

A Geography Course
for Secondary Schools

CHRISTINE MOORCROFT

WORLD WATCH Geography

1
TEACHING GUIDE

OXFORD
UNIVERSITY PRESS

Introduction

An outline of the course

World Watch is a geography course for the 21st century. It is designed for secondary schools that want to stimulate curiosity, thinking skills, and a love of learning. The course comprises four components: Student's Books, Skills Books, My E-Mate companion website, and Teaching Guides.

Core features

- It draws its content and skills from international secondary school syllabuses while focusing on Pakistan for examples.
- At all levels, learning is built on students' knowledge; the teacher eliciting what they already know and building on this, not simply loading them with facts.
- The language, content, and tasks are progressively graded according to class levels.
- Each level is split into separate units, each focusing on a different topic.
- High priority is given to independent and critical thinking skills.
- Ideas for discussion are provided to help students to express their own ideas in open-ended tasks.
- Mapping skills are taught in a progressive way that builds on the students' previous learning.
- Diagrams and charts/tables are used to vary the presentation of content.
- Students are encouraged to make connections between the geographical environment and the way people live.

Student's Books

- The Student's Books form the core of the course. The illustrations, photographs, and maps bring alive the familiar environment and distant places, and both natural and man-made geographical features.
- The 'Contents' page details the learning outcomes for each unit.
- Each unit of the Student's Book consists mainly of reading texts and making observations, followed by assessment questions.
- The 'Overview' at the end of each unit virtually represents the various topics in the unit and how they are interlinked to each other.
- Fact boxes contain interesting information about the relevant topics and key fact boxes at the end of each unit summarize the unit.

Skills Books

- At each level, there is an accompanying Skills Book.
- The tasks are varied and enjoyable, and include maps, diagrams, charts or tables, crosswords, fill-in-the-blanks, and situational questions.
- Skills Book pages should be introduced in class and can be completed either in class or for homework.
- Students are usually expected to write in the Skills Book.
- There is a brief learning outcome at the top of every page.

Teaching Guides

Teaching Guides are an invaluable resource for the teacher. It provides a framework for formative assessment of students during each lesson. It has the following features:

- background knowledge
- student learning outcomes
- step-by-step lesson plans
- ideas for further activities and student research

Contents

Page Nos/ Units	Teaching objectives	Learning outcomes	Keywords and phrases
	Student's and Skills Books	Students should be able to:	
Page 1 Unit 1 The universe	<ul style="list-style-type: none"> to develop the students' knowledge of the Earth's place in the universe, including the formation of the stars and planets to encourage the students to observe the sky, and to help them to understand and question their observations 	<ul style="list-style-type: none"> explain how the stars and planets were formed and describe their movements. differentiate between different heavenly bodies in space. explain how eclipses occur. 	constellation, nebula, galaxy, orbit, solar system, force, gravity, solar eclipse, lunar eclipse, planet, star
Page 9 Unit 2 Satellite Earth	<ul style="list-style-type: none"> to explain the connection between seasons, the calendar, and the measurement of time to develop an understanding of the use of longitude in measuring time 	<ul style="list-style-type: none"> explain how the year and day and night are related to the Earth's orbit and rotation. explain how time is measured and the need for time zones linked to longitude. explain how the Earth's tilt causes the seasons. 	axis, rotate, rotation, tilt, Equator, latitude, longitude, Prime Meridian, time zone, solstice, equinox
Page 17 Unit 3 Mapping the world	<ul style="list-style-type: none"> to explain the key elements of maps and scale drawings 	<ul style="list-style-type: none"> relate how maps developed. read and draw scale plans