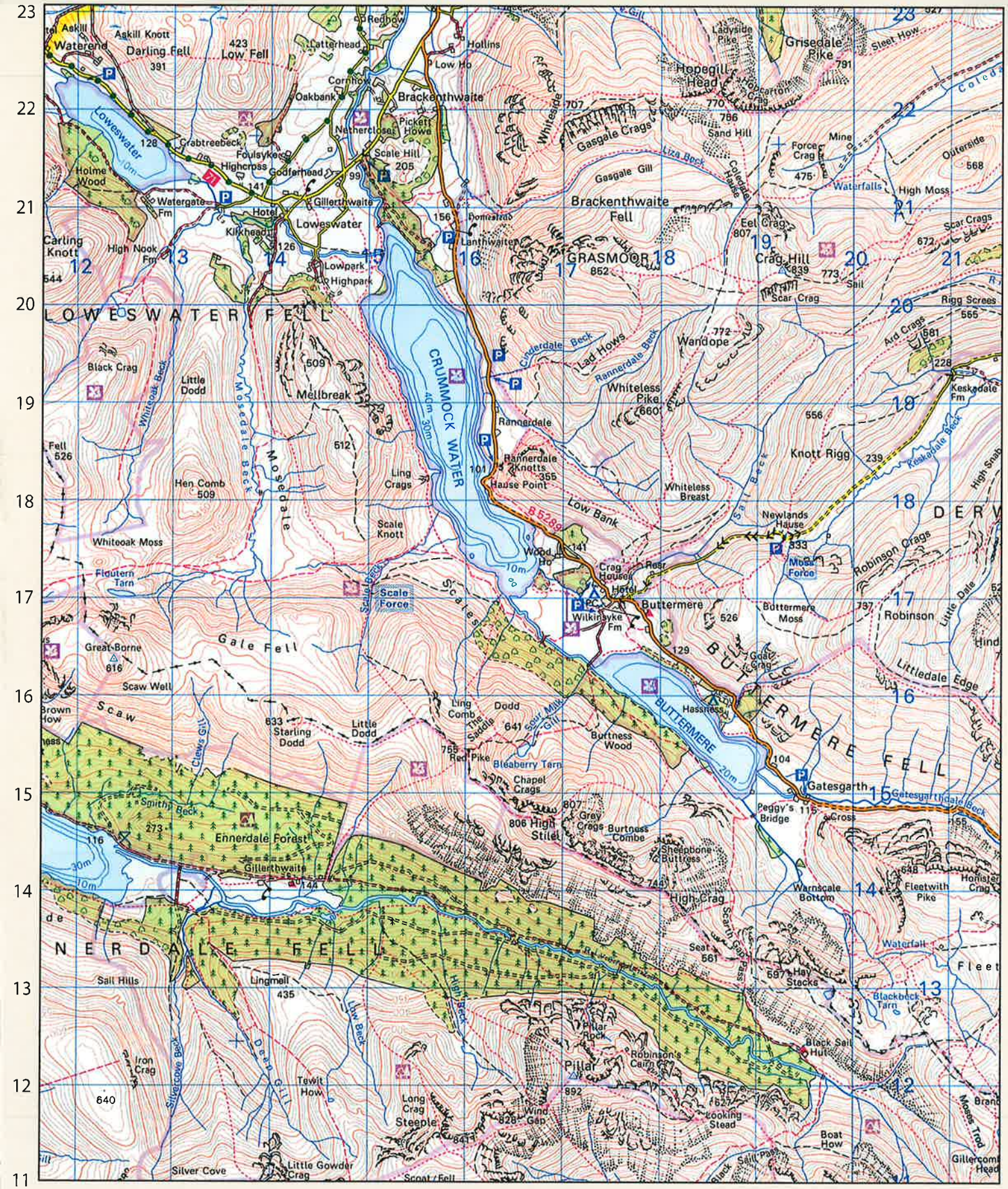
4 Keskadale Beck appears in photo **B** on page 70.
- **a** What do you think a *beck* is?
- **b** Find Keskadale Beck on the OS map again. How can you tell that it is a *misfit*, from the map?
- **c** See if you can find another beck on the map, that looks like a misfit.

5 There is a tarn in square 1615.
- **a i** Find it on the map. What is its name?
- **ii** What kind of landform is it sitting in?
- **b** There is a photo of this tarn on page 68.
- **i** See if you can work out where the photographer was standing. Give a four-figure grid reference.
- **ii** In which direction was the photographer facing?

6 In the Lake District, a waterfall is often called a *force*. Photo **D** on page 71 shows a waterfall in the OS map area. Find it on the map, and give a four-figure grid reference for it.

7 There are many *crags* on the map. (Glossary.)
- **a** Give a grid reference for a square with crags in.
- **b** Are crags formed by erosion, or by deposition? Decide, and give your reasons.

8 Now see how well you can describe the area shown on the map. Is it hilly? Crowded? What about rivers, forests, villages? What do some people do for a living? Give your answer as bullet points, or as a spider map.


LOWESWATER FELL
CRUMMOCK WATER
BUTTERMERE
BUTTERMERE FELL
ENNERDALE FELL
Scale 1: 50 000
0 0.5 1 km

4.8 Glaciers and us

Do glaciers matter? You can think about it here!

Do they affect us?

Today, most of us live far away from glaciers. But do they affect us? And do they matter? Read on …

1 Bringing in the tourists

We no longer have glaciers in the UK. But they left some stunning scenery behind – and it attracts tourists. Around 16 million people visit the Lake District a year, and spend almost £1 billion. That's Lake Windermere in the photo.

2 Presenting a challenge

Many people dream of climbing Mount Everest, in the Himalayas. It is Earth's highest mountain. It sits on the border between Nepal and China. (And it's a pyramidal peak.)

The photo shows the Khumbu Icefall – like a waterfall, but it's a glacier. It is the most dangerous part of the climb.

If you want to climb Everest, or other high mountains, be prepared for glaciers. Don't forget your ice axe!

3 Supporting life

People depend on glaciers for survival, in some places – and especially in Pakistan.

The great River Indus runs down through Pakistan. Up to half its water is meltwater from glaciers in the Himalayas. Farmers use the river water for their crops.

Several other major rivers are partly fed by glaciers. For example the Ganges in India, and the Yangtze in China. Many millions of people depend on these rivers for water.

4 In need of protection

Antarctica has 90% of Earth's ice. The land below the ice sheet may be rich in mineral resources. People might like to mine it.

Nobody owns Antarctica. But seven countries claim slices of it: the UK, France, Norway, New Zealand, Australia, Chile, and Argentina. Other countries may want to make a claim.

One day, these claims may cause conflict. But for now, mining is banned by the **Antarctic Treaty**. It protects Antarctica as a place of peace and scientific research.

5 Melting!

Glaciers are just ice. So if Earth warms up, they melt. And today, Earth is getting warmer.

Scientists are watching the ice sheets closely. They appear to be melting already: their ice is getting thinner.

The trouble is, the more they melt, the higher the water level in the ocean will rise. Many coastal places may flood, affecting many millions of people.

Mountain glaciers are shrinking too. Look at the photo on the left.

Earth has warmed up often before. This time, most scientists agree that we humans are the main cause. Mainly because of all the fossil fuel (coal, oil, and gas) that we burn. You'll find out more about this later in your course.

Your turn

1 *Glaciers help some people to earn a living.*
See how many examples you can give, of people who depend on glaciers for a living. (Not only the farmers in box 3!)

2 *Glaciers help people to enjoy life.*
See how many examples you can give this time.

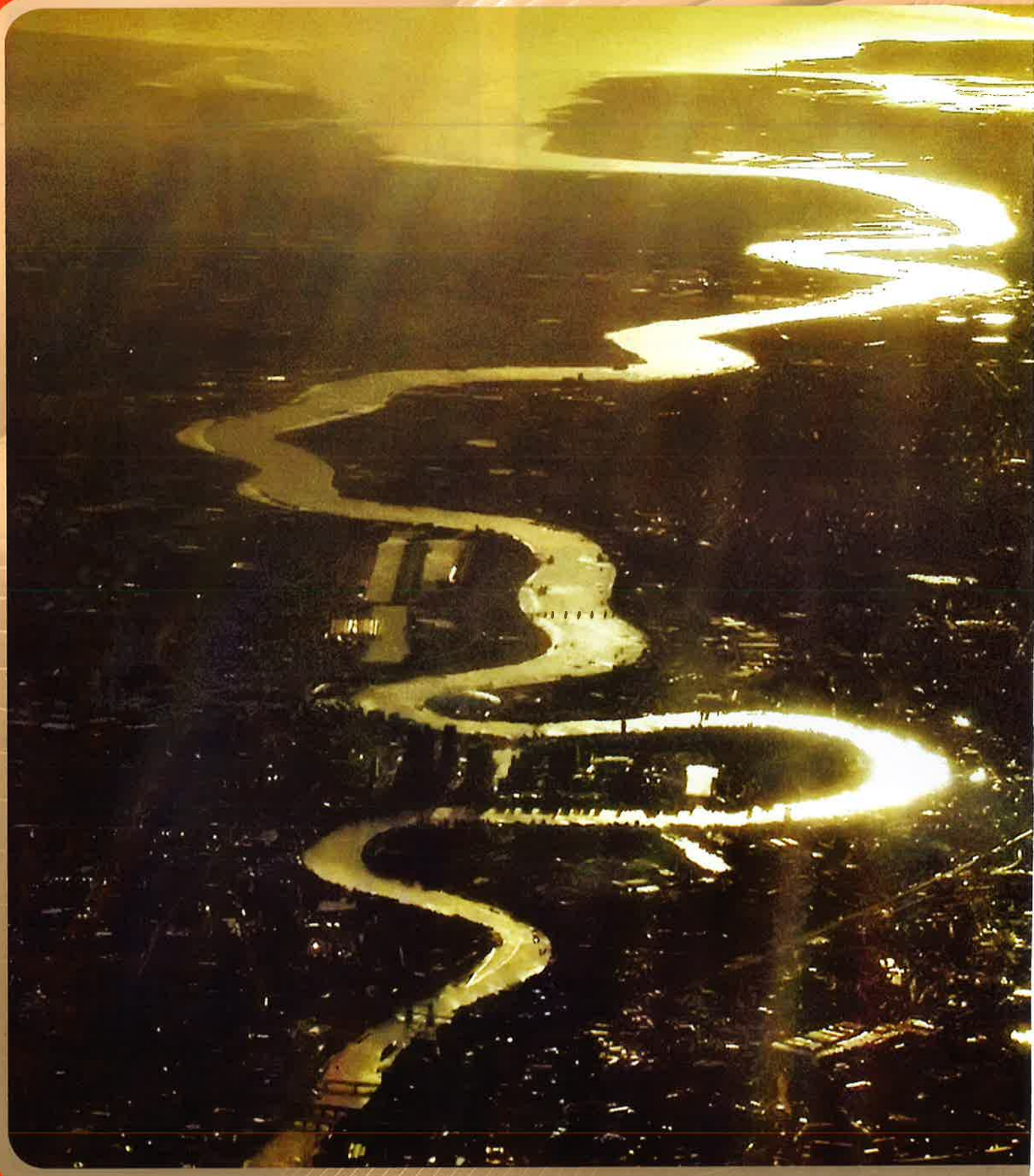
3 Mount Everest is in the Himalayas, in Asia. If the Himalayan glaciers melted away, how might it affect:
a children in Pakistan? b climbers tackling Everest?

4 Seven countries claim slices of Antarctica (including the UK and France). Why would anyone want to own land that lies under an ice sheet? Think of as many reasons as you can.

5 Look at the photo with the sign.
a The glacier would have looked different in the year 2000. In what way?
b The change is explained below, with some words missing. Write it out, with suitable words filled in.
It is getting ____ in this region. So ____ snow falls.
That means there is ____ snow to feed the ____.
So the glacier has _____.

6 See if you can explain these two statements.
a *People all over the world pose a threat to the ice sheets.*
b *The ice sheets pose a threat to people all over the world.*

5 Rivers



The big picture

This chapter is all about rivers, with the River Thames as our example. Here's the big picture …

- A river is water flowing to the ocean, or sea, or lake, or to another river.
- As it flows, it shapes the land – by picking up stones and soil in one place, and dropping them in another.
- We use rivers in many different ways, as they go on their journey.
- When a river overflows its banks, we get floods.
- The River Thames is the longest river in England.

Did you know?
- There are millions of rivers on Earth.
- There are about 5000 in the UK. (Some are very small.)

What if...
- …our planet had no rivers?

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- What is the water cycle?
- How does the rainfall from the water cycle feed a river?
- Explain what each of these river terms means. (Draw sketches?)
  source *mouth* *tributary* *confluence* *river basin*
  watershed *floodplain* *river bed* *river banks*
- How do rivers shape the land? Use the terms *erode*, *transport*, and *deposit* in your answer.
- How do these get formed?
  V-shaped valley *waterfall* *gorge* *meander* *oxbow lake*
- In what kinds of ways do we use rivers? (At least five.)
- What causes floods? And which factors make flooding more likely? (See if you can give at least three.)
- Where does the River Thames rise, and which sea does it flow into?
- Name some settlements (cities, towns, villages) on the River Thames. (At least six!)

Did you know?
- The Nile in Africa is the world's longest river.
- It is 6853 km long.

What if...
- …you owned a river?

Why...
- … do rivers keep on flowing?

Why...
- … do we like rivers so much?

And then …

When you finish the chapter, come back to this page, and see if you've met your goals!

Your chapter starter

You are flying over a city at dawn. You look out the window. Page 78 shows the view.

What is that winding ribbon?

Look closely. Do you recognise anything on it?

Which city could this be?

What's the wide bright area at the top of the picture?

5.1 Meet the River Thames

Here you'll learn about England's longest river, and its journey from source to sea.

Did you know?
- The River Severn is the longest river in the UK.

Why...
- ... do we give rivers names?

It starts as a puddle!

Look at these photos of the River Thames.

This is the start or **source** of the river: a spring seeping up in a field in the Cotswolds. (Look at the map on the next page.) The site is called Thames Head.

Here is the Thames 20 km later, near Cricklade. It is just a stream, wandering through meadows. But it is on a mission. It is heading for the North Sea, over 300 km away.

This is it 20 km further on, at Lechlade, on the edge of the Cotswolds. The stream is now a river. It is deep enough for boats and barges.

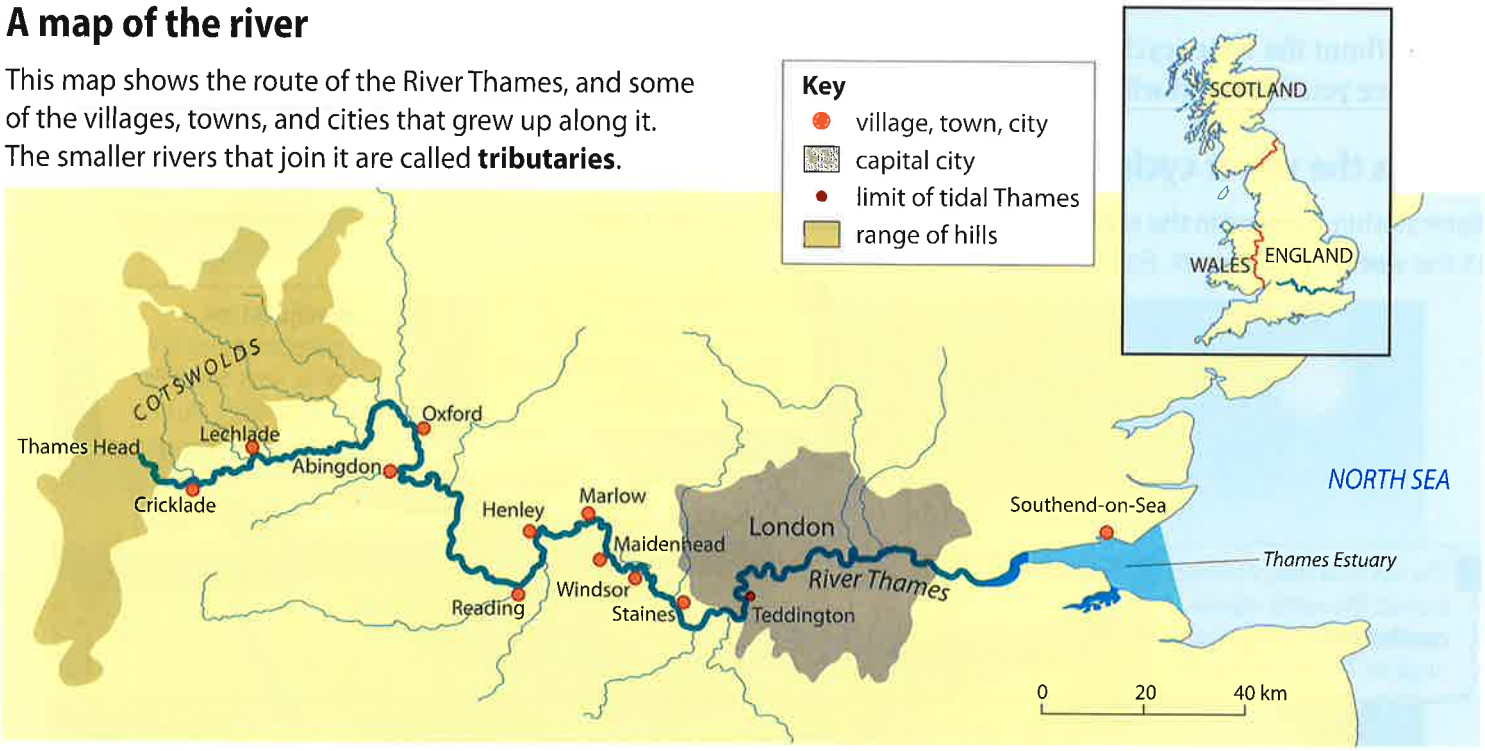
This is Henley, half way on the river's journey. Between the source and here, fifteen smaller rivers join the Thames. No wonder it has got bigger.

And here it is in London! The Thames flows through the city. That bridge is the Millennium bridge, and the building with the white dome is St Paul's Cathedral.

The journey's end. Over 50 km from the centre of London, and 346 km from its source, the Thames flows from its wide **mouth** – the Thames Estuary – into the North Sea.

A map of the river

This map shows the route of the River Thames, and some of the villages, towns, and cities that grew up along it. The smaller rivers that join it are called **tributaries**.



The tidal Thames

The photo on the right shows the Thames in London. Find a similar photo on page 80. What do you notice?

Both show the same scene. But the water level is different. That's because the Thames is **tidal**, from Teddington – marked by a red dot on the map above – to the sea.

As the tide rises in the North Sea, sea water moves up the Thames Estuary and through London. The water level in the river rises. As the tide falls, water drains away again.

The water level on the tidal Thames changes non-stop, from high to low tide and back. There are two high tides and two low tides each day.

▲ *Low tide in London. Some river bed is showing. 6 hours from now, the water level will be several metres higher, like on page 80.*

Your turn

1 See if you can give six facts about the River Thames. Include facts about its length, and location in the UK.

2 Now draw a sketch map of the Thames. You do not need to show its tributaries. But mark in and label:
- the Cotswolds, the range of hills where it rises
- at least six settlements (cities, towns, villages) along it
- the Thames Estuary, and the North Sea
- the tidal stretch of the river. (Use a different colour?)

3 What exactly is the Thames Estuary?

4 See if you can explain these facts.
- a The Thames has much more water in it by the time it reaches London, than it had at Lechlade.
- b The water in the Thames in London is a bit salty.
- c The Thames pours over 60 million cubic metres of water into the North Sea per day – and still does not run dry.

5 Do rivers really matter to us? Decide, and give your reasons!

5.2 It's the water cycle at work

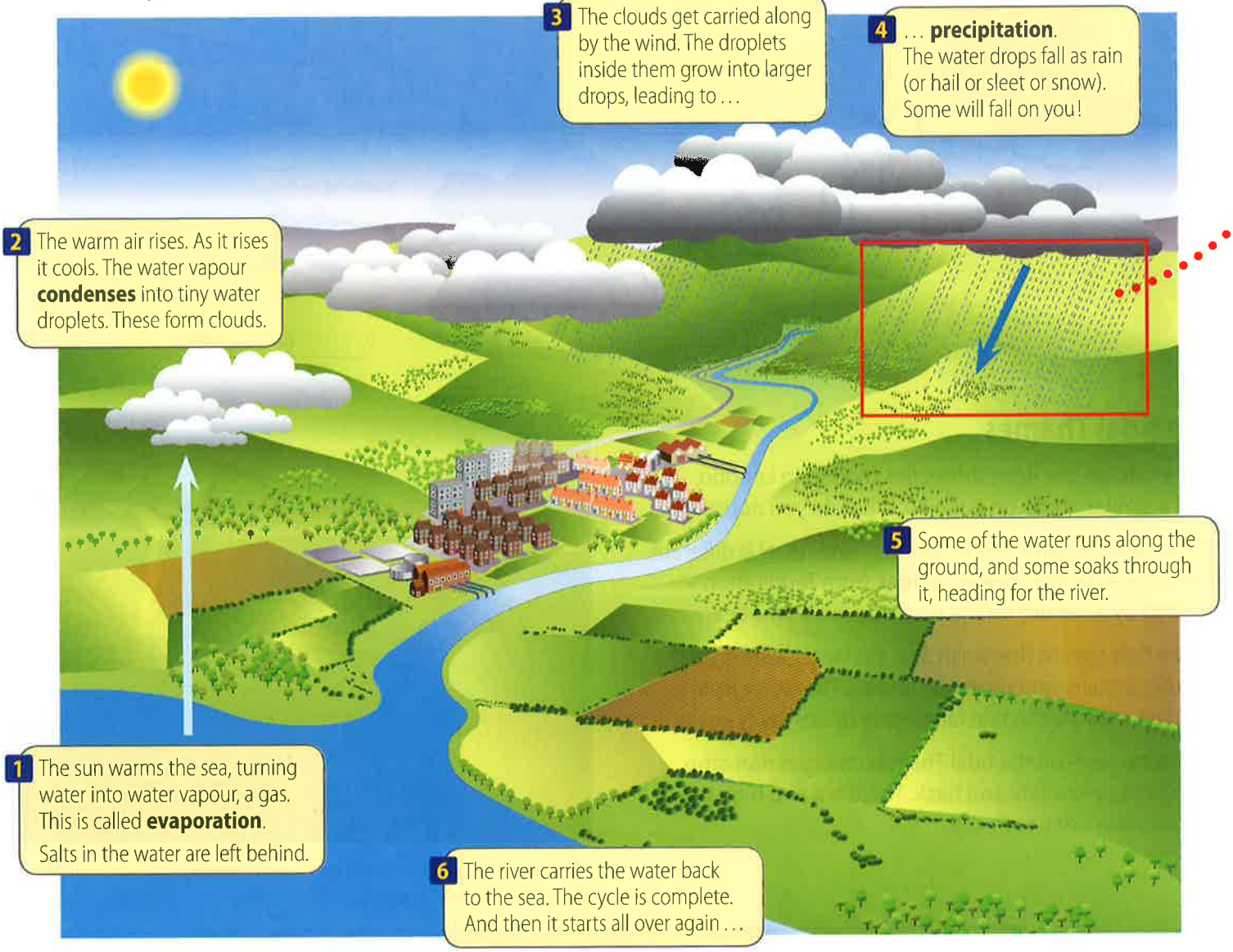
Without the water cycle there'd be no rivers – and no you. Here you'll find out why.

Did you know?

- The rain that falls on you has fallen millions of times before.
- It may have fallen on a dinosaur.

What is the water cycle?

Water sloshing around in the sea this week may rain down on you next week. It's the **water cycle** at work. Follow the numbers …



We'd die without the water cycle

We depend on the water cycle. Our bodies need water. There is plenty in the sea. But we can't drink it, because it's too salty.

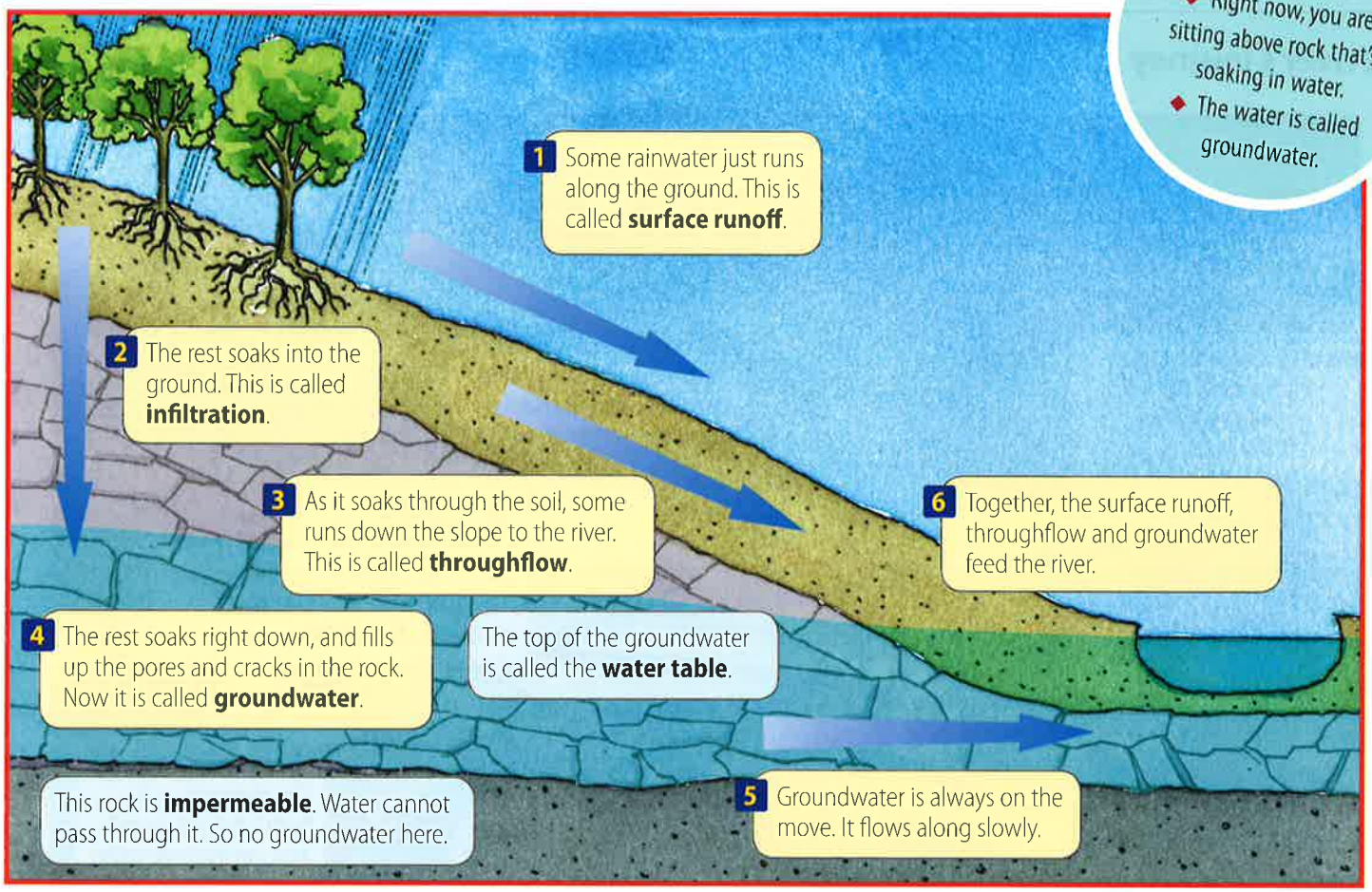
The water cycle turns salty water into **fresh water**, which we can drink. It scatters it over a large area, as rain. The rain feeds rivers, and underground stores of water. And we take our water from these.

Crops need fresh water too. The rain provides it. No rain, no crops. No crops, no food! So without the water cycle, we could not survive.

▲ *Borrowing from the water cycle.*

How rainwater reaches the river

Rain makes rivers! Follow the numbers to see how:

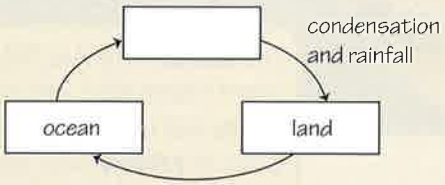


Did you know?

- Right now, you are sitting above rock that's soaking in water.
- The water is called groundwater.

Your turn

1 a Make a larger copy of this flow-chart for the water cycle.

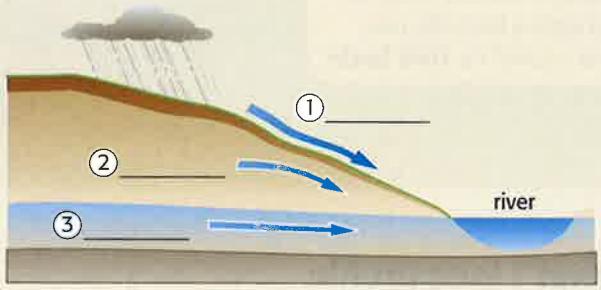


b Then add these labels in the correct places:
rainwater feeds rivers *evaporation* *atmosphere*

2 **A – G** below are definitions.
a You have to find the matching words in this unit!
b Then write out the words and their definitions.

A this water is held in rock, underground
B the name for water in gas form
C when water soaks down through the ground (*i*....)
D a longer name for rainfall
E the process that turns water into a gas (*e*....)
F the process that turns water gas into water
G does not let water pass through

3



Copy this diagram, to show how rainwater reaches a river. Add the missing labels, and a title.

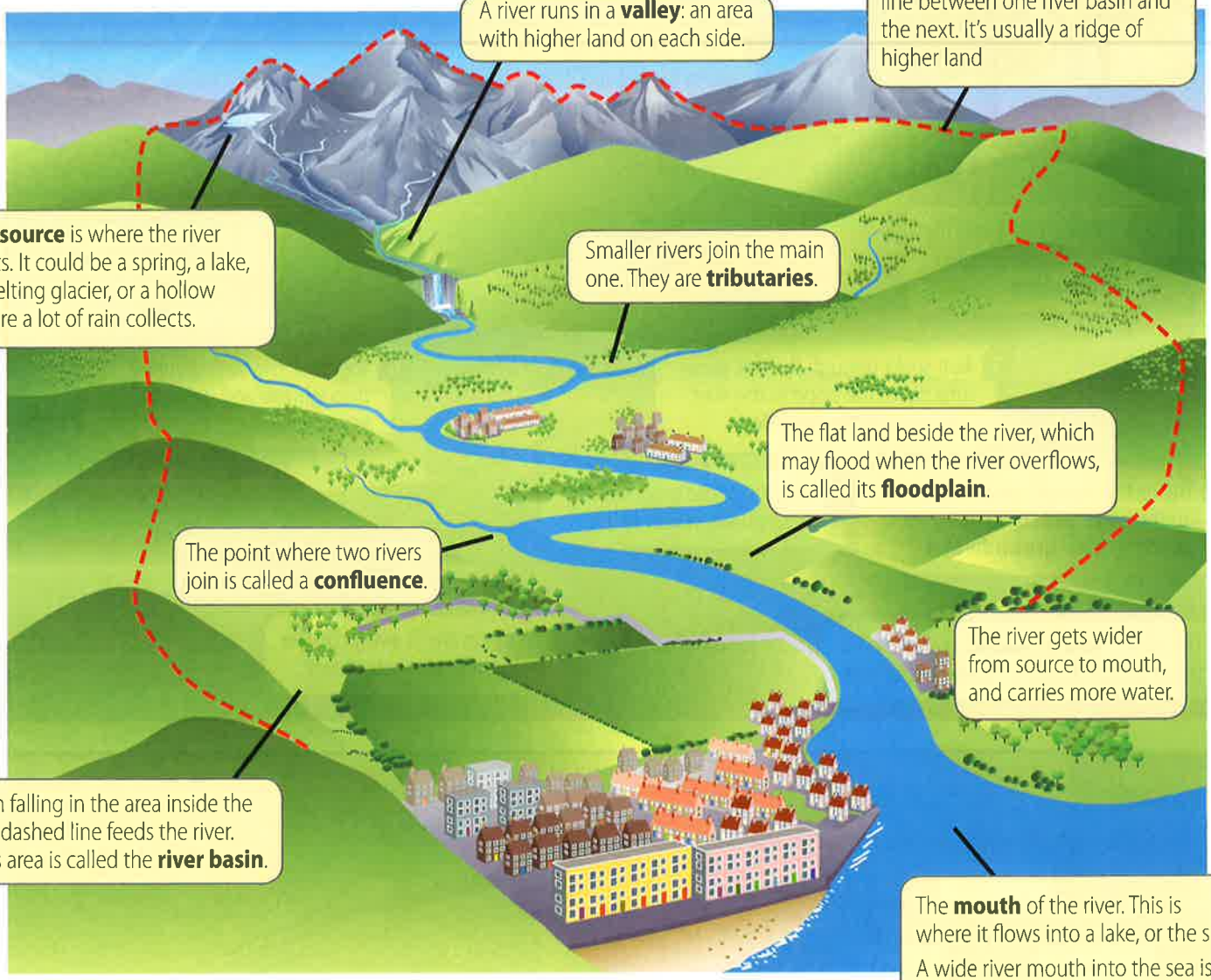
4 See if you can explain why:
a rain does not sink right down to the centre of Earth
b the water level in a river falls, if there's no rain for months
c a river can fill up very fast in very wet weather

5 Suddenly the water cycle stops working. No more evaporation from the ocean! No more rain! And now, two months later, you have to write a news report about how the UK is coping with this big change. Not more than 250 words.

5.3 A closer look at a river

Here you'll learn more about the course of a river – and take another look at the River Thames.

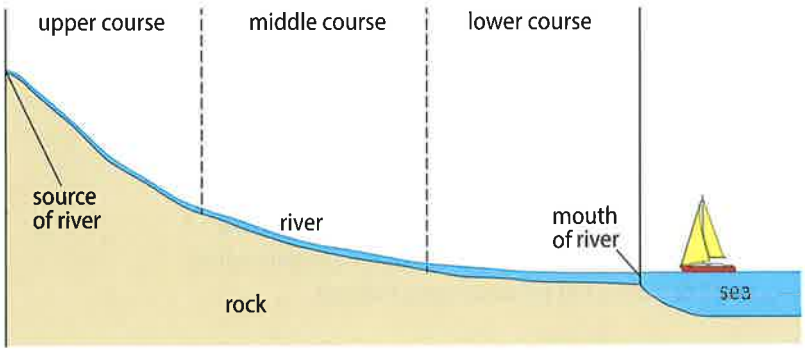
The river's journey



The river's long profile

A river flows downhill from source to mouth. This drawing shows its **long profile** – a side view, showing how the slope changes.

- The long profile curves down like a saucer.
- You can divide the river into three parts:
  - the upper course, where the slope is steepest
  - the middle course, where it is less steep
  - the lower course, where it flattens out.
- This river finally reaches **sea level**.

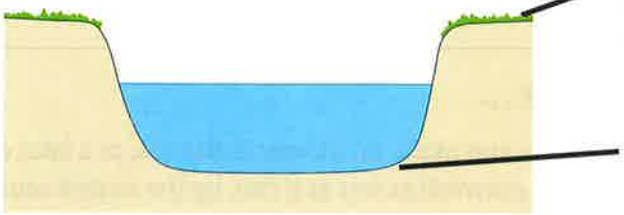


The river's channel

A river carves out a **channel** for itself.

This diagram shows the channel in **cross-section** (as if you'd sliced across it).

Its shape changes along the river, as you'll see later. In the upper course it is shaped like a V.



Your turn

1 Terms **A** – **F** are about rivers. But they are jumbled up!

A crouse	**B** tmuoh	**C** lavely
D tsyaeru	**E** ooldfianlp	**F** thareesdw

a First, see if you can unjumble each term.
b Then explain what it means.

2 The map above shows the River Thames and its basin. Some of the tributaries are named.
a Give the names of three tributaries of the River Thames.
b Which tributary joins the Thames at Oxford?
c Which one is shown in the photo on page 32?
d Name the place at the confluence of the Thames and:
i the Ock ii the Kennet

3 Rain that falls at Luton ends up in the Thames – which is at least 40 km away. See if you can explain how this happens.

4 Will rain falling at Milton Keynes reach the Thames? Explain.

5 The first box below gives places on the Thames's journey.

Thames Estuary	*Windsor*
Lechlade	*Reading*
Oxford	*Staines*
Thames Head (source)	

	12 m
110 m	
	66 m
0 m	
	29 m
45 m	
	73 m

a First, list the places in order, from the start of the journey.
b Then beside each place, write its height above sea level, in metres. Use the heights in the second box.

6 Now, see if you can explain why …
a a river grows wider and deeper as it nears the sea
b the biggest settlement (town, city) along a river is often close to its mouth.

5.4 A river at work

A river changes the land it flows over. How does it do that? Find out here.

▲ *Down the slope, by the easiest route.*

Off down the slope ...

A river flows non-stop, day and night, on its way to the sea, or a lake, or to join another river. It flows downhill as fast as it can, by the easiest route.

As it flows, the river changes the land it flows over. It wears it away in some places by lifting material from it. It carries the material along. And then it drops it somewhere else. Let's look at those processes now.

The three river processes

1 Erosion

Erosion means *wearing away*. The river **erodes** the land it flows over. Look how it happens:

The water dissolves soluble minerals from the bed and banks. That helps to break them up. It is called **solution**.

Rocks and stones and sand in the water act like sandpaper. They scrape the river bed and banks and wear them away. This is called **abrasion**.

In a fast-flowing river, water is forced into cracks in the bank. Over time this breaks the bank up. It is called **hydraulic action**.

The rocks and stones wear each other away too. They bang together and knock bits off each other. This is called **attrition**.

2 Transport

Next, the river carries away the eroded material. This process is called **transport**. The material is called the river's **load**. Look how it is moved:

Dissolved material is carried along as a **solution**. You cannot see it.

Small light particles of rock and soil are carried along as a **suspension**. They make the water look cloudy or muddy.

The heavier material is carried along the bottom. It is called the **bedload**. The larger stones and rocks roll along. Sand and small stones bounce along.

3 Deposition

Then, as the river reaches flatter land, it loses energy. As it loses energy, it drops or **deposits** its load. The deposited material is called **sediment**.

The biggest, heaviest, stones and pebbles are deposited first. Then smaller ones. And last, the smallest particles.

But dissolved material stays in the water. It will end up in the lake or sea.

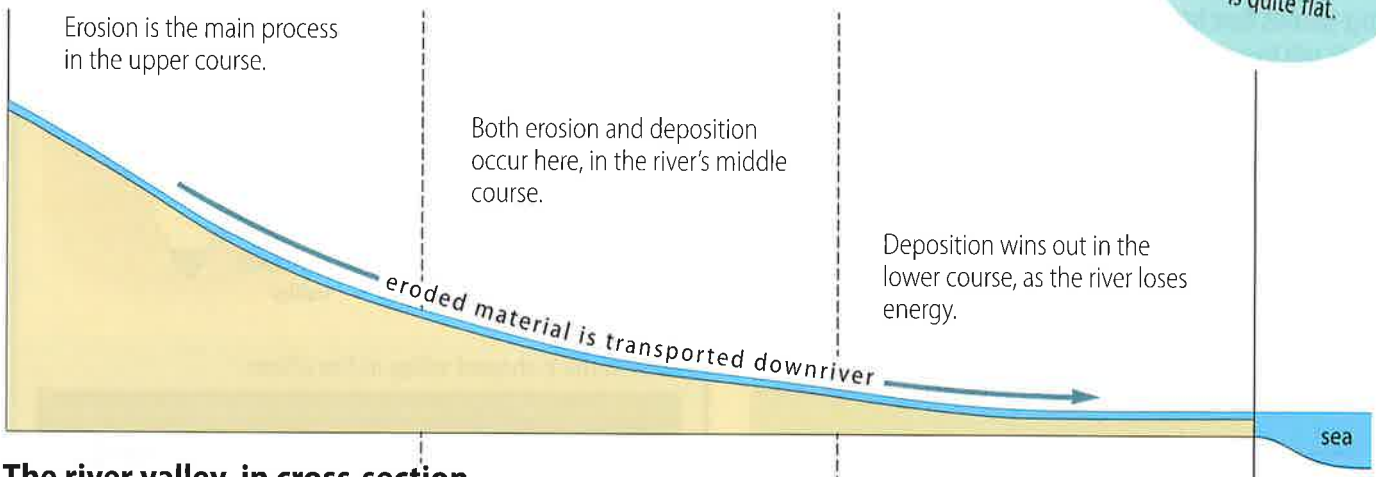
What happens where?

This diagram shows how the balance between the processes changes, as you go down the river. Look how the shape of the valley and channel change too.

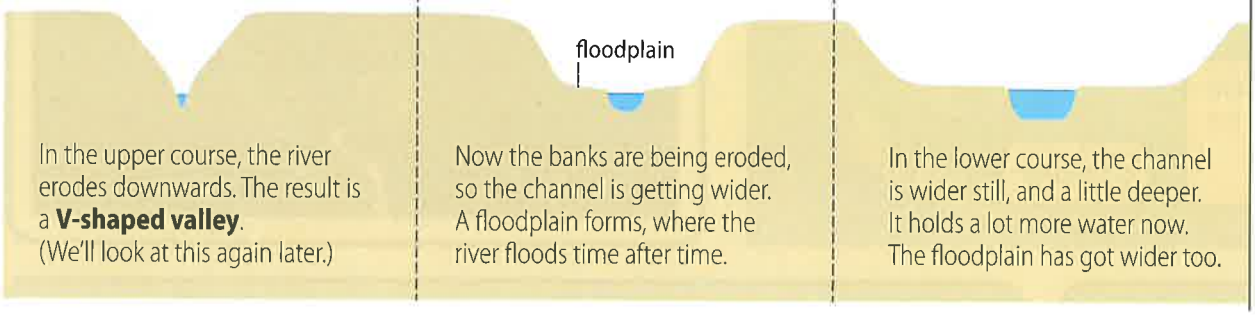
Did you know?

- The Thames rises only 110 m above sea level ...
- ... so its long profile is quite flat.

The river's long profile



The river valley, in cross-section



Your turn

1 **A**

material is carried away
material is worn away
material is dropped

B

erosion
deposition
transport

a List **A** shows the processes that go on in a river. Write them in the correct order.
b Beside each, write the correct term from **B**.

2 Now look at photo **A** on page 86.
a Which is the main process going on here? Explain why you think so.
b What part is being played in this process by:
i the water itself? ii the stones in the river?
Use the correct technical terms in your answers.

3 a Look at photo **B**. What's going on at **X**?
b Do you think the river is flowing quickly, or slowly, at **X**? Explain why you think so.
c Could **X** be in the river's upper course? Explain.

4 You are dying of thirst. Which river would you rather drink from: the one in photo **A**, or the one in photo **B**? Explain.

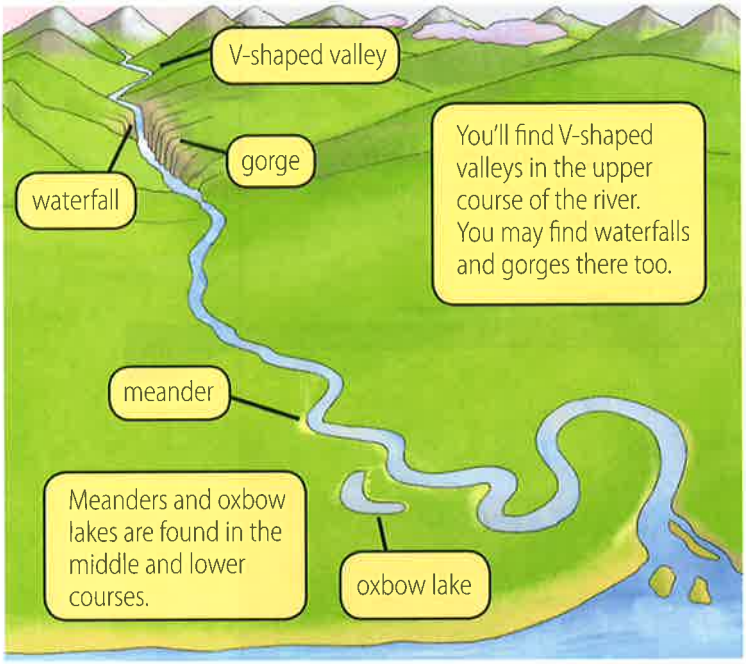
5 Make a copy of the drawing above, showing the long profile and cross-section. Add ONLY these labels, in the right places:
the river's long profile *cross-section through the river valley* *mainly erosion* *upper course* *mainly deposition* *both erosion and deposition* *lower course* *middle course* *river channel* *floodplain* *V-shaped valley*
Then give your drawing a title.

5.5 Five landforms created by the river

Find out about five of the landforms a river may create on its journey.

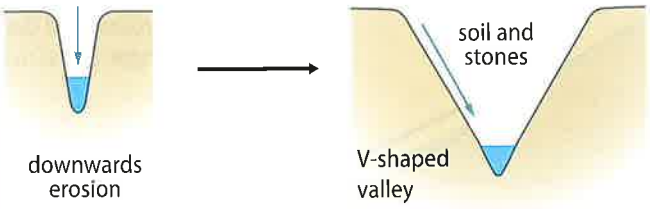
The five landforms

This drawing shows five landforms created by rivers. The boxes will tell how they formed.



A V-shaped valley

In its upper course, a river erodes sharply downwards, cutting like a knife. This gives a steep valley. Rain washes soil and stones from the sides. So over time, the valley becomes V-shaped.



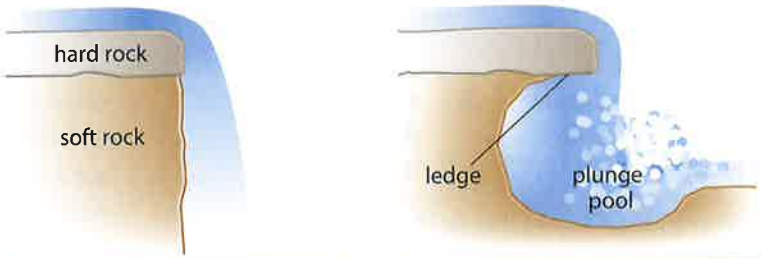
Look at the V-shaped valley in this photo.

A waterfall

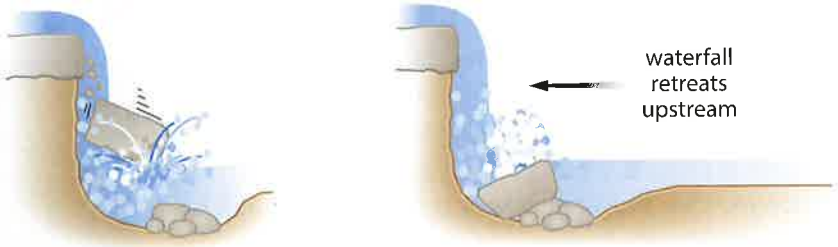
A waterfall is where water tumbles over a ledge of hard rock.

The waterfall forms because there is softer rock below the hard rock, and it is easier to erode.

From a waterfall to a gorge



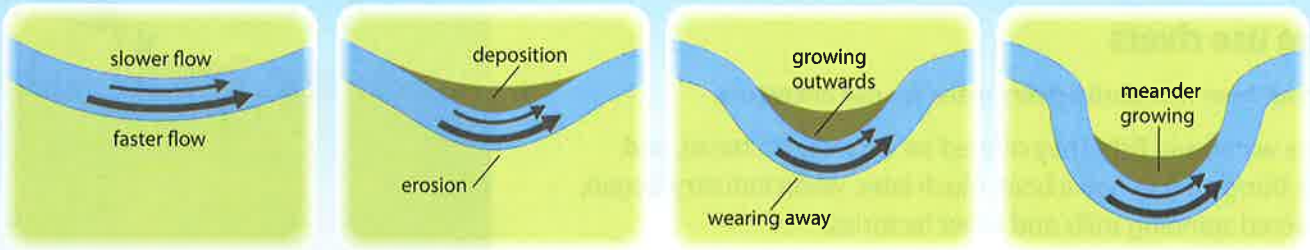
1. The hard rock erodes very slowly. The soft rock below it erodes much faster.
2. Erosion of the soft rock leaves a ledge of hard rock and a hollow called a **plunge pool**.



3. In time, the ledge falls into the plunge pool. The debris from it helps to speed up erosion.
4. Steps 1–3 are repeated. The waterfall gradually retreats upstream, carving out a **gorge**.

A meander

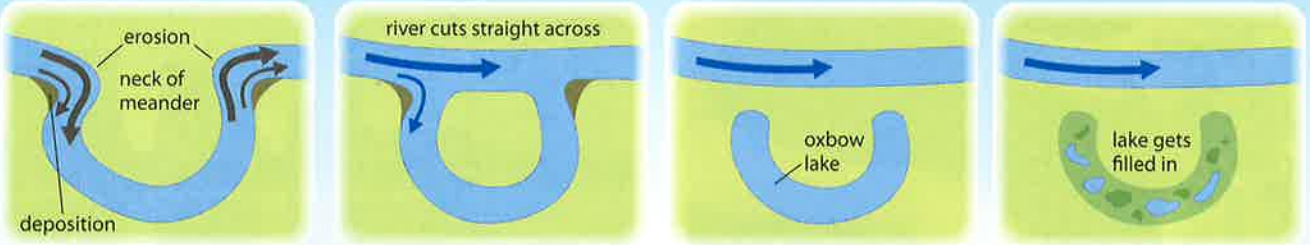
A **meander** is a big bend in a river. It starts as a slight bend. Look how it develops:



1. Water flows faster on the outer curve of the bend, and slower on the inner curve.
2. So the outer bank gets eroded, but material is deposited at the inner bank.
3. As the outer bank gets worn away, and the inner one grows, a meander forms.
4. Over time, as the process continues, the meander grows more 'loopy'.

An oxbow lake

An **oxbow lake** is a narrow U-shaped lake near a river. It's a meander that got cut off.



1. As erosion continues, the neck of the meander is worn away. It gets narrower and narrower.
2. Then, during flooding, the river takes a shortcut – straight across the neck.
3. Soon the loop of the meander gets sealed off. It turns into an oxbow lake.
4. In time the lake will get covered with weeds, and fill with soil, and disappear.

Your turn

1 Make a table like this, and complete it for the five landforms named in first drawing on page 88.

Landform	Created by ...
V-shaped valley	erosion

2 V-shaped valleys are found in the upper courses of rivers. Draw a diagram to show how they form. Label it.

3 Look at this river, flowing over layers of rock. Draw diagrams to show how a waterfall develops.

4 Most rivers have meanders.
- a What is a meander?
- b Explain how a meander forms. (Use diagrams?)

5 Look at the photo above.
- a What is happening: i at **A**? ii at **B**?
- b Draw and label a sketch to show how this part of the river might look 150 years from now, after many floods.

5.6 Rivers and us

Find out how we make use of rivers, with the River Thames as example.

How we use rivers

Think about how wonderful rivers were, for our ancestors.

They gave water, and fish. They offered an easy way to travel, and transport things, if you had a boat. Much later, when industry began, they powered spinning mills and other factories.

So it's not surprising that we chose to live beside rivers. Over 70 **settlements** – villages, towns, and cities – have grown up along the Thames. (And more along its tributaries.)

And we still depend a lot on rivers, just like our ancestors.

▲ *Windsor Castle, by the Thames. It's one of the royal homes. Henry VIII is buried in the chapel.*

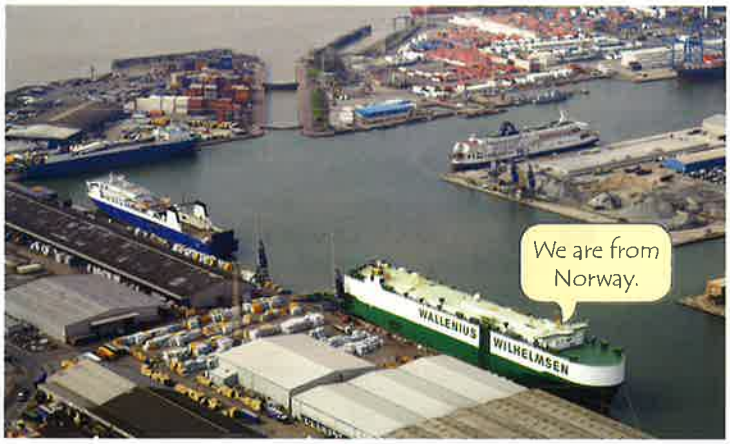
Making use of the River Thames

As a water supply. That's the main use. Water is taken from the Thames, cleaned up, and piped to millions of homes. Then the used water is cleaned up and put back in the river. (See page 92.)

In producing electricity. That's the second biggest use. In power stations, steam drives turbines. River water is then used to cool the tanks of steam. This power station is beside the Thames at Didcot, not far from Oxford.

In factories. Factories use river water for washing materials, and cooling equipment. This is the Ford factory on the bank of the Thames at Dagenham, east of London. It takes water from the river.

In farming. For much of its journey, the Thames passes through rural areas, and farmland. Some farmers use river water to spray their crops in dry weather, and as drinking water for their herds.



For transporting cargo. Roman ships once sailed right up the Thames into London, bringing goods from Italy. Today, ships dock at the Port of London, east of the city. (They are too large to go further.)

For transporting people. In London, thousands of people take river buses to work every day. Thousands of tourists enjoy Thames cruises. This shows a cruise boat at Henley, half way along the Thames.

For fishing. People once fished in the Thames for their dinner. Today they still fish – for sport. (Over 250 000 fishing licences are bought every year, for fishing in the Thames and its tributaries.)

For other sport and leisure activities. There's rowing and canoeing. Swimming. Picnics. And river walks. You can follow the Thames Path for 294 km, from the source of the river to London.

Your turn

1 a Show all the ways the River Thames is used. Give your answer as a spider map. You could start like this:

b Now number them in what you think is their order of importance, for people living in the Thames basin. 1 = the most essential for well-being.

2 Choose four uses of the Thames that are *not* likely to apply at Cricklade, near its source. (See the photo on page 80.) Explain your choice.

3 Now choose one use of the Thames that is *not* likely to apply in central London. Again, explain your choice.

4 We use other rivers in the UK too, not just the Thames. See if you can pick out two uses that are likely to apply to *all* rivers. Give your reasons.

5 River water is used in power stations that burn oil and gas, to make electricity. Many fast-flowing rivers produce electricity without burning anything. It is called *h* … ? (Glossary?)

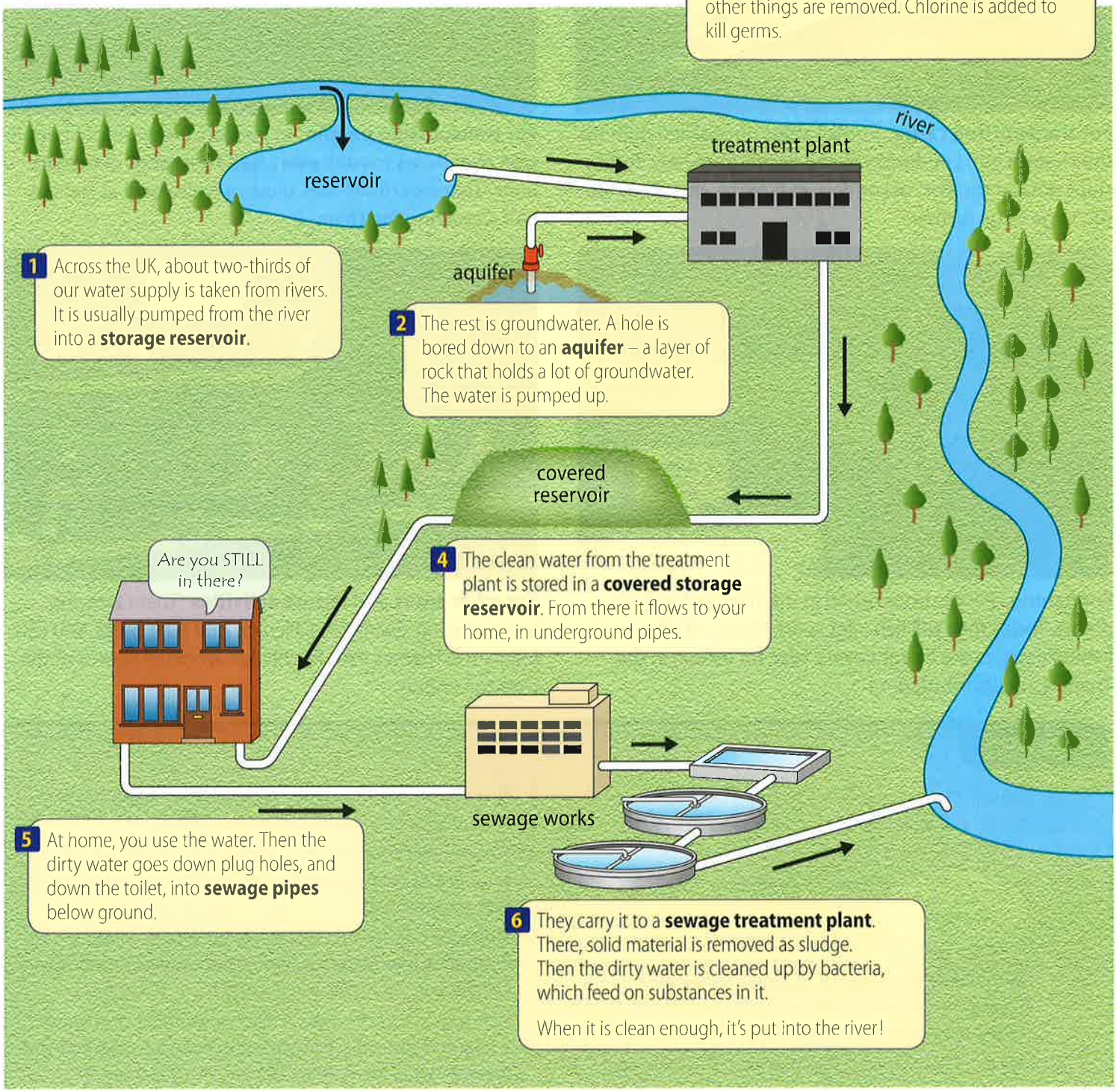
6 Now turn to page 97. The OS map shows Purley-on-Thames, a suburb of Reading. This map has clues about some past and present uses of the Thames. See how many you can find. (The key on page 138 may help.)

5.7 Our water supply

We depend on rain from the water cycle, for our water supply. We pump it from rivers and under the ground. Find out more here.

Where our tap water comes from

Turn on the tap, and out comes water. Magic!
But where does it come from? Follow the numbers.



1 Across the UK, about two-thirds of our water supply is taken from rivers. It is usually pumped from the river into a **storage reservoir**.

2 The rest is groundwater. A hole is bored down to an **aquifer** – a layer of rock that holds a lot of groundwater. The water is pumped up.

3 The water goes to a **water treatment plant** to be cleaned up. Particles of soil and sand and other things are removed. Chlorine is added to kill germs.

4 The clean water from the treatment plant is stored in a **covered storage reservoir**. From there it flows to your home, in underground pipes.

5 At home, you use the water. Then the dirty water goes down plug holes, and down the toilet, into **sewage pipes** below ground.

6 They carry it to a **sewage treatment plant**. There, solid material is removed as sludge. Then the dirty water is cleaned up by bacteria, which feed on substances in it.

When it is clean enough, it's put into the river!

So we just borrow water from the water cycle. We take water from rivers and aquifers, clean it, use it, clean it again, and put it back in the rivers.

Water supply in the Thames basin

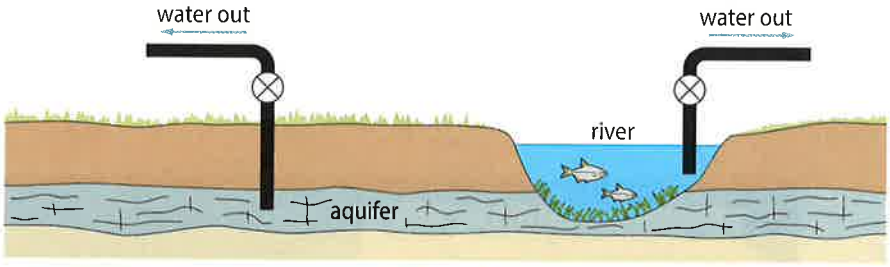
In the Thames basin, 40% of the water supply is groundwater from aquifers. These also feed the Thames and its tributaries. But quite often, there's a water shortage in the Thames basin. Why?

- First, the Thames basin does not get that much rain.
- And second, it is home to over 14.5 million people, or nearly a quarter of the UK's population. They use a lot of water!

▲ *A dried-up river bed in the Thames basin. What happened to the things that lived in the water?*

Drought

Imagine it's a hot dry summer. No rain for months. People drink more water, and shower more often, and water their plants a lot. But look:



1 If there's no rain, and we keep taking water from aquifers, the groundwater level falls. So there is less water to feed the rivers.

2 And if we take more water from the river too, its water level falls even further. Fish may die. The river may even dry up.

So we can't keep on **abstracting** (pumping out) water. Instead, we face a water shortage, or **drought**. There may be a hosepipe ban.

What if... ... the River Thames dried up?

Use salty water?

Beside the Thames, in east London, is a **desalination plant**. Here, salty river water is forced through a special kind of filter to remove the salt. Next, it is treated to make sure it's safe to drink, and tastes good. And then it goes into the water supply.

This plant can provide water for nearly 1 million people a day.

▲ *The desalination plant at Beckton, in east London. It treats salty water from the tidal Thames.*

Your turn

1 a About a third of the water that we use in the UK is *groundwater* that is pumped up from *aquifers*. Explain what the two terms in italics mean.
b Where do we get the rest of our water from?

2 When you wash your hands under the tap, you are washing them in rainwater. Draw a flowchart to show how the rainwater reaches you – and where it goes after you use it.

3 Rain is free. But every home has to pay for its water supply and sewage disposal – perhaps several hundred pounds a year. Do you think it's fair to have to pay? Explain.

4 When there's a drought, we are asked to save water at home. See if you can write down at least five ways *you* could save water. (No funny ones!)

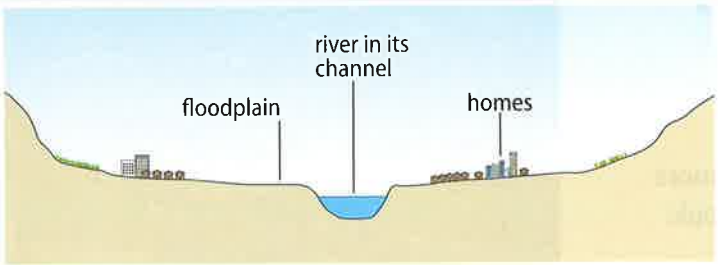
5 Do you think *desalination* is a good idea? Give your reasons.

5.8 Floods!

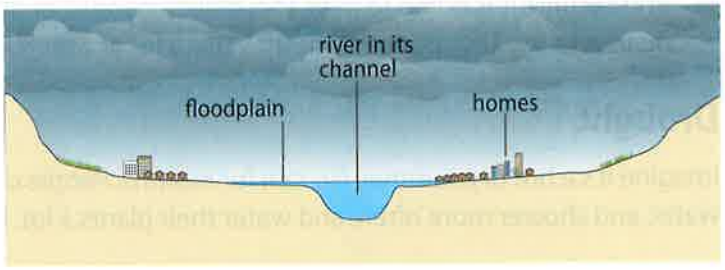
What are floods? And what causes them? Find out here!

What are floods?

Floods occur when water overflows the river's channel. Look:



1 Here the river is flowing in its channel, as usual. Alongside the river is the floodplain, a fairly flat area that is likely to flood. There are people living on it.

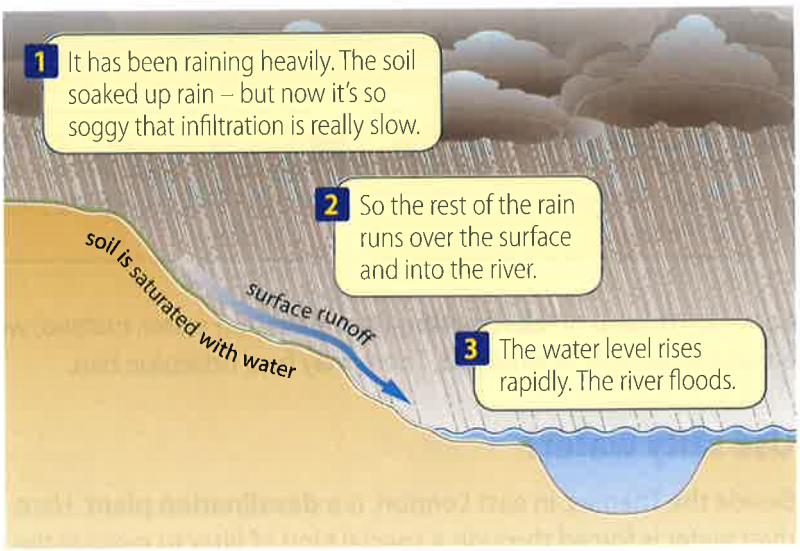


2 It has been raining heavily for weeks. The channel filled right up, and now the water has overflowed. That means trouble for some of those people!

What causes floods?

Heavy rain is the main cause. It quickly finds its way to the river, as this drawing shows. The river's channel overflows.

When there is a lot of snow and it melts quickly, that can cause floods too.



Flash floods

A burst of very heavy rain can cause a sudden flood called a **flash flood**. This happens so fast that people get no warning. They can get trapped, and drown.

Adding to the flood risk

If rain can soak into the soil quickly, there is less chance of flooding. So anything that slows down infiltration, or prevents it, will add to the flood risk. Study the drawing on the next page. Then try these 'Your turn' questions.

Your turn

1 The sentences below explain how a flood occurs. They are in the wrong order. Write them in the correct order.
- The river fills up with water.
- The ground gets soaked.
- More rain runs over the ground and into the river.
- Heavy rain falls for a long period.
- The water rises over the banks.
- Infiltration slows down.

2 a List all the factors that contribute to flooding.
b Now underline the *natural* factors in one colour and the *human* factors in another.
c Which group of factors can we do something about?

3 a Look at page 95. Why are floods:
i not really a problem, if they occur at **X**?
ii a big problem, when they occur at **Y**?
b How would you stop floods reaching the homes at **Y**?

Factors that contribute to flooding

Heavy rain
Rain is the main factor. The heavier it is and the longer it goes on for, the greater the risk of flooding. The soil will be so soggy that the rain can't soak away.

Steep land
Rain will run down a steep slope quickly – before it has much of a chance to soak into the soil.

Impermeable rock
If there is Impermeable rock (such as granite) below the surface, rain will not be able to soak through.

Tributaries
The more tributaries the river has, the greater the chance of flooding. They may all be swollen by rain too.

Built up areas
Rain can't soak through concrete. So rain that falls on our streets runs down the street drains, and is usually carried to the river. The river swells.

(But if the street drains are blocked, streets can flood quickly just from the rain.)

Cutting down trees
Trees help rain to soak into the soil. It is caught by the leaves, and trickles to the ground. It runs into the soil along the tree roots.

So if you cut trees down, you increase the risk of flooding.

5.9 Flooding on the River Thames

Here you'll explore flooding on the River Thames, and some reasons for it.

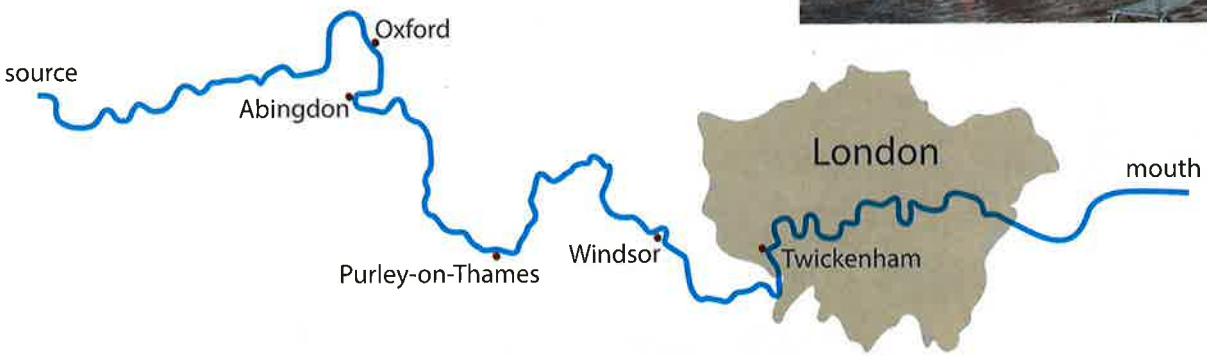
Year after year …

Almost every year, there is flooding somewhere along the River Thames. Look at these photos.

▼ *Twickenham, 2010.*

▲ *Oxford, 2007.*

▼ *Abingdon, 2007.*



▲ *Windsor, 2003.*

▶ *Purley-on-Thames, 2012.*

Your turn

The graph on the right is for questions 1 – 4. It shows rainfall for each month of 2012, in the Thames basin. The red lines show the *average* rainfall for the month, over the previous 30 years.

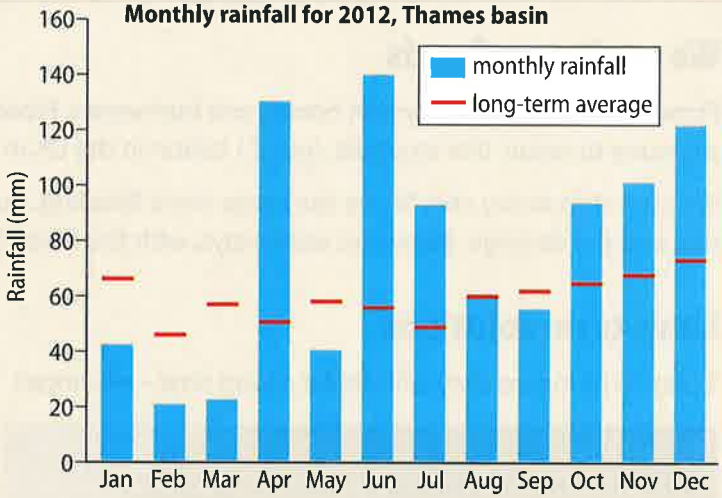
1 **a** How much rain fell in January 2012? Choose one:
about 26 mm about 42 mm about 65 mm
b Was January wetter or drier than average, that year?

2 In fact there was a hosepipe ban in January – March of 2012, in the Thames basin. See if you can explain why, using the graph and the facts in the blue box.

3 The graph shows that April and June were much wetter than usual. But the Thames did not flood in those months. See if you can come up with a reason. (To do with soil?)

4 **a** The ground in the Thames basin was really dry at the end of March. But by the end of October it could not hold any more water. It was **saturated**. Explain why.
b The Thames began to flood in November, and flooding continued in December. Explain why.

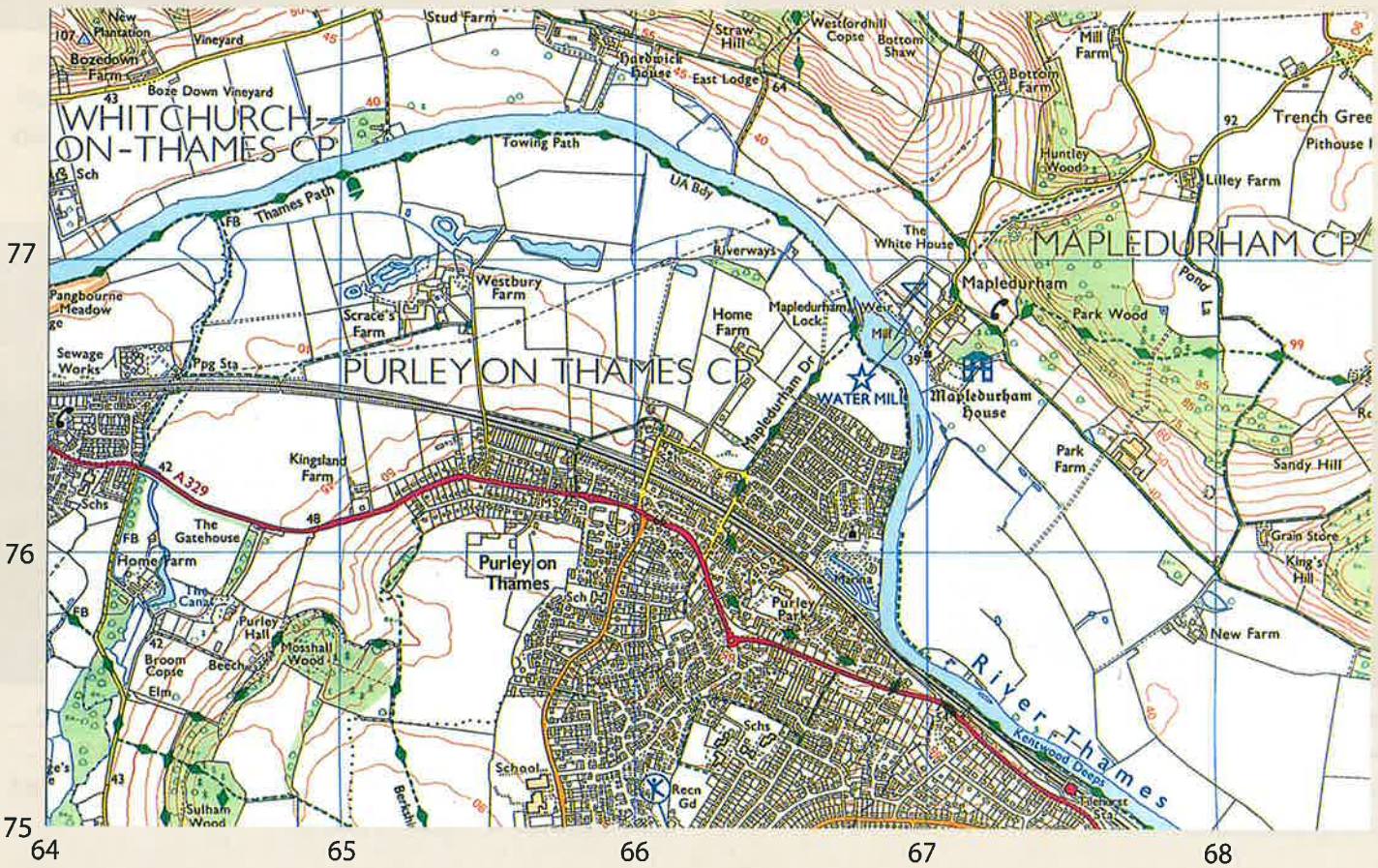
5 Photo **E** shows flooding in Purley-on-Thames, a suburb of Reading, in 2012. Purley is shown on the OS map below.
a How can you tell from the map that Purley lies in the floodplain of the Thames? (Hint: contour lines!)
b Which is more likely to flood: a house at 668764 or a house at 655762? Explain your answer.



The winter of 2011 was unusually dry, in the Thames basin. By the start of 2012, groundwater levels were low.

6 You want to prevent flooding of the houses along the river in square 6676. What will you do? Try to think of something.

7 Choose photo **B** or **C**. What's it like there? What damage has been done? Write a report for a newspaper. (At least 90 words.)



Scale 1 : 25 000

5.10 Protecting ourselves from floods

Here you'll find out about ways to reduce the risk of flooding, and protect ourselves from floods.

We can't stop floods

Floods can drown us. They ruin homes and businesses. Flood damage can cost a fortune to repair. (For example, over £1 billion in the UK in 2012.)

We can't stop heavy rain. So we can't stop rivers flooding. But we can reduce the risk, and the damage. Below are some ways, with the River Thames as example.

Did you know?

- The world's worst flooding was in China in 1931, when the Yangtze and Huai rivers flooded.
- It's thought that over 3 million people drowned.

Long-term solutions

'Long-term' means they will last for a long time – we hope!

A

Build embankments (high banks). These embankments along the Thames in London were first built to hold an underground sewage system, and Tube lines.
But later, the walls were made higher as flood protection.

B

Dig new river channels. The Jubilee River above looks natural – but it's not! It was dug out to divert water from the Thames, in order to prevent flooding at Maidenhead, Windsor, and Eton. There are plans for others too.

C

Take care where you build new homes. Local councils now weigh up the flood risk, before they allow new homes to be built in the Thames floodplain. They may refuse planning permission.

D

Let nature help. Allow land along the river to soak up flood water, as nature intended. Plant more trees too. This common land beside the Thames in Oxford is called Port Meadow. It regularly floods.

Short-term solutions

When we know floods are on the way, here are some things we can do.

Put up portable flood barriers. This shows them being fitted in Oxford, next to the river, because floods are expected. They'll be taken down later and stored away.

Put anti-flood shutters on homes. You can buy metal shutters like these to stop water coming in through doors and windows. (Or else try sandbags.)

The Thames Barrier

London can also be flooded from the sea. So it has special flood protection: the **Thames Barrier.**

This barrier has a set of giant steel gates below the water. They are raised when there's a risk that high water levels on the Thames will meet high tides coming in from the sea. Their job is to shut the sea water out.

▲ *The Thames Barrier. These piers hold machinery for raising the steel gates, which usually lie flat on the river bed. They swing up to close the gaps between the piers. (Now look for this on page 78!)*

Who decides?

The **Environment Agency** works with local councils in England, to decide what to do about flooding. It gets a grant from the government to install anti-flood structures.

It also keeps an eye on water levels in rivers, and gives out flood warnings.

Your turn

1 This is about the long-term solutions on page 98. You can answer using their picture labels, **A** – **D**.
   - **a** Which solutions aim to keep flood water in?
   - **b** Which one aims to *keep us away* from floods?
   - **c** Which one do you think would cost the least?
   - **d** Which two are likely to cost most?

2 You are in charge of building a new town near a river. Which solution(s) will you choose, to reduce the risk of flooding? Explain your choice. (Draw a sketch map of the town and river?)

3 How do these help to protect people from flooding? See if you can explain by drawing simple diagrams.
   - **a** embankments **b** digging a new river channel
   - **c** setting aside fields to take flood water

4 The solutions in **E** and **F** are called *short-term*. Why?

5 Do you agree with this person's idea? Write a thoughtful reply.

6 Now see if you can design a flood-proof home. Draw sketches!

6 Africa

The big picture

This chapter is about Africa. Here's the big picture …

- Africa is a continent. (Not a country!) And it's where we humans started.
- It has 54 countries.
- Their borders were mostly established by Europeans, who took over most of Africa at one stage.
- The countries are all different – but they have a number of things in common.

Did you know?

- In area, the Sahara is 9.4 million sq km …
- … and the USA is 9.8 million sq km.

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- Where is Africa? You should be able to point it out on a map of the world.
- How good is your mental map of Africa? See if you can sketch it roughly, and mark in and label these:
  - the lines for the Equator and Tropics
  - the oceans around it
  - the Red Sea, and Mediterranean Sea, and Suez Canal
  - the River Nile
  - its tallest mountain, and biggest lake
  - at least two mountainous regions
  - its three main deserts.
- Some European countries played a big part in creating today's map of Africa. Explain how, and name at least three of them.
- Name *at least* 12 African countries and their capitals. And say roughly where they are. (For example, in West Africa?)
- Give at least five facts about the human geography of Africa – about people and their lives. For example, how big is the population?
- Name Africa's four main biomes, and give at least four facts about each of them. You should be able to mark them roughly on a sketch map of Africa.

Did you know?

- Today, hippos are found only in Africa.
- A group of hippos is called a pod.

Did you know?

- Africa was the first continent that we (*Homo sapiens*) inhabited.

What if...

- …we humans had not left Africa?

And then …

When you finish the chapter, come back here and see if you've met your goals!

Your chapter starter

Page 100 shows Africa, and parts of two other continents, from space.

Which parts of the image are Africa?

Some parts of Africa look green, and some look golden. Why do you think this is?

What are those dark blue patches within Africa?

Two oceans are shown, and a number of seas. See how many you can name.

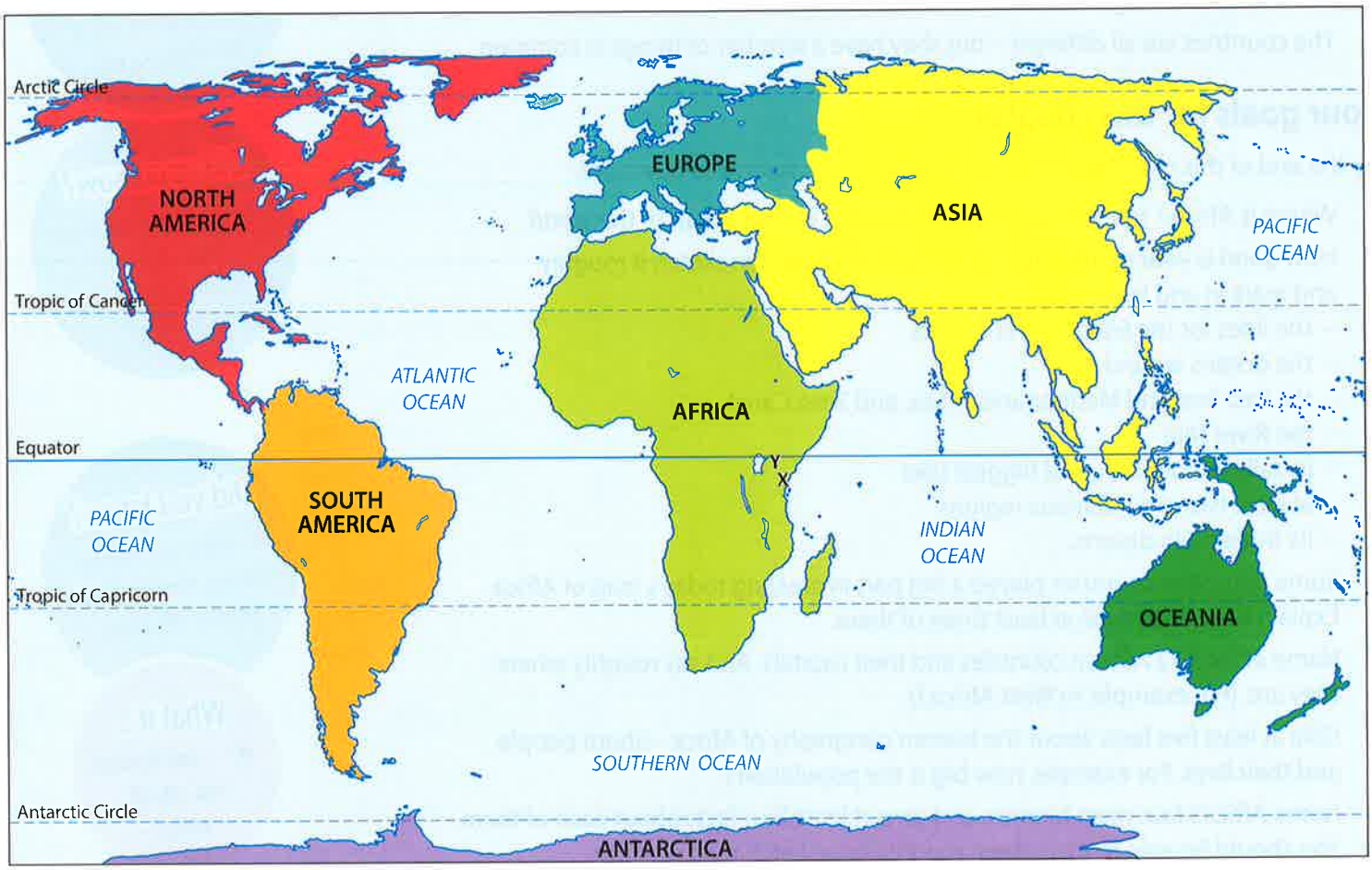
6.1 What and where is Africa?

Here you'll compare Africa with other continents – and think about your mental images of Africa.

Did you know?
- At their closest points, Africa is only 14 km from Europe.

Africa: a continent

Africa is not a country. It is one of the world's seven continents. Look at this map.



Note how the Equator runs across the middle of Africa. Most of Africa lies within the tropics.

Compare it with the others

Africa is the world's second-largest continent, for both area and population. Look at these tables.

Did you know?
- Most of the world's best long-distance runners are African.

The continents by land area

Continent	millions of square km
Asia	44.6
Africa	30.1
North America	24.5
South America	17.8
Antarctica	13.2
Europe	9.9
Oceania	8.1

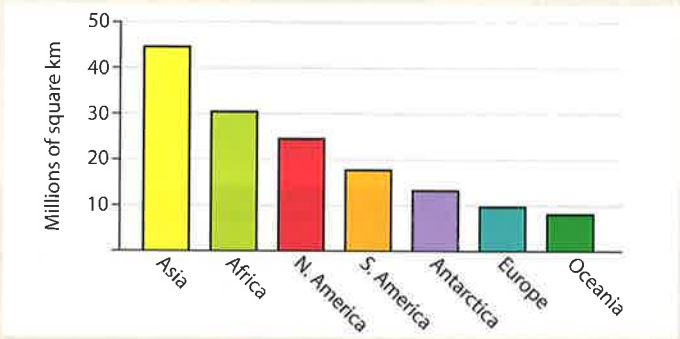
The continents by population

Continent	millions of people
Asia	4300 (or 4.3 billion)
Africa	1111 (or 1.1 billion)
Europe	743
North America	565
South America	407
Oceania	38
Antarctica	people only visit

Your turn

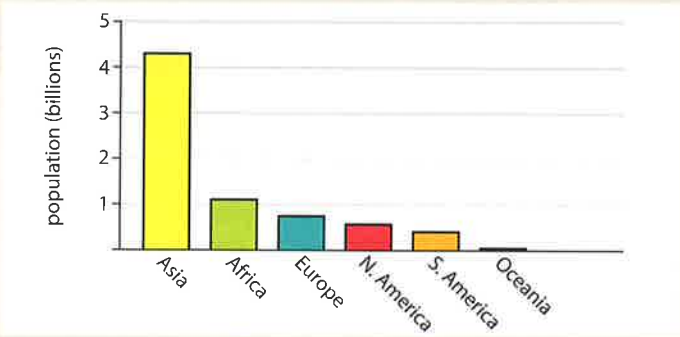
1 Lots of people think Africa is a country. It's not. It is a continent.
- a See if you can explain the difference between a country and a continent. (Glossary?)
- b Now, a challenge. See how many African countries you can list, *without looking at a map*. (There are 54!)
- c Then swop lists with your partner. Turn to the map on page 108. Give your partner 1 mark for each correct name. Subtract 1 mark for each wrong one.

2 Look. This graph compares the **areas** of the continents.



Using the graph, decide whether each statement below is true, or false. (You can check the table on page 102 too.)
- A All of North America would fit into Africa.
- B South America and Europe together would fit into Africa.
- C Africa is about three times the size of Europe.

3 This graph compares the **populations** of the continents.



True or false? (Check the table on page 102 too.)
- A There are more people in Africa than in Europe.
- B Africa has more people than North and South America combined.
- C More people live inside Asia than outside Asia.

4 The **population density** of a place is the number of people living there per square kilometre, on average.
The population densities for the continents, rounded off, are:
Africa, 37 Antarctica, 0 Asia, 96 Europe, 75
North America, 23 South America, 23 Oceania, 5
See if you can find a good way to display this data. (A bar chart? A pictogram?)

5 True or false? Your answer for question 4 will help you decide.
- A Africa is the least crowded of the *inhabited* continents.
- B Europe has about twice as many people per square km as Africa does.
- C Africa has more people per square km than either North or South America.

6 This photo shows the place marked **X** on the map.

- a There is an ocean in the photo. What is its name?
- b Name the ocean off the west coast of Africa.
- c At **X**, the days are warm all year round. See if you can explain why. (Look at the blue lines across the map?)

7 We all have **mental images** of Africa (pictures in our minds).
- a From where did you pick up your mental images of Africa?

- b Above is a view of Nairobi, a city at **Y** on the map. Does this photo fit with your mental images of Africa? Explain.

8 Some people think Africa is full of poor people, with no hope. This is a **stereotyped** view.
- a What does *stereotyped* mean? (Glossary?)
- b See if you can think of ways to make sure that your views of Africa are not stereotyped.

9 Now it's time to start a big spider map, as your summary for Africa. Use a double page. Mark in facts you know already. You could group them under headings such as: *Where is Africa?* Don't forget to add to your spider map later.

6.2 A little history

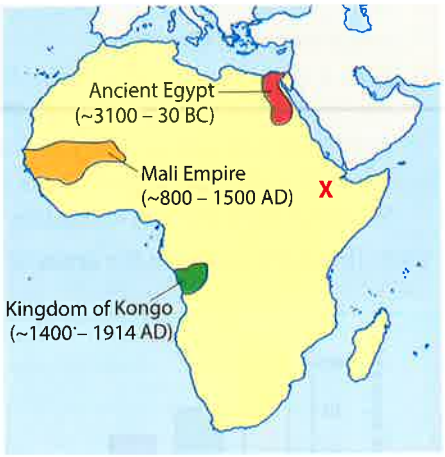
For a time, most of Africa was 'owned' by Europe. Find out more here.

Africa: our cradle

You, me, the Emperor of Japan: we are all linked to Africa … because that's where humans began!

Look at this map. We think that the first species of human appeared around X, about 2 million years ago. It was related to apes. (X is in today's Ethiopia.)

Then around 200 000 years ago, our own species emerged (*Homo sapiens*). And about 60 000 years ago, we began leaving Africa, and we spread around the world. (See page 13.)



African empires and kingdoms

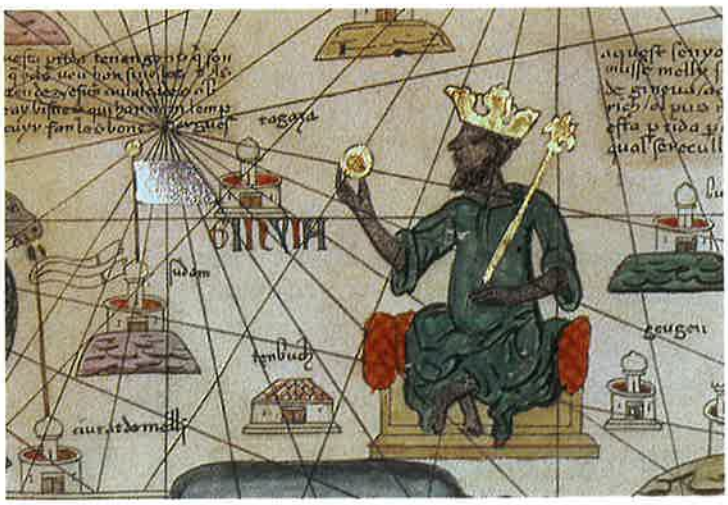
Humans spread around Africa too. And if you could travel back in time, you'd find many African civilisations, empires, and kingdoms. The map above shows just three.

- Ancient Egypt. This civilisation lasted for over 3000 years. It ended in 30 BC with the death of Cleopatra, the last pharaoh.
- The Mali Empire. (About 800 to 1500.) It grew very wealthy, mainly through selling salt, gold, ivory, pottery, silks, and slaves, to other parts of Africa. (Slavery was common in many places.)
- The Kingdom of Kongo. (About 1400 to 1914.) It depended on trade in ivory, metals and slaves. From 1857 it was controlled by Portugal.

▲ *Portuguese envoys kneel before Alonso I, King of Kongo. (He ruled 1509 –1542.) The Portuguese got slaves from Kongo.*

▼ *These paintings in a pharaoh's tomb are over 3200 years old.*

▼ *Mansa Musa, once ruler of the Mali Empire, was famous for his wealth. We think he was the richest person ever – richer than anyone alive today!*



The Europeans arrive

Around 600 years ago, Europe began to take an interest in Africa. In 1420, Portuguese ships arrived to explore the west coast. The Dutch, the British, and others came later.

They found lands rich in gold, and ivory. And something else they wanted: slaves.

So they began trading. They swopped things like cloth, beads, scissors, and guns for gold, and ivory, and slaves. The slaves were shipped across the Atlantic to North and South America, and the Caribbean, to work on plantations.

The Atlantic slave trade lasted for over 300 years. At least 12 million Africans were taken.

▲ *Elmina Castle, in Ghana. (See the red dot on the map below.) The Portuguese built it. The British took it over. It was like a warehouse. Slaves were held in the dungeons, waiting for ships.*

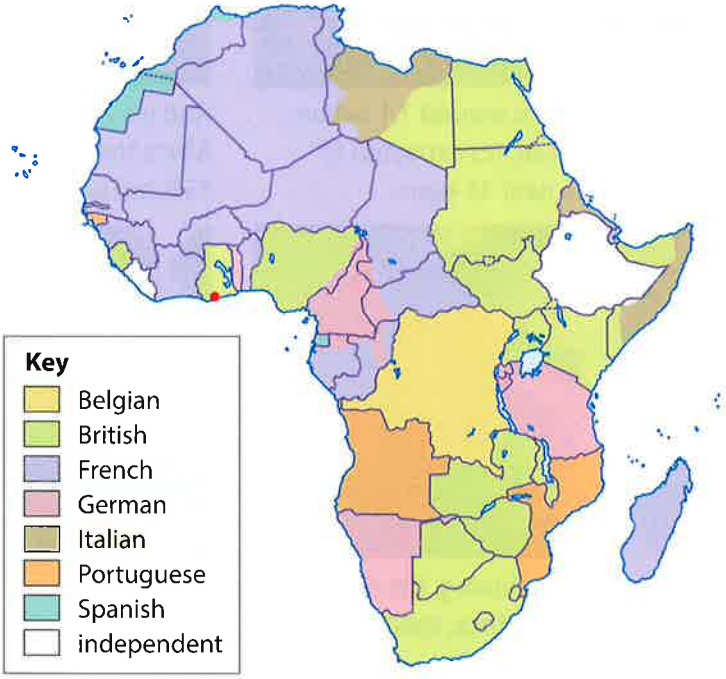
They carve Africa up

When the Europeans arrived, Africa was a collection of thousands of kingdoms and states and smaller units. All had their own ethnic groups, and languages, and customs.

For a long time, the Europeans just traded. But then they got greedier. They **colonised** places (took control of them). So they could ship out what they wanted: things like timber, gold and other metals, coffee, cocoa, and spices.

The Europeans fought over colonies. But in1884 they got together in Berlin, to carve up Africa among themselves. They created new countries by drawing lines on a map. Look at the map on the right.

Who colonised Africa?



Independence!

In time, the African colonies grew tired of being exploited. They struggled for their freedom. Libya was first. It gained independence from Italy in 1951. Zimbabwe – Britain's last African colony – did not gain independence until 1980.

Your turn

1. We all share one link with Africa. What is it?
2. Ancient Egypt was based around a great river. Which one?
3. What did the Mali Empire and the Kingdom of Kongo have in common?
4. Two European countries between them colonised about two-thirds of Africa. Which two countries? (Look at the map above.)
5. See how many African countries you can name, that were British colonies. (The map on page 108 will help.)
6. Using 50 – 60 words, see if you can explain why European countries wanted to colonise areas of Africa.
7. The African colonies grew tired of being *exploited*, and fought for their *independence*.
   a. What do the two terms in italics mean? (Glossary?)
   b. See if you can explain *why* they wanted to be independent.
8. When they drew the country borders, the Europeans forced different ethnic groups and cultures together. What kinds of problems could this cause? See how many you can think of.

6.3 Africa today

This unit will give you an overview of Africa, and its people, today.

Why...
- ... are there so many different languages?

What if...
- ... everyone in the world spoke the same language?

Africa's countries

- Today, Africa has 54 countries. You can see a map of them on page 108.
- 23 of them are smaller than the UK, in area.
- Only 4 have more people than the UK!

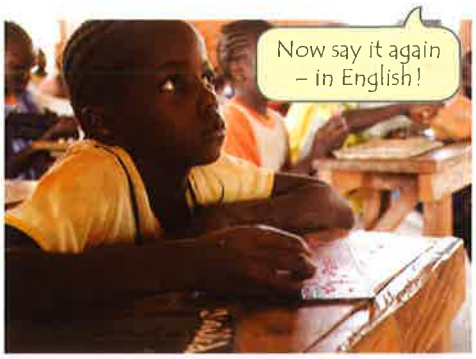
Africa's people

The population is around 1.1 billion. And growing fast. It's expected to double in the next 35 years.

And it's young! Half of the people in Africa today are aged under 20. And 85% are under 45.

There are hundreds of different ethnic groups, across the 54 countries. Each has its own language or dialect.

For example the Tuareg, the nomadic people of North Africa, speak dialects of the Berber language.



But countries also have 'official' languages. English is an official language in over 20 African countries.

On average, over 60% of Africa's workforce are in farming. In some countries, it's up to 90%.

But some countries have industries that earn them a lot. For example mining, and oil and gas production.

So Africa has some wealthy people and places. Many people live very comfortable lives.

But nearly half of the people live in great poverty, with less than £1 a day to live on – for everything.

◀ *A diamond mine in Sierra Leone. Buckets of mud are passed up the slope from person to person. At the top, people will sieve the mud, looking for the precious stones.*

▼ *With love from Africa?*

Africa's natural wealth

- Africa has large deposits of many metal ores. Such as aluminium, copper, cobalt, iron, uranium, and lithium.
- It is one of the top continents for gold and diamonds.
- It has 10% of the world's *known* oil deposits – and may have much more.
- Thanks to its range of climates, it can grow a wide range of crops to sell to other continents. Like cotton, tea, coffee, rubber, fruits, flowers.

Did you know?

- China is Africa's top trading partner.
- There are over 1 million Chinese living in Africa.

Africa's challenge

Africa is facing a big challenge: to use its natural wealth, and the talents of its people, to end poverty. African countries are working hard on this.

Your turn

1 Which two facts do you find the most surprising, in this unit?

2 The population of Africa is about … how many?

3 Africa's population is expected to double in the next 35 years. What problems might this fast growth cause? (Think about things people need … like food, shelter, water.)

4 In Africa, half of the population is aged under 20. Is such a young population a good thing, or a bad thing? See how many advantages and disadvantages you can list.

5 English is the official language in Ghana and Nigeria. Why?

6 Millions of young people in Africa speak their own language at home, but learn through English at school. Do you agree with the man in the red cap? Explain.

7

Country	Life expectancy (years)
Nigeria	53
Sierra Leone	47
UK	80

Look at the table. **Life expectancy** means how long a person can expect to live for. In Sierra Leone, it's 47 years. (The figure is an *average* so some people live a lot longer.)

a What kinds of things would help *you* to live a long life? (For example, enough good food? Doctors?)

b See if you can suggest reasons why life expectancy is low, for the two African countries in the table.

8 Now look at the two photos at the top of this page.

a What's the link between them?

b Diamond mining is hard, messy work. How can you tell, from the first photo?

6.4 Africa's countries

Africa has 54 countries. Find out more about them here.

The countries and their capitals

Look at all these countries! Can you spot any that you have never heard of?

Did you know?

- Africa's top football competition is the Africa Cup of Nations ...
- ... played every second (odd-numbered) year.

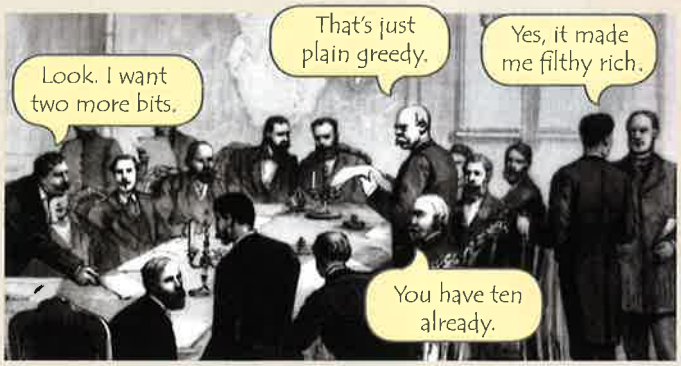
◀ *Cairo, Africa's second largest city. (Lagos is first.) Cairo has over 9 million people. That's more than London.*

Your turn

1 See if you can find and name these African countries.
- **a** It's on the east coast, and its name begins with K.
- **b** It is tiny, and completely surrounded by South Africa.
- **c** It is a big island, larger than the British Isles.
- **d** It is just north of Nigeria, and a bit larger.
- **e** It is small and thin; its name starts with T and has 4 letters.

2 Now see how many countries you can find, beginning with:
a M **b** Z **c** L **e** S

3 When the European colonisers met in 1884 to carve up Africa, they drew new country borders on a map.



Look at the map on page 108. Which countries have straight borders, or parts of borders, that look as if a ruler were used? See how many you can find.

4 Below are some capital cities, from the map.
For each, see how fast you can find the matching country. Then write down the country and its capital.
- **a** Addis Ababa **b** Lusaka
- **c** Nairobi **d** Tripoli
- **e** Nouakchott **f** Kampala
- **g** Windhoek **h** Libreville

5 Africa has different regions. Look at this map.

See if you can name countries in each region, as follows:
- **a** three in Central Africa **b** four in North Africa
- **c** three in East Africa **d** four in West Africa
- **e** four in Southern Africa

6 Now look at Cairo, in the photo at the top of the page.
- **a** It is the capital of ... ?
- **b** See how much you can discover about it, from the photo.
- **c** Now draw a sketch from the photo, and add notes to it. Don't forget to name the river! (See page 112.)

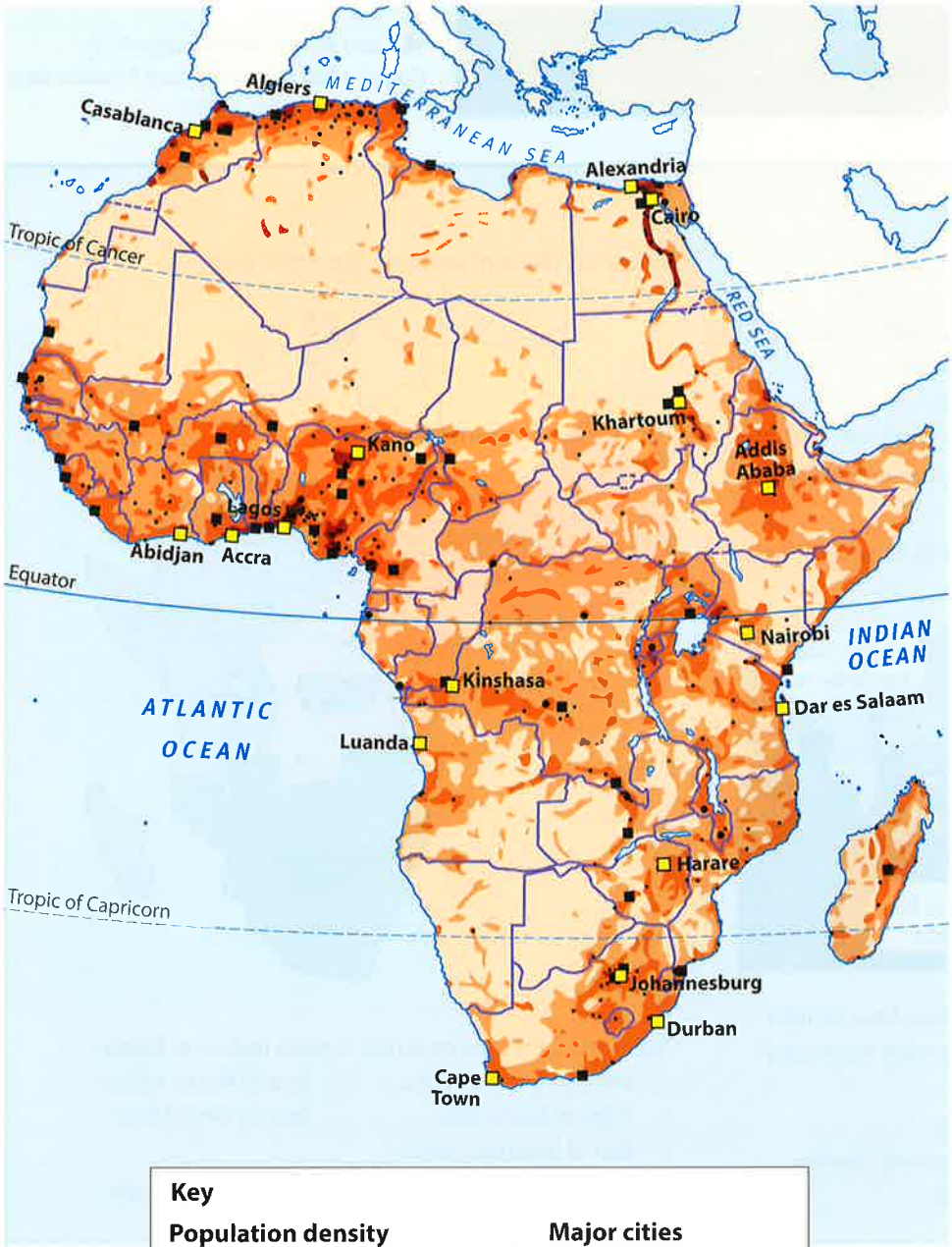
6.5 Population distribution in Africa

This unit is about where people live in Africa. You will explore a table of data, and a map.

How many people, and where?

Africa is home to about 1.1 billion people. Look at the list on the right. It gives the **population** of each country.

People are not spread out evenly. Some places are more crowded. The map below shows the **population density**. The deeper the shade, the more people there are, in that area.



Country	Population
Algeria	33 333 000
Angola	15 941 000
Benin	8 439 000
Botswana	1 840 000
Burkina Faso	13 228 000
Burundi	7 548 000
Cameroon	17 795 000
Cape Verde	421 000
Central African Republic	4 217 000
Chad	10 146 000
Comoros	798 000
Côte d'Ivoire	1 655 000
Dem. Rep. Congo	71 713 000
Djibouti	906 000
Egypt	80 335 000
Equatorial Guinea	504 000
Eritrea	5 880 000
Ethiopia	85 237 000
Gabon	1 384 000
Gambia	1 517 000
Ghana	23 000 000
Guinea	9 402 000
Guinea-Bissau	1 586 000
Kenya	34 708 000
Lesotho	1 795 000
Liberia	3 283 000
Libya	6 037 000
Madagascar	18 606 000
Malawi	12 884 000
Mali	13 518 000
Mauritania	3 069 000
Mauritius	1 219 000
Morocco	35 757 000
Mozambique	20 367 000
Namibia	2 031 000
Niger	13 957 000
Nigeria	154 729 000
Republic of Congo	4 013 000
Rwanda	7 600 000
São Tomé and Príncipe	183 000
Senegal	11 658 000
Seychelles	81 000
Sierra Leone	6 145 000
Somalia	9 832 000
South Africa	47 432 000
South Sudan	8 260 000
Sudan	36 787 000
Swaziland	1 032 000
Tanzania	44 929 000
Togo	6 100 000
Tunisia	10 102 000
Uganda	27 616 000
Zambia	14 668 000
Zimbabwe	13 010 000

▲ *Lagos ...*

▲ *... and Lagos.*

Your turn

1 What does this term mean? (Glossary?)
   a population **b** population density

2 Look at the table on page 110.
   a Which African country has the smallest population?
   b Which has the largest population?
   c The population of the UK is around 64 million, or 64 000 000. Name the African countries which have a larger population than the UK.
   d The population of London is about 8 300 000. How many African countries can you find, with a smaller population than London? List them.

3 In the table on page 110, the numbers all end in 000. We rounded them off. Why do you think we did that?

4 **a** See if you can name a country with a high population density overall. (You'll need the map on page 108.)
   b Now name one with a low population density.

5 Copy this table. Then fill in the missing population densities, in the right places, from the list in italics. The map will help!

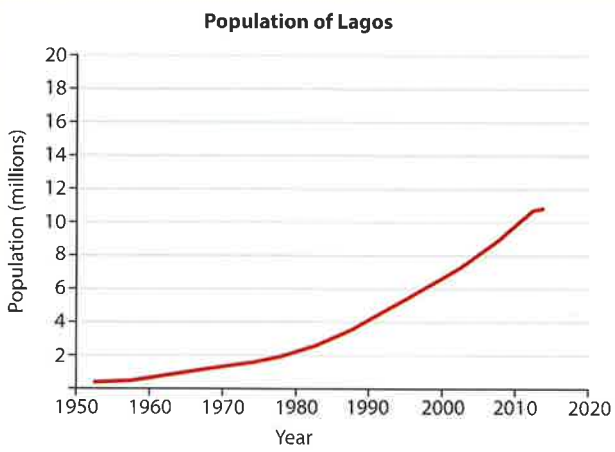
Country	Average population density (people per square km)
Somalia	
Namibia	
Nigeria	
UK	256

Population densities: *3* *188* *15*

6 Look at your completed table for question 5. What can you say about the population density of the UK compared to the three African countries? Answer in *at least* 50 words!

7 See if you can explain these. (Pages 112 and 114 will help.)
   a It is *sparsely populated* along the Tropic of Cancer. (Glossary?)
   b Most of the coastal areas are quite densely populated.
   c People like to live around East Africa's great lakes.
   d There's a wiggly strip of high population density in Egypt.

8 Lagos, in Nigeria, is Africa's biggest city. It is growing very fast. People are moving in from rural areas. Look at this graph.



   a What was the population of Lagos in 1990?
   b What was its population twenty years later, in 2010?
   c Why might people want to move from rural areas to Lagos?
   d A fast rise in population can put a big strain on a city. See if you can explain why.
   e Many new arrivals end up living in slums, like the one in photo **B**. What difficulties might they face?

6.6 Africa's physical features

Now learn about Africa's key physical features – and where they are on the map.

Mountains, rivers, deserts, lakes …

Study this map for a little while. Then try 'Your turn'.

Why...
- … does the Sahara get so little rain?

Did you know?
- The Bible and Koran tell how Moses led the Israelites out of Egypt, across the Red Sea.

Did you know?
- The Kalahari Desert is really semi-desert.
- It has lots of vegetation after rain.

Your turn

1 The world's longest river is in Africa.
   a Find it on the map. What is it called?
   b Is it flowing towards the north, or southwards?
   c It has two tributaries. Name each, and say where it rises.
   d i What sea does this river flow into?
   ii What do you notice about it, where it reaches the sea?

2 Now name five African rivers that flow into the Atlantic Ocean. Include one with the same name as a fruit!

3 This photo shows the famous Victoria Falls.

   a Which river are they on? Look on the map!
   b *A river joins Lake Victoria to Victoria Falls.* True or false?

4 To the west of Lake Victoria lies a long thin valley with several lakes. It is called … ?

5 a Which part of Africa is the most mountainous? The north? The south? Be as clear as you can, in your answer.
   b Where in Africa are the Atlas Mountains?
   c Name two other highland areas in Africa.

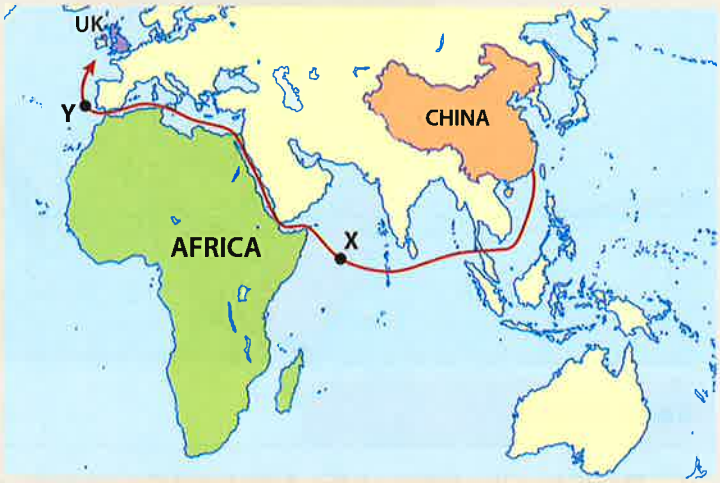
6 The photo below shows Africa's highest mountain.
   a Use the map to find out its name.
   b Even though it's near the Equator, it has glaciers on top. Explain why.

7 Now see if you can name Africa's second and third highest mountains. (They are also marked on the map.)

8 a This photo was taken in the world's largest hot desert. It is in Africa. What is its name? (6 letters!)

   b Where in Africa is it?
   c Is it mountainous? Flat? A mixture? Give your evidence.
   d Now name two other African deserts.

9 Many of the things you own and buy are made in China. They reach the UK by sea, in container ships. They usually take the route shown on the map below.



Using the maps on pages 112 and 108 to help you, describe the route a ship takes, to get from **X** to **Y**. Include the names of the African countries it passes. You could start like this: *The ship sails through the Gulf of Aden. Then it …*

10 It's time for some work on your mental map of Africa. Practise drawing a rough sketch map of Africa. Be quick! Mark in and / or label these:

River Nile	at least two other rivers	two oceans
Red Sea	Mediterranean Sea	Suez Canal
Kilimanjaro	Lake Victoria	three deserts
Equator	Tropics	three mountainous regions

6.7 Africa's biomes

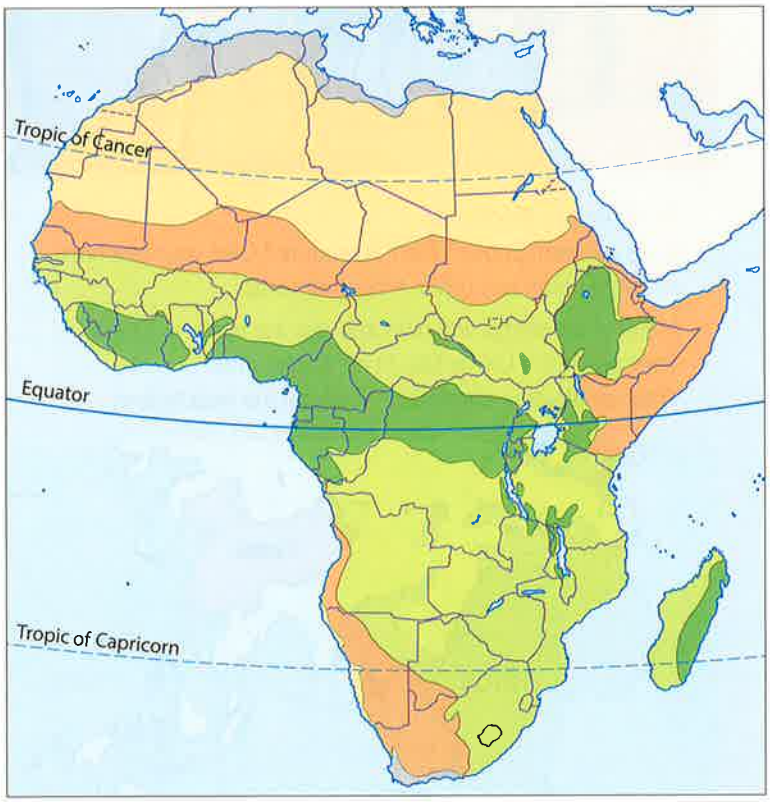
Here you will learn about Africa's four main biomes.

What's a biome?

A **biome** is a large region with its own distinct climate, plants, and animals. The climate dictates what a biome will be like. That's because plants and animals adapt to suit the climate.

Africa's biomes

Africa has different climate zones – so it has different biomes. The panels tell you about the four main ones. Check colours.



Hot desert

- Hot in the day – up to 50 °C. But very cold at night. (No clouds to keep the heat in.)
- Very little rain. Some places get almost none.
- Very strong winds.
- Plants must be able to find and store water, and protect themselves from heat and wind.
- So you'll find low spiny shrubs with long roots and thick stems, and wiry grasses.
- There are camels, antelopes, and ostriches too. All have adapted to survive for long periods without drinking.
- There are other animals like vipers, scorpions, and tiny rodents, that hide from the sun in shady places, or down burrows.

Semi-desert

- This biome lies between the desert and the savanna, and is always warm or hot. (But a bit cooler than the desert.)
- There's some rain over a few months of the year – but you cannot depend on it. The rest of the year is very dry.
- It has grass, and low shrubs, and scattered trees.
- You might see wild dogs, and lots of rodents.
- Most people farm. They grow crops like maize and chick peas. Some raise animals: cattle, goats, sheep – and camels in north Africa. But rains often fail, so crops and animals may die.

Savanna

- The savanna is warm all year, with a wet season and a longer dry season.
- It is rolling grassland, with scattered trees (mostly acacia trees).
- You may see lions, elephants, giraffes, zebra, and gazelles. (Africa's game parks are in this biome.)
- People living in the savanna grow crops, and raise animals. In many places the soil is worn out and useless after years of crops, and overgrazing. **Desertification** is a problem.

Rainforest

- Warm and wet all year - but less rain than in the Amazon rainforest.
- There are thousands of species of plants: from low shrubs and ferns to trees up to 45 m tall.
- Animals include chimps and gorillas, many kinds of monkey, snakes, hippos, and hundreds of species of bird.
- Much of the African rainforest has been destroyed. People chop down trees for timber and firewood, and to clear land to grow crops.

Your turn

1 What is a *biome*?

2 Let's start with the hot desert biome.
- a It does not have much vegetation. Why not?
- b Give two ways in which plants have adapted to the climate in this biome.
- c The Sahara belongs to this biome. Which countries share the Sahara? List them.

3 a The semi-desert region next to the Sahara is called the **Sahel**. Which countries lie (at least partly) in the Sahel?
- b Suppose there is hardly any rain in the Sahel this year. What might the consequences be?

4 You are visiting a game park in Africa.
- a Which biome are you likely to be in?
- b Which animals might you see?
- c Name five countries which share this biome.
- d *Desertification* is a problem in this biome. What does the word in italics mean? (Glossary?)

5 a Which biome has the most lush vegetation?
- b See if you can explain *why* vegetation grows well there.

6 Look again at the map on page 114. See if you can find an overall pattern. (Hint: start at the Equator!)

7 Now compare the satellite image on page 100 and the map on page 114. Are the patterns similar? Describe what you notice.

8 Next, compare the maps on pages 114 and 110.
- a i Which biome is the most sparsely populated?
- ii See if you can explain why.
- b i Is the rainforest biome densely populated?
- ii See if you can explain what you notice.
- c i Which biome do most people live in, overall?
- ii Try to explain why.

9 Look at the photos of the different biomes.
- a Which one would you most like to spend time in? Why?
- b Which one would you least like to spend time in? Why?

7 In the Horn of Africa

The big picture

This chapter is all about the Horn of Africa. Here's the big picture …

- The Horn of Africa is a region in north east Africa.
- It is made up of four countries: Djibouti, Eritrea, Ethiopia, and Somalia.
- The four countries are all different – but they have a lot in common too.

Did you know?

- Some of your clothes may have been made in the Horn of Africa. (Check the labels!)

Your goals for this chapter

By the end of this chapter you should be able to answer these questions:

- Where is the Horn of Africa? You should be able to point to it on a map.
- Which countries make up the Horn of Africa? You should be able to draw a rough map of the region, with countries and capitals marked in.
- Name these physical features of the region, and mark them on a rough map:
  - the main highland area, and its highest peak
  - at least two rivers, including a tributary of the world's longest river
  - a flat area that's below sea level, one of the hottest places on Earth
  - the lowest point in Africa
  - two volcanoes
  - the sea, gulf, and ocean that border the region.
- Describe the climate patterns in the Horn of Africa: temperature and rainfall.
- What can you say about these, for the Horn of Africa?
  population *% living in rural areas* *life expectancy* *GDP per person (PPP)*
- Give at least three facts about each of these, for the Horn of Africa:
  - growing coffee
  - the nomads and their way of life
  - salt mining in the Danakil Depression
  - the coast, and earning a living on it
- See if you can give six facts about Addis Ababa.
- Djibouti's location helps it a lot. Explain why, and how.

Did you know?

- In about 10 million years from now, the Horn of Africa will have become an island.

Did you know?

- Ethiopia claims to have the Ark of the Covenant.
- It's a chest containing the stone tablets on which Moses received the Ten Commandments.

Why...

- … do camels have long eyelashes?

And then …

When you finish the chapter, come back to this page and see if you've met your goals!

Your chapter starter

Look at the woman and her camels, on page 116.

Where do you think she is coming from? And where is she going?

What do you think is in all those plastic containers?

What do you think the climate is like, in this place?

What can you say about the landscape?

7.1 Meet the Horn of Africa

Meet the region of Africa that you'll study in this chapter … and find out what makes it a 'region'.

Where's the Horn of Africa?

The orange area on the map is called **the Horn of Africa**.

That's because it is shaped like a rhino's horn!

Did you know?

- The Queen of Sheba ruled part of the Horn of Africa.
- Her kingdom stretched from Yemen across to Northern Ethiopia.

Did you know?

- Experts say we humans first appeared in Ethiopia, about 200 000 years ago …
- … and began to spread around 60 000 years ago.

Four countries

There are four countries in the Horn of Africa. Look at this map.

A

▲ *The Ethiopian Highlands: the largest area of high land in Africa.*

Did you know?

- Eritrea used to be part of Ethiopia.
- After 31 years of conflict, it split from Ethiopia in 1993.

People sometimes include other countries too: Sudan, South Sudan, and Kenya. In that case, the correct name for the larger region is **the Greater Horn of Africa**.

▲ *Looking for us? Many fossils of early human species have been found in Ethiopia.*

▲ *Nearly 80% of people in the Horn of Africa live in rural areas. These girls are collecting water from a well, in Eritrea.*

The Horn of Africa as a region

In geography, a **region** is a large area where the places have something in common. The four countries in the Horn of Africa have a lot in common.

- They have a long shared history. There were several ancient civilisations in this region, that crossed today's country borders.
- Ethnic groups are spread across the region. The Somali people live in Somalia, Ethiopia, and Djibouti. The Afar live in Ethiopia, Eritrea, and Djibouti.
- This region is in the tropics. But much of it is semi-desert. Only the Ethiopian Highlands get a lot of rain.
- There has been a great deal of conflict over the last 50 years, both between and within the four countries.
- The region is poor – but is now developing quite fast.

▲ *Stopping for a chat in Asmara, the capital of Eritrea.*

Your turn

1

The countries in the Horn of Africa			
Country	**Capital**	**Area (sq km)**	**Population (millions)**

a First, make a larger copy of the table started above.
b In the first column, write the names of the countries.
c In the second column, name their capital cities.
d In the third column, give the area of each country. Choose from the white box below. The map will help!
e Now give the populations. (Use your common sense!)

Area (sq km):	1 127 130	637 660	23 000	117 600
Population:	9 832 000	85 237 000	5 880 000	906 000

2 The UK has a population of about 64 million. Which country of the Horn has a larger population than the UK?

3 London has a population of about 8.3 million. Which countries of the Horn have a smaller population than London?

4 a Now look at photo **A**. Write a list of words and phrases to describe the landscape it shows. (Is it flat?)
b Do the same for photo **B**.

5 Study photo **C**. How much you can tell from it, about people's lives in that area? Write at least 35 words in your answer.

6 It's mental map time!
a Study the second map on page 118 for a few minutes.
b Now close the book. Sketch the map. Label the countries. Mark and name their capitals.
c Assess your map. How good is it?
d Repeat a – c. See how much you can improve.

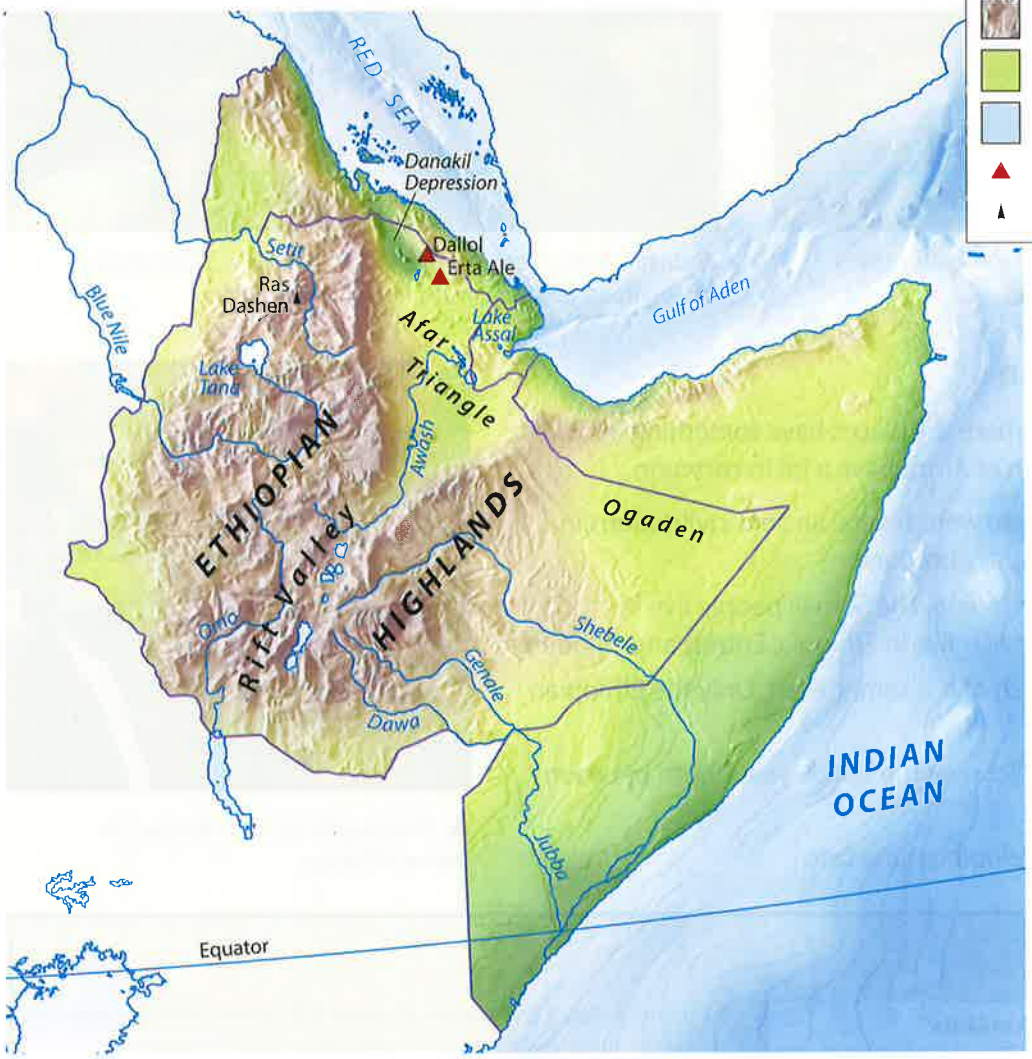
7.2 The Horn of Africa: physical features

The Horn of Africa has almost everything except glaciers! Find out more here.

Why...
- ... are there volcanoes?

A map of the physical features

Mountains, rivers, lakes, deserts, beaches, volcanoes ... the Horn of Africa has them all.



Did you know?
- Lake Assal is the second saltiest lake in the world.
- First is Don Juan Pond in Antarctica. (The salt means it does not freeze.)

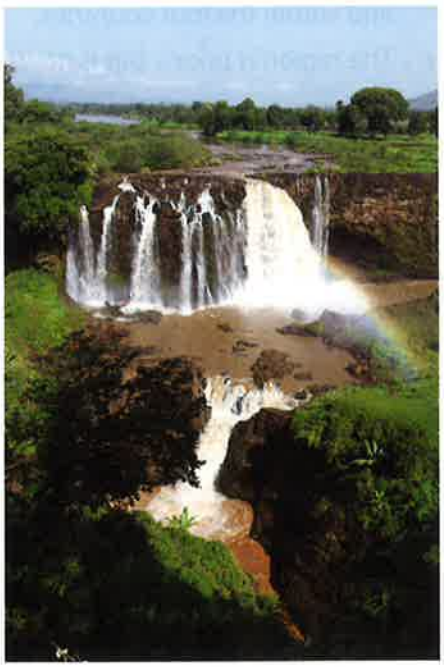
The Ethiopian Highlands

Look at the **Ethiopian Highlands**. They are the largest area of high land in Africa. They are divided in two by the **Rift Valley**, which holds a string of lakes.

The rivers

The map shows some main rivers of the region. Note how they all rise in the Ethiopian Highlands, which provide most of the water for the Horn of Africa.

The highlands provide water for other countries too. Look at the **Blue Nile**. It leaves Ethiopia and heads north, joined by its tributary. In Sudan it joins the **White Nile** to form the **River Nile**, which flows on to Egypt. (See page 112.)



▲ *The Blue Nile Falls, about 30 km from Lake Tana, the river's source.*

▲ *Around the Dallol volcano, the heat below ground forces salty water upwards. It evaporates, leaving these coloured salts.*

▲ *The volcano Erta Ale. Inside the crater is a lake of lava (molten rock). There are only four lava lakes in the world.*

The Afar Triangle

This lowland area is shaped like a triangle. Look at it on the map. It is named after the Afar people.

- It has the lowest point in all of Africa, **Lake Assal**.
- It has volcanoes, and suffers many earthquakes. That's because Earth's crust is being torn apart here, from below. (There is more about this on page 129.)
- Look at the **Danakil Depression**. It is about 100 m below sea level. (That's why it's called a depression.) It is one of the hottest places on Earth, with very little rain.
- Around the **Dallol volcano** is a strange landscape of brightly coloured salts, with pools full of sulfuric acid.

The Ogaden

This is a **plateau**. Many of the people here are **nomads**, who rear animals, and travel with them to find **grazing**.

The coast

Look at the long coastline. Somalia has the longest coastline in Africa. And coast means beaches !

▲ *Behhhh ! Herding goats in the Ogaden.*

▲ *The beach at Mogadishu. This ocean is called ... ?*

Your turn

1 Look at the map on page 120.
   a Which country has most of the high land?
   b The Ogaden is a *plateau*. What's a plateau? (Glossary?)
2 Name the highest and lowest points in the Horn of Africa.
3 Name the lake where the Blue Nile rises.
4 a A river flows up through the Afar Triangle, but does not reach the sea. Its name is ...?
   b Describe the pattern of rivers in the Horn of Africa.
5 Give two interesting facts about the Afar Triangle.
6 Which country in the Horn of Africa:
   a lies along the Red Sea? b borders the Indian Ocean?
7 The map shows the Gulf of Aden. What is a *gulf*? (Glossary?)
8 Now look at the photos. Which of these five places would you most like to visit? Explain why.
9 Mental map time again. Study the map on page 120. Then sketch your mental map. See how good you can make it.

7.3 The Horn of Africa: climate

Here you'll find out about the climate in the Horn of Africa, and how it influences farming.

Climate in the Horn of Africa

Climate means what the weather in a place is usually like: how hot or cold it is, and how much rain it gets.

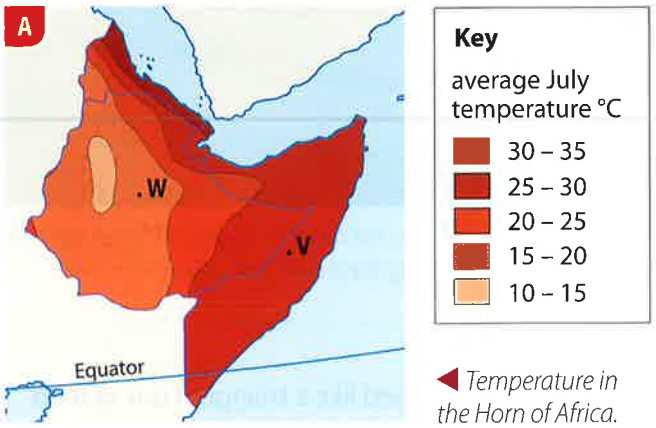
How hot?

The Horn of Africa is in the tropics, and the Equator crosses it. So it is generally hot all year, on the low land.

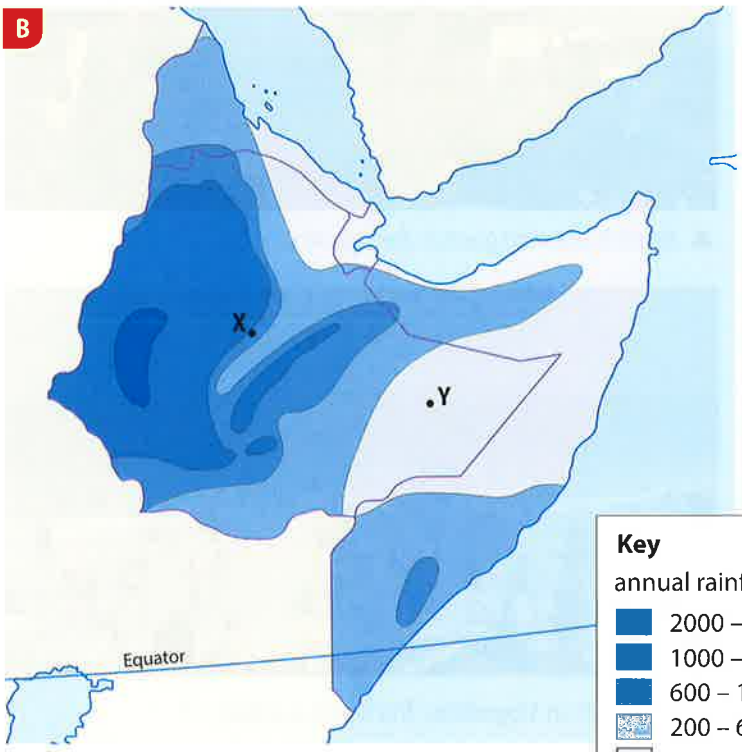
But the higher you go, the cooler it gets. So it is cooler up the Ethiopian Highlands. Look at map **A**.

How much rain?

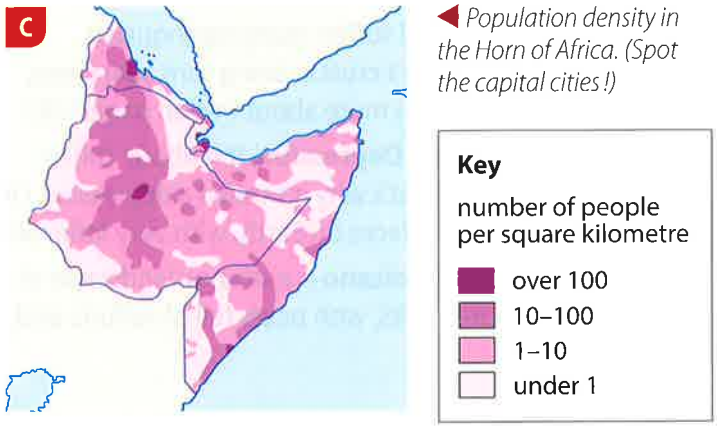
Rain is in very short supply in some places. Look at map **B**.



◀ *Temperature in the Horn of Africa.*



▲ *Rainfall in the Horn of Africa. The two palest areas have least rain, and are mostly semi-desert.*



◀ *Population density in the Horn of Africa. (Spot the capital cities!)*

The palest blue areas on the map get no more than 200 mm of rain a year. So they are very dry. The next paler blue areas get no more than 600 mm. So they are quite dry. But the deeper blue areas get lots of rain.

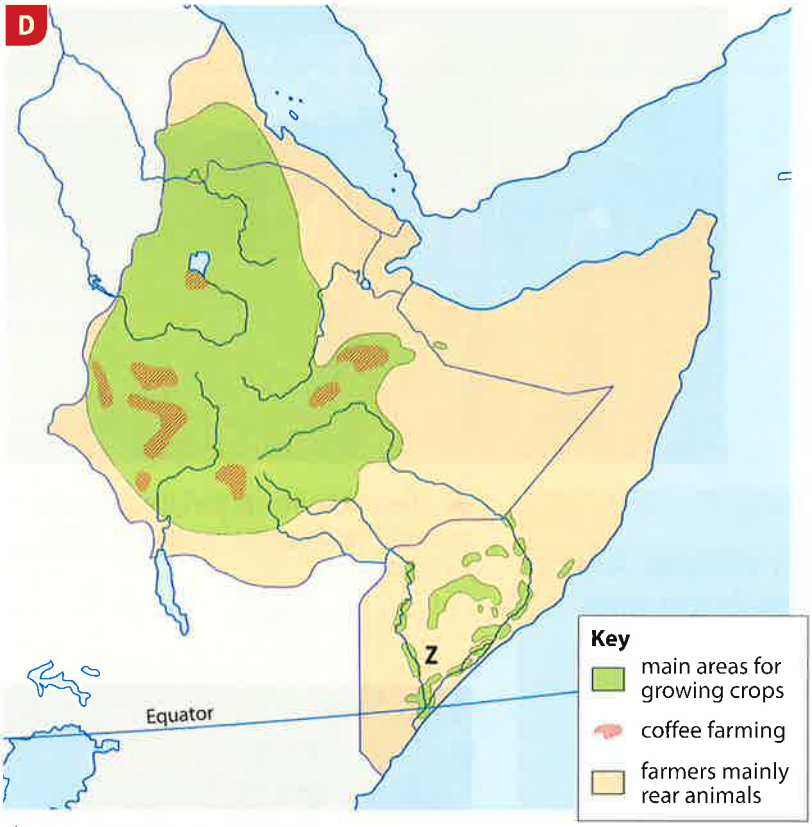
Rain does not fall steadily through the year. There are rainy seasons, and dry seasons. Some areas have two of each in a year.

The big problem is that the rains are not reliable, in the drier areas. They fail every few years. Then vegetation dries out. Crops shrivel. There may be nothing to eat or drink. The result is famine. Thousands may die.

▲ *The graves of two children who died in the famine of 2011, in the Horn of Africa. It is thought that over 250 000 people died in Somalia. More than half were children.*

Adapting to the climate: farming

Most people in the Horn of Africa depend on the land to survive. They grow crops, or rear animals, or both. Look at this map:



▲ *Farming in the Horn of Africa.*

Look at the coffee farming areas in Ethiopia. Coffee is Ethiopia's top export. You will find out about growing coffee in Unit 7.4. And Unit 7.5 is about life as a nomad.

But not everyone farms. In later units you'll read about other ways people earn a living.

Growing crops

People grow crops in this area. For example wheat and other grains, coffee, cotton, sugar, bananas. Some rear animals too.

Rearing animals

Some crops are grown here, but it's mostly too dry. So people rear animals: goats, sheep, cattle, camels.

In dry seasons, people travel with their animals to find food for them: grass and leaves. They take their homes with them. They are **nomads**.

Your turn

1 Overall, it is warm to hot in the Horn of Africa. Why? (Look for it, and the Equator, on the map on page 141.)

2 a What does map **A** show?
b Which place is cooler, V or W?
c Explain why it's cooler there. (Page 120 may help.)

3 a What does map **B** show?
b Give the annual rainfall range at: i X ii Y
c Which place, X or Y, is in a very dry area?

4 Which statement is true, for the Horn of Africa?
A Overall, the upland areas get a lot of rain.
B Overall, the upland areas are very dry.

5 Map **C** shows *population density*. Explain what that is.

6 Compare the patterns in maps **A** and **C**.
a What similarities do you notice?
b See if you can explain any similarities you find.

7 Now compare the patterns in maps **B** and **C**. Explain any similarities you notice.

8 Map **D** is about farming. Compare the patterns in maps **B** and **D**. If you find similarities, try to explain them.

9 a The climate in some parts of the Horn of Africa can lead to great suffering. Explain why.
b See if you can explain why young children suffer most.

10 Look again at map **D**. There are strips around Z, where people grow crops. Try to explain this pattern. (Page 120?)

7.4 Coffee farming in Ethiopia

Not far from you, just now, someone is drinking Ethiopian coffee. Find out about coffee farming here.

The home of coffee

Ethiopia is the home of coffee. The story is that over 1000 years ago, a goatherd noticed that the red berries on a certain tree made his goats very frisky!

Today, coffee is Ethiopia's top export. Around 15 million Ethiopians depend on it, directly or indirectly, for a living.

▲ *Abel and his friends. (He's the one in the middle.) They are coffee farmers too. That's his house.*

The life of a coffee farmer

Almost all of Ethiopia's coffee is grown on small family farms. Many of the farmers have got together and formed groups called **co-operatives**, to sell their coffee.

Abel's story

I have about 700 coffee trees, and now it's picking time. My wife helps. And the older children too – they stay out of school. You pick the cherries when they're red. So we go up and down, up and down, looking for red ones.

We carry the sacks on our backs to the co-op store. It's about 10 km away. They weigh them and give me a receipt. Then they put them in the pulping machine to get the coffee beans out. I collect my money.

I never know in advance how much I'll earn. Sometimes it's so little I cry. Because it means no shoes for the children, or school uniforms, or pencils. And no medicine if they're sick.

Last year I got 20 birr a kilo for the cherries. (*That's 66 pence.*) I had 1050 kilos so I got 21 000 birr. (*That's £690.*) Not much for a year's hard work, is it?

I suppose we're lucky. We grow maize and beans for the family, and avocados and ginger to sell in the market. I plant them between the coffee trees. I don't know how we'd survive without them. We'd starve!

▲ *Each cherry contains two coffee beans. They can be extracted by machine, or by letting the beans soak.*

Did you know?

- It takes at least 30 coffee beans to make a cup of coffee.
- That's 15 coffee cherries!

Did you know?

- Coffee cherries are fruit.

◀ *After the coffee beans are extracted and dried, they are checked by hand. Some are rejected. All that work, to bring us a cup of coffee!*

▲ *Coffee beans ready for export. They go to the port in Djibouti.*

▲ *The beans are roasted before they're sold to make coffee.*

Black gold

Around 2 billion cups of coffee are drunk every day, around the world. Shoppers spend about £50 billion a year on coffee. It is one of the world's most valuable crops. They call coffee black gold!

But most of Ethiopia's coffee farmers are poor. Why? There are many reasons. Here are two:

- Other countries grow coffee too. The more coffee there is, the lower the price, and the less the farmers get. That's how the world market works!
- Four big companies buy up about half of the coffee beans grown around the world. They push for the lowest price they can, to make more profit. They don't worry too much about the farmers.

But there's hope!

Many coffee co-ops in Ethiopia have joined the **Fair Trade** movement. They sell their coffee beans directly to smaller coffee companies, who pay a fair price – plus a bit extra to help the farmers' communities. For example, to help them build a new school, or dig a well. Then, in the shops, many shoppers are happy to pay a bit extra for Fair Trade coffee, to help the farmers.

▲ *Fair Trade coffee from Ethiopia. Look at the Fair Trade logo.*

Your turn

1 Use maps **D**, **A** and **B** in Unit 7.3 to help you decide which statement is true.
   A Coffee grows best in a very hot dry climate.
   B Coffee trees need warmth, but also quite a lot of rain.

2 Suppose you buy some Ethiopian coffee in a supermarket. Many people have played a part in bringing it to you. See how many you can list. Start with *coffee farmer*.

3 **a** The price the coffee farmers receive per kilo of beans changes every year. Try to explain why.
   b What problems might this cause for the farmers?

4 Do you think it would be better for Ethiopia if the farmers grew food instead of coffee? Give your reasons.

5 Now … design an advert for a Facebook page, for Fair Trade coffee. Be persuasive!

7.5 Life as a nomad

Read about the nomads, who travel with their animals to find grazing.

Safiyo's day

My day starts early. I get up at dawn, and help my husband, Madar, to milk the camels. He likes to sing to them first!

I give the children camel milk, and maize porridge. Then Madar and the boys take the animals off to graze. We have 4 camels and 65 goats, so we're doing okay – at least for now.

A lot of my day goes in fetching water from the well, and searching for firewood. Later, I'll bake bread and make goat stew. After sunset, we go to bed. We have only one torch for light.

Tomorrow Madar will walk about 25 km to the town, and sell two goats in the market. He'll buy maize and other things we need. And next day we'll pack up the hut and load the camels and head off to the next place.

No, it's not an easy life. The rains are such a worry. Madar would hate to settle down in one place – but I'd like the children to go to school. I hear there are special schools for nomads now. Maybe we will find one.

▲ *Safiyo's portable home … in Somalia.*

Who and where are the nomads?

Nomads are people who rear animals, and travel with them to find **grazing**.

In the Horn of Africa, nomads live in the dry areas, where there's too little rain for crops, and the land is not fertile. They follow the rain, because wherever it falls, grass and other vegetation grow.

There are at least 10 million nomads in the Horn – and perhaps many more. Over half the population of Somalia are nomads.

▲ *Safiyo's kitchen.*

◀ *At the well. Nomads depend on wells and seasonal rivers for themselves and their animals. (Seasonal rivers flow in the rainy season.)*

▲ *Off again. The camel carries the hut. It might take two weeks or more to reach the next grazing place. A family may stay in one place for a few months, if grazing is good.*

▲ *Many families in the Horn of Africa are **semi-nomadic**. They stay in a village like this one and grow some crops, while the men of the family travel with the animals.*

Enterprising people …

By moving around, following the rains, the nomads do something amazing. They turn poor land, and natural vegetation, into meat and milk. Enough to live on themselves – and sell to other people.

Thanks mainly to the nomads, countries of the Horn officially export hundreds of thousands of pounds' worth of animals each year. There are unofficial exports too, because the nomads ignore borders. They move between countries of the Horn, and down to Kenya, and sell their animals in different places.

▲ *A school for nomads in Somalia. The teacher travels with them. The children go to school in the morning and herd animals in the afternoon.*

… and a tough life

Many factors make the nomads' lives more difficult. Here are three:

- **Unreliable rains**. Without rain, their animals cannot survive. Sadly, the rains fail every few years in the drier parts of the Horn of Africa.
- **Conflict**. For example Somalia had civil war for over 20 years, and peace is still fragile there.
- **Competition for grazing**. Often too many nomads turn up in the same area. That means less food for their animals. It often leads to fights.

What if...

- … we were all nomads?

Your turn

1. Why do people become nomads?
2. Imagine you are a nomad, like Safiyo and her family. In what ways might life be difficult? List as many as you can. (Think about washing? cooking? rain? illness? … and more.)
3. Fetching firewood and water is hard work, for Safiyo and other nomads. Why? (Some of the photos may help.)
4. When there is drought, nomads really suffer. Why?
5. Nomads are very important to the Horn of Africa. Why?
6. What would be helpful for students to learn, in nomad school? Write a list. (No silly suggestions!)
7. What if all the nomads decide to settle down? See how many consequences you can predict. (Both good and bad.)

7.6 Working as a salt miner

This is about mining salt in Ethiopia, in one of the world's most hostile environments.

Salt in the Danakil Depression

This map shows the **Danakil Depression**. As you saw on page 121 it is low: over 100 m below sea level. And it's one of the hottest and most hostile places on Earth.

In the past, when sea levels rose, the Red Sea flooded the depression. Then when they fell again, the trapped water evaporated, leaving thick beds of salt.

Today, most of Ethiopia's salt is mined from these beds by hand – just as it has been for many centuries.

Dejen's day

Dejen whacks his pickaxe into the ground, breaking the salt into slabs. Someone else will follow him, levering the slabs out with wooden poles. Others cut and shape them into neat blocks.

The sun blasts down. It is over 50°C. There is no shade. The ground burns through his sandals. Dejen is used to it. He has been mining salt since he was 16. But sometimes he think of Yonas, who died from the heat last year.

That's it! The camel master has enough salt to load up the camels. He pays Dejen 150 birr for his work (*about £5*). Now they'll head back to Hamed Ela, the village two hours walk away. That's where Dejen lives. He'll go home and rest. At dawn tomorrow he'll be back here, hired by someone else.

Meanwhile, the salt caravan will carry on towards Berahile, over two days' walk away. The camel master will sell the salt to a salt merchant in Berahile. It will go by truck to Mekele, the centre of the salt trade – and from there, all over Ethiopia.

▲ *Dejen at work. By the end of his day, his feet feel like they're on fire.*

Did you know?

- In the Danakil Depression, there are about 20 000 camels working in the salt trade.

Did you know?

- In Ethiopia, blocks of salt were once used as money.

◀ *Cutting and shaping the salt into blocks.*

◀ *The salt caravan. It is heading back to Berahile, the camels loaded with salt.*

▼ *Sometimes guards travel with the caravans, to protect them from bandits. Those leaves are khat, for chewing. (It's banned in many countries.)*

A worry for Dejen

One thing worries Dejen. There is talk of building a paved road all the way from Berahile to Hamed Ela. It would follow the route in the photo above. And one day, trucks may take the road, with machinery to mine the salt. There will be no need for him and his pick axe, or the camels. What will he do then?

The Afar (the ethnic group) control the salt flats. They collect a tax for each camel passing through Hamed Ela. They say they will not allow machinery in. Ever. They will fight it to the bitter end. But what if they fail?

Ten million years from now ...

Ten million years from now, nobody will worry about the salt beds – because they will be under water!

Why? Because the Danakil Depression and Afar Triangle are slowly sinking. They are in the part of Africa where Earth's crust is being torn apart. In time the ocean will flood in. A big chunk of East Africa will be cut off from the rest of Africa. It will become an island.

We can tell this is happening from all the earthquakes and volcanic activity in the area. You will find out more about it later in your course.

▲ *The blue strip down East Africa shows where ocean will flood in, millions of years from now. The result: a big new island.*

Your turn

1 There is a lot of salt in the Danakil Depression. Where did it come from?

2 The highest temperature ever recorded in the UK: 38.5 °C. Now imagine you are doing Dejen's job, in over 50 °C. How does it feel? Write a paragraph. Make it gripping!

3 Why is salt so important? See how many of its uses you can list. (For one thing, *livestock* need to eat some salt.)

4 Look at the main photo at the top of this page. Imagine you are in that place. What do you see? Describe it.

5 How might a paved road to Hamed Ela change Dejen's life? Try to think of both positive and negative impacts. (For example, would it be easier to get fresh food?)

6 One day, far off in the future, most of the Horn of Africa will be part of a new long thin island. Explain why.

7.7 Life on the coast

The Horn of Africa has a long stretch of coastline. Find out about earning a living on the coast.

A long coastline

Look at the coastline of the Horn of Africa. It is long! Around 5600 km. Somalia has the longest coastline in Africa.

The map shows the main ports. Only Ethiopia is **landlocked**. So it has no port. It uses the port at Djibouti.

By the Law of the Sea, a coastal country has rights to the sea and sea floor up to 200 nautical miles (370 km) from its coastline. This area is called its **exclusive economic zone** or **EEZ**.

A country can stop other countries fishing in its EEZ, or exploring for oil, for example.

The coast: a natural resource

The coastline of the Horn of Africa has some beautiful beaches. And sunshine. And coral reefs, where you can snorkel and dive. So the coastal countries could earn a lot from tourism.

Their waters are rich in fish, including tuna, swordfish, and lobster, which people pay a lot for. So they could earn a lot from fishing.

But Eritrea and Somalia have had few tourists. Their fishing industries are run down. That's because of years of conflict in these countries. (Djibouti has been doing better, as you'll see in Unit 7.9.)

However, one group of people did work hard along the coast. They were pirates!

See the next page for more. Then try 'Your turn'.

▲ *Swordfish: worth a lot.*

Your turn

1 a Which countries of the Horn have coastlines?
  b Think about the advantages of having a coastline. List as many as you can.
2 a Ethiopia is *landlocked*. What does that mean?
  b Which port does Ethiopia use to export its coffee?
3 a What does *EEZ* stand for?
  b Why is an EEZ very important, for a coastal country?
  c Do you think the UK has one? (Yes? No? Maybe?)
4 The coastline of the Horn of Africa could attract lots of tourists. But not many have visited it. Why not?
5 The ocean off Somalia is always a busy place for shipping. See if you can explain why. Map **B** on page 134 may help.
6 Now think about those pirates.
  a What made the fishermen become pirates, at first?
  b More and more people became pirates. Why? Give as many reasons as you can. (For example, is Somalia rich?)

Piracy off the Horn of Africa

Before 1991, many people on the coast of Somalia earned a living from fishing.

In 1991, civil war broke out in Somalia. The country fell apart. Foreign fishing boats seized the chance to fish illegally in Somalian waters. They came from as far away as Korea and Japan.

The fishermen fight back

Some fishermen were angry that the fish were being taken. So they armed themselves. They surrounded illegal fishing boats, and fined them.

News spread about this quick way to make money, and others joined in – fishermen, and ex-soldiers, and people who could use GPS to track ships. Soon, all kinds of ships were being hijacked and held to ransom.

A very profitable business

Between 2005 and 2012, pirates collected around £257 million in ransom money. A pirate could earn up to £47 000 in a single hijacking.

Business people invested in the pirates, buying them faster boats and better weapons. In return, they got a share of the ransom. Spies in other countries told the pirates about ships on the way.

Shipping protects itself

Large ships travelling near the Horn began to carry armed guards. Warships from several countries now patrol the area. It seems to work. There were only a couple of hijackings in 2013, plus a few failed attempts.

Peace – and fishing?

By 2013, a fragile peace had returned to Somalia. People hope it will last.

Piracy could start up again at any time. People say the only way to end it is to develop the fishing industry, and export the fish, so that they can earn a decent living. Now there are plans to do just that.

▲ *Pirates guard a hijacked ship in 2008. The crew are on deck because the US Navy asked to see if they were okay.*

▲ *Hands up! Pirates surrender in 2011. The men in the grey boat are part of a special force formed to fight piracy.*

◀ *A big catch: the Sirius Star, an oil tanker from Saudi Arabia, was hijacked in 2009. The parachute is dropping ransom money – 3 million dollars.*

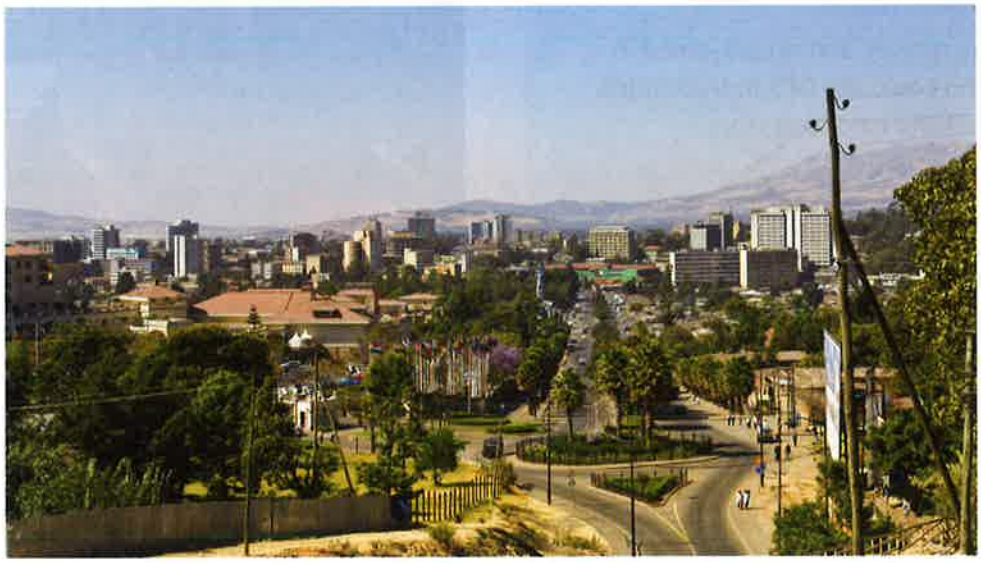
7.8 In the city: Addis Ababa

Like every city in the world, Addis Ababa is a place of contrasts. Find out more here.

Introducing Addis

Addis Ababa is Ethiopia's capital city, and the biggest city in the Horn of Africa. It has a population of around 4.2 million. (So it's half the size of London.)

Addis has a special status in Africa. Many international organizations are based here. One is the **African Union**, which represents 53 African countries. Its aim is to promote peace in Africa, and improve people's lives.



▲ *A view of the city, looking towards the centre.*

▲ *Addis has houses like this one …*

What's it like?

- Addis Ababa is on high land: over 2300 metres above sea level.
- You'll see fine buildings, and shopping malls, and modern blocks of flats. And all kinds of businesses.
- It is growing fast. The population increases by over 140 000 people a year.
- It has lots of people with no work: over a quarter of the workforce.
- And think about this: the government owns all the land, and over half of the houses, which it rents out. (The government owns all land in Ethiopia.)

The housing problem

Addis has one big problem: **slums**. In fact over 75% of the city counts as slums.

The slums are mostly run-down housing which the government rents out at a very low rent. There are also thousands of shacks people built illegally.

Life in a slum is not easy. You may have to queue for water at a tap in the street. You will share smelly toilets – holes in the ground – with many households. There will be lots of rubbish, since there are no bin men in the slums to collect it. And your roof might leak …

▶ *… and many like these …*

▲ *You'll see a lot of these in Addis: share taxis. The weyela (conductor) shouts out the destination, and takes your money.*

▲ *You'll see a lot of shoeshine boys too. Mebrete is fourteen. He started polishing shoes when he was eleven.*

But the good news is ...

The good news is: the government is building hundreds of thousands of cheap new flats for slum dwellers to buy, and clearing the slums away.

You put your name on a list, and the new flats are awarded by lottery. You could be lucky!

Did you know?

- Addis has a special status in Africa because ... Ethiopia was never colonised.
- Italy tried!

Did you know?

- A hundred years ago, Britain had some shocking slums.

▲ *Up go new flats for slum dwellers.*

Your turn

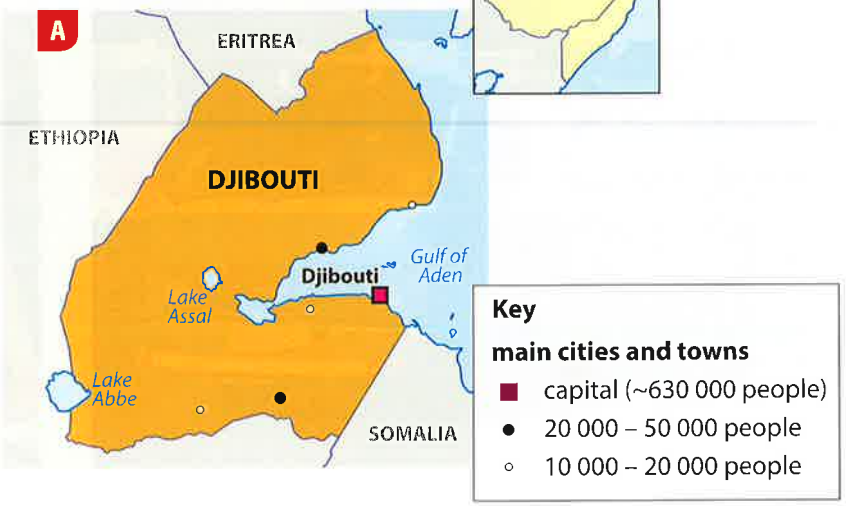
1. Where in Ethiopia is Addis Ababa?
2. Study the photos of Addis Ababa on page 132. Then write down four things you notice about the city.
3. Now see how much you can say about the climate of Addis, from maps **A** and **B** on page 122.
4. The government owns over half of the housing in Addis Ababa, and charges low rents. Would this be a good idea for the UK? See if you can give pros and cons.
5. Addis gains over 140 000 more people a year. They mostly arrive from rural areas. What kinds of problems could this cause for the city?
6. Look at the photo at the bottom of page 132. Why might people build shacks like those?
7. It will cost a lot of money to clear away the slums in Addis. Why should the government bother? Give as many reasons as you can.

7.9 Djibouti: a great location

Here you can learn more about the smallest country in the Horn of Africa.

What's it like?

- Djibouti is a tiny country: not much bigger than Wales, and with fewer people than Birmingham.
- It is mostly hot and dry, and is mostly semi-desert.
- Its capital city is also called Djibouti, and around 70% of the population lives there.
- About 77% of the population is **urban**. Most of the rest are nomads.
- Djibouti has few natural resources. (Salt is one of them.) But it has one big advantage: its **location**.



A great location

Djibouti sits at the entrance to the Red Sea. Look at map **B**.

About half of the world's container shipping passes along the Red Sea, on journeys from Africa and Asia to Europe and back.

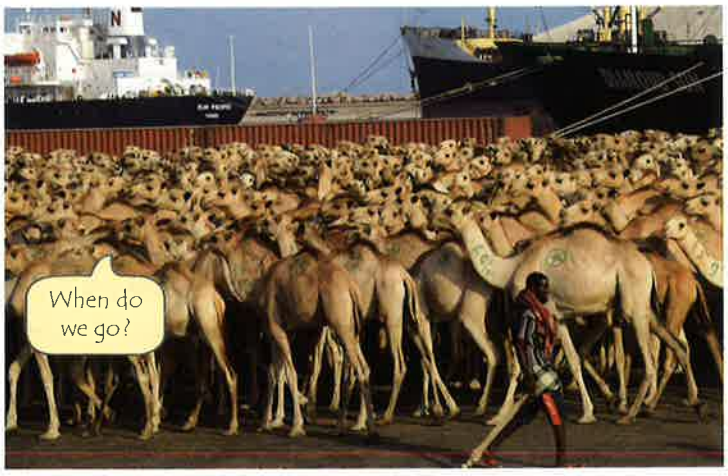
And that's how Djibouti earns money. The city has a port where ships can load and unload cargo, and get fuel. It acts as the main port for Ethiopia.

Other countries like its location too. France and the USA have military bases in Djibouti. And warships from several other countries are based there, to fight piracy in the Indian Ocean. Djibouti earns money from all of them.

For the internet too ...

It's not just shipping. Djibouti is a hub for phone and internet traffic too. It partly owns the cables that lie along the bed of the Red Sea, linking Europe to Africa and Asia. The cables have landing stations at Djibouti.

▲ *Early morning view of Djibouti, the capital city of Djibouti.*



▲ *Waiting for their ship, at the Port of Djibouti.*

▲ *In the market in the capital city. The fruit and vegetables were grown in Djibouti.*

▲ *Djibouti exports salt from Lake Assal. It is the world's largest salt reserve. It sits at the lowest point in Africa.*

The challenges it faces

- Djibouti can't grow much food, since it is mostly semi-desert. Some fruit and vegetables are grown there, but most food is imported.
- So most people earn a living by providing services. (Many are linked to shipping.) But unemployment is very high. Over half of the workforce has no work.
- And that means poverty. About 75% of Djiboutians live in poverty – and over 40% are very poor.

This is a big challenge for the government. To help create jobs, it is making the port bigger. It is welcoming tourists. And it has invited foreign banks in. It plans to become the financial centre for the Horn.

Meanwhile, it's spending more on education for its young people, to give them the skills for work.

▲ *Over you go! Tourists on a diving trip off the coast of Djibouti. Tourism helps to create jobs.*

Your turn

1 This is about Djibouti. But some words are jumbled, and some are incomplete. Write out the paragraph correctly.
Djibouti is the *llesstam* country in the Horn of Africa. It is in a brilliant *tiolocan*. It sits where the *G*____ of ____ meets the *R*____ *S*____. So it can earn a lot of *yemon* from *spish*.

2 Now see if you can draw a sketch map, with labels and notes, to explain why its location is so important for Djibouti. Decide for yourself what you need to show.

3 In spite of its great location, Djibouti does have some problems. List them.

4 A good education for its young people will help Djibouti. See if you can explain why. (And is the same true for the UK?)

5 Tourism will bring jobs to Djibouti. See how many kinds of jobs you can list, linked to tourism. (For example, taxi drivers?)

6 Now … design an advert for a business magazine, to attract companies to Djibouti.

7.10 How is the Horn of Africa doing?

Here you'll explore some data, to compare the countries of the Horn with each other … and with the UK.

Using data to compare countries

Data means facts and figures. Using data to compare countries is like being a detective. You can learn a lot – and it's fun!

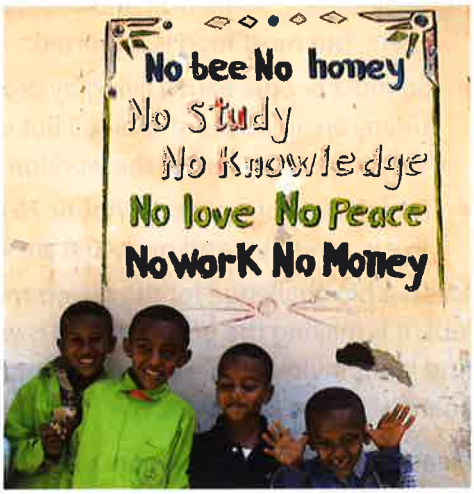
This table gives some data about the countries of the Horn, and the UK.

	Djibouti	Eritrea	Ethiopia	Somalia	UK
Population (millions)	0.9	5.9	85.2	9.8	64
% aged 14 or under	34	41	44	44	17
% living in towns and cities	77	21	17	38	80
How long a new baby is likely to live for (years)	62	63	60	51	80
% of population with access to clean safe water	92	61	44	29	100
What % of workforce are farmers?	under 30	80	85	71	1.4
GDP per person (PPP) (in dollars)	$2700	$800	$1200	$600	$37 500

GDP per person (PPP)

Look at the last row in the table. It tells us how well off the countries are. *GDP per person (PPP)* may sound difficult. It's not really!

- **GDP** stands for **gross domestic product**. This can be found by adding up how much everyone in the country earns in a year. It is given in dollars.
- GDP divided by the population gives you **GDP per person**.
- A dollar can buy more in one country than another. So next, GDP per person is adjusted, to allow for this. The result is **GDP per person (PPP)**. It lets you compare countries fairly. (PPP stands for *purchasing power parity*.)



▲ *Outside a primary school in Eritrea.*

Clues from GDP per person (PPP)

If GDP per person (PPP) is low, it is a sign that a country is poor, overall. So if you go there, you are likely to find that:

- many people have no electricity in their homes.
- many have no piped water. They fetch water from a well, or a river.
- many have no access to a proper toilet or latrine.
- many do not get enough food to stay healthy.
- there are not enough doctors, or clinics, or hospitals.
- a large number of people are **unemployed**, or **underemployed**.

You will find that people are poorest in rural villages.
But remember: even in the very poorest countries, there are some rich people.

▶ *Many countries (including the UK) give aid to the Horn of Africa. Aid can take many forms. This doctor is part of a Chinese team providing medical care in Djibouti.*

▲ *An oil rig set up by a Canadian company in Somalia, to explore for oil. This photo was taken on an open day in 2012.*

▲ *A Chinese company set up this shoe factory in Ethiopia, not far from Addis Ababa. It employs 2000 people.*

So how are the countries of the Horn doing?

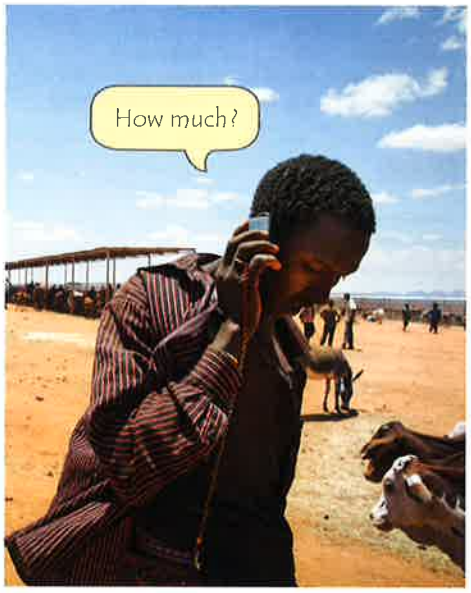
Today, the countries of the Horn of Africa are not well off. You can tell from the low GDP per person (PPP) values.

There are many causes of poverty. You will look at them later in your course. But for these countries, one factor is the years of conflict they have suffered.

The good news is ...

They may be poor today – but the good news is that the countries of the Horn are developing quite fast, and especially Ethiopia. All these play a part.

- More and more factories are opening. (Primark, Tesco, and Asda all have clothing made in factories in Ethiopia.)
- Companies are exploring for oil and gas, with high hopes of finding them.
- Education and healthcare are improving, with help from other countries.
- Roads and railways are being improved.
- The use of mobile phones and the internet is spreading fast.



▲ *His mobile allows this cattle trader to check cattle prices in different places.*

Your turn

1 See if you can pick out two rows from the table, that show a big contrast between the UK and the Horn of Africa.

2 GDP per person (PPP) gives us an idea of how well off the people in a country are, on average.
   a What is its value for: i Somalia? ii Djibouti? iii the UK?
   b It is bigger for the UK than for Somalia. How many times bigger?

3 In which countries of the Horn is *life expectancy* less than 65 years? (Glossary?)

4 Which Horn country has the highest % for urban population?

5 In one country in the table, only 29 people out of every 100 have access to clean safe water. Which country?

6 Many people in the Horn of Africa are *unemployed*. Many are *underemployed*. See if you can explain the difference.

7 Conflict can make a country worse off. Try to explain why.

8 How could this help a country in the Horn of Africa?
   a finding oil and gas
   b new factories opening
   c better roads and railways
   d better healthcare

9 Look at the message on the wall, in the photo on page 136. Then write a similar message to suit *your* school.

Ordnance Survey Symbols

ROADS AND PATHS 1: 25 000

Motorway
Dual carriageway
Main road
Secondary road
Narrow road with passing places
Road under construction
Road generally more than 4 m wide
Road generally less than 4 m wide
Other road, drive or track, fenced and unfenced
Gradient: steeper than 1 in 5; 1 in 7 to 1 in 5
Ferry; Ferry P – passenger only
Path

PUBLIC RIGHTS OF WAY

1:25 000	1:50 000	
		Footpath
		Bridleway
		Byway open to all traffic
		Restricted bridleway

RAILWAYS 1: 25 000

Multiple track
Single track
Narrow gauge/Light rapid transit system
Road over; road under; level crossing
Cutting; tunnel; embankment
Station, open to passengers; siding

BOUNDARIES 1: 50 000

National
District
County, Unitary Authority, Metropolitan District or London Borough
National Park

HEIGHTS/ROCK FEATURES 1: 50 000

Contour lines
144 Spot height to the nearest metre above sea level

ABBREVIATIONS 1: 25 000 and 1: 50 000

PO / P	Post office	PC	Public convenience (rural areas)
PH	Public house	TH	Town Hall, Guildhall or equivalent
MS	Milestone	Sch	School
MP	Milepost	Coll	College
CH	Clubhouse	Mus	Museum
CG	Cattlegrid	Cemy	Cemetery
Fm	Farm	Hosp	Hospital

ANTIQUITIES 1: 25 000 and 1: 50 000

VILLA Roman
Castle Non-Roman
Battlefield (with date)
Visible earthwork

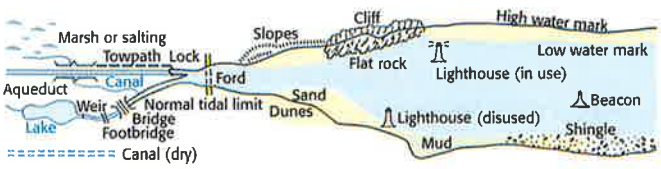
LAND FEATURES 1: 25 000 and/or 1: 50 000

ruin Buildings
Public building
Bus or coach station
Place of Worship (current or former): with tower; with spire, minaret or dome; without such additions
Chimney or tower
Glass structure
Heliport
Triangulation pillar
Mast
Wind pump / wind turbine
Windmill
Graticule intersection
Cutting, embankment
Quarry
Spoil heap, refuse tip or dump
Coniferous wood
Non-coniferous wood
Mixed wood
Orchard
Park or ornamental ground
Forestry Commission access land
National Trust – always open
National Trust, limited access, observe local signs
National Trust for Scotland

TOURIST INFORMATION 1: 25 000 and/or 1: 50 000

Parking
Visitor centre
Information centre
Recreation/leisure/sports centre
Telephone
Camp site/Caravan site
Golf course or links
Viewpoint
PC Public convenience (toilet)
Picnic site
Pub/s
Cathedral/Abbey
Museum
Castle/fort
Building of historic interest
English Heritage
Garden
Nature reserve
Water activities
Fishing
Other tourist feature

WATER FEATURES 1: 25 000 and/or 1: 50 000



Map of the British Isles

Map of the world

international boundary
capital city

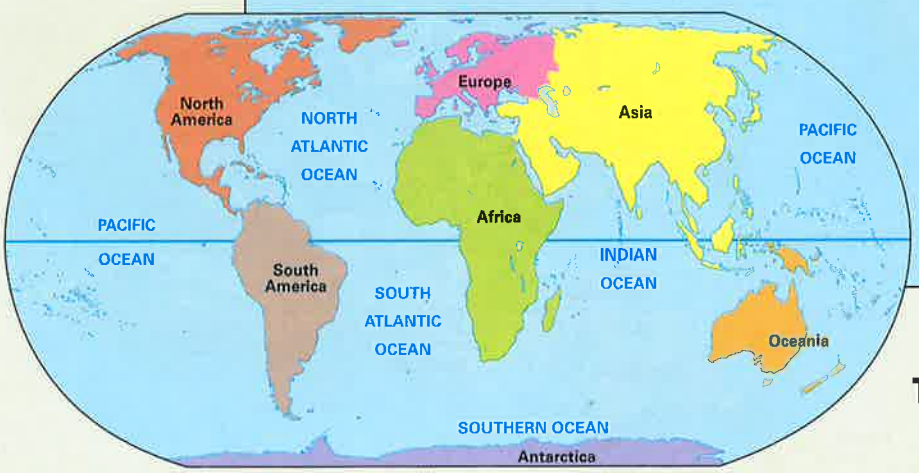
abbreviations

BELG.	BELGIUM
B-H.	BOSNIA-HERZEGOVINA
C.	CROATIA
CENT. AF. REP.	CENTRAL AFRICAN REPUBLIC
CZ.	CZECH REPUBLIC
F.	FYROM (Former Yugoslav Republic of Macedonia)
K.	KOSOVO
LITH.	LITHUANIA
MT.	MONTENEGRO
LUX.	LUXEMBOURG
NETH.	NETHERLANDS
S.	SLOVENIA
SE.	SERBIA
SL.	SLOVAKIA
SWITZ.	SWITZERLAND
U.A.E.	UNITED ARAB EMIRATES
U.S.A.	UNITED STATES OF AMERICA

Equatorial Scale 1: 95 000 000

Did you know?

- Earth is 4600 million years old.
- It weighs 6000 million million million tonnes.



The continents and oceans

Amazing – but true!

- Nearly 70% of Earth is covered by saltwater.
- Nearly 1/3 is covered by the Pacific Ocean.
- 10% of the land is covered by glaciers.
- 20% of the land is covered by deserts.

World champions

- Largest continent – Asia
- Longest river – The Nile, Africa
- Highest mountain on land – Everest, Nepal
- Highest mountain in the ocean – Mauna, Hawai
- Largest desert – Sahara, North Africa
- Largest ocean – Pacific

Did you know?

The world has:

- over 190 countries
- over 7 billion people
- over 6000 different languages

Glossary

A

abrasion – scraping away material

abstract – pump out water to be used as a water supply (from a river or aquifer)

aerial photo – a photo taken from the air

aquifer – underground rock that holds a large amount of fresh water

arête – a sharp ridge, shaped by a glacier

asteroid – large chunks of rock that orbit the Sun; it is thought that they are material left over when planets formed

asylum seeker – a person who flees to another country for safety, and asks for permission to stay there

atmosphere – the layer of gas around Earth

B

bedload – stones and other fragments that roll or bounce along a river bed

Big Bang – the explosion of energy that led to the formation of the Universe

biome – a very large area with a similar climate throughout, and similar plants, and animals

C

capital city – the city where the country's government is based

climate – what the weather in a place is usually like, over the year

condense – to change from gas to liquid

confluence – where two rivers join

continent – one of Earth's great land masses; there are seven continents

contour line – line on a map joining places that are the same height above sea level

country – humans have divided continents into political units called countries

core – the inner layer of Earth, made mainly of iron plus a little nickel

corrie – a hollow where a glacier started; corries are also called cirques, and cwms

crags – steep rugged cliffs

crust – the thin outer layer of Earth, made of rock

D

deposit – to drop material; rivers deposit sediment as they approach the sea

depression – an area of sunken land

desertification – where land is being turned into desert, often through overuse

DNA – deoxyribonucleic acid; it forms the genes that tell our cells how to develop

drought – there is less rain than usual, so there is not enough water for our needs

drumlin – a long smooth hill shaped like the back of a spoon, created by a glacier

E

earthquake – the shaking of Earth's crust, caused by sudden rock movement

economic – about money and business

economy – all the business activity going on in a country; if more goods and services are being produced and sold, we say the economy is growing

economic migrants – people who move to a new place to find work, and to improve their standard of living

EEZ – exclusive economic zone; the area off a country's coast, where only that country has the right to fish, explore for oil, and so on

embankment – a bank of earth or concrete built up on a river bank, to stop the river flooding

emigrant – a person who leaves his or her own country to settle in another country

eon – the biggest block of time in the geological timescale

Equator – an imaginary line around the middle of Earth (at 0° latitude)

erosion – the wearing away of rock, stones and soil by rivers, waves, wind or glaciers

erratic – a large rock that's different from the types of rock around it; it was carried there by a glacier

evaporation – the change from liquid to gas

evolution – the process by which new species of living things develop

exploit – to make use of a place, or people, or things, for your own benefit

F

famine – when food is scarce; people may starve to death

flash flood – a sudden flood usually caused by a very heavy burst of rain

flood – an overflow of water from the river

flood defences – structures built to prevent flooding; for example an embankment

floodplain – flat land around a river that gets flooded when the river overflows

fossil fuel – coal, oil, natural gas

freeze-thaw weathering – where water freezes in cracks in rock, making them bigger; eventually the rock breaks up

fresh water – the water found in rivers, lakes, wells, and streams; it is not salty

G

galaxy – a group of billions of stars

geological timescale – it shows the time since Earth began

geologist – a scientist who studies rocks, earthquakes, and so on

glacier – a river of ice

glacial – to do with glaciers

glaciated – covered by glaciers, now or in the past

global warming – the rise in average temperatures around the world

gorge – a narrow valley with steep sides

gravity – the force of attraction that holds planets in the solar system, and holds us on Earth

grazing – land with grass and other vegetation, where animals can feed

grid reference – a set of numbers, or numbers and letters, that tells you where to find something on a map

ground moraine – the material a glacier drops all over the ground when it melts

groundwater – rainwater that has soaked down through the ground and filled up the cracks in the rock below

gulf – a large area of ocean that is partly enclosed by land

H

hanging valley – a valley that hangs above a larger one; if it has a river, the water will pour down to the larger valley as a waterfall

Homo sapiens – our species; there were other species of humans before us

hydroelectricity – electricity generated when flowing water drives a turbine

I

ice age – a time when Earth's average temperature was lower than usual, and glaciers spread

ice shelf – a sheet of ice that is attached to land, but floats on the ocean

immigrant – a person who moves here from another country, to live

impermeable – does not let water pass through

independence – when a country governs itself; the European colonies in Africa fought for independence

Industrial Revolution – the period (about 1760 – 1840) when many new machines were invented, and many factories built

infiltration – soaking into the ground

international – to do with more than one country

invader – enters a country to attack it

irrigate – to water crops

L

land bridge – land that is exposed when sea levels fall; people can walk across it

landform – a feature formed by erosion or deposition (for example a gorge)

lateral moraine – the material a glacier deposits along the sides of its route

latitude – how far a place is north or south of the Equator; it is measured in degrees

lava – melted rock from a volcano

leeward – sheltered from the wind

life expectancy – how many years a new baby can expect to live for, on average

local – to do with the area around you

longitude – how far a place is east or west of the Prime Meridian; it is measured in degrees

long profile – the side view of a river from source to mouth, showing how the slope changes

M

magma – melted rock below Earth's surface; at the surface it is called lava

mantle – the middle layer of Earth, between the crust and the core

manufacturing – making things in factories

mass extinction – when a large number of species die off; for example because an ice age arrives

meander – a bend in a river

media – forms of communication, such as TV, radio, newspapers, the internet

meltwater – water from a melting volcano

mental map – a map you carry in your head

meteorite – a chunk of rock that lands on Earth, from space

migrant – a person who moves to another part of the country, or another country, often just to work for a while

moraine – material deposited by a glacier

multicultural – has different ethnic groups

N

national – to do with the whole country (for example the national anthem)

nomad – a person who rears animals, and travels with them to find grazing

North Atlantic Drift – a warm current in the Atlantic Ocean; it keeps the weather on the west coast of Britain mild in winter

O

oxbow lake – a lake formed when a loop in a river gets cut off

OS maps – detailed maps of places drawn by the Ordnance Survey, to scale

P

permeable – lets water soak through

persecute – to punish or treat cruelly (for example because of race or religion)

plan – a map of a small area (such as the school, or a room) drawn to scale

plateau – an area of fairly flat high land

plunge pool – deep pool below a waterfall

population – the number of people living in a place

population density – the average number of people living in a place, per square kilometre

precipitation – water falling from the sky (as rain, sleet, hail, snow)

prevailing winds – the ones that blow most often; in the UK they are south west winds (they blow from the south west)

Prime Meridian – an imaginary line that circles Earth from pole to pole; it is at 0° longitude

pyramidal peak – a sharp peak on a mountain, created by glacial erosion

R

rainforest – has lush vegetation, with many different species of plants and animals

refugee – a person who has been forced to flee from danger (for example from war)

ribbon lake – long thin lake in a trough created by glacial erosion

river basin – the land from which water drains into the river

rural area – an area that is mainly countryside, but may have villages and small towns

S

savanna – has grassy plains with scattered trees

scale – the ratio of the distance on a map to the real distance

sediment – a layer of material (stones, sand and mud) deposited by a river

semi-desert – dry, and not much vegetation

settlement – a place where people live; it could be a hamlet, village, town or city

sewage works – where the waste liquid from our homes is cleaned up, before it is put back in the river

sketch map – a simple map to show what a place is like, or how to get there; it is not drawn to scale

slum – area of very poor housing

solar system – made up of our Sun, the planets, their moons, and asteroids and other floating objects

source – the starting point of a river

sparsely populated – not many live there

species – a type of plant or animal

spot height – the exact height, in metres, at a spot on an OS map (look for a number)

stereotyped – about fixed opinions people have, that do not reflect reality

striations – grooves in rock, caused by abrasion when glaciers flowed over it

suspension – small particles of rock and soil carried along in a river

T

tarn – lakes in corries are often called tarns in the Lake District

terminal moraine – the ridge of material dropped at the front of a melting glacier

till – a mixture of rocks, clay, sand and other sediment dropped by a glacier

transport – to carry things along

tributary – a river that flows into a larger one

tundra – a cold region where the ground is deeply frozen; only the surface thaws in summer, allowing small plants to grow

U

underemployed – has paid work, but not enough, or not making full use of skills

unemployed – has no paid work

urban area – a built-up area (town or city)

U-shaped valley – a valley shaped like the letter U, carved out by a glacier

V

valley – low land, with higher land on each side; it was carved out by a river or glacier

volcano – a place where melted rock erupts

V-shaped valley – a valley shaped like the letter V, carved out by a river

W

water cycle – water evaporates from the sea, falls as rain, and returns to the sea in rivers

waterfall – where a river or stream flows over a steep drop

water table – the upper surface of groundwater

water vapour – water in gas form

watershed – the dividing line between one river basin and the next – usually a ridge of land

weather – the state of the atmosphere – for example how warm or wet it is

weathering – the breaking down of rock, caused mainly by the weather; it turns into soil in the end

windward – facing into the wind

Index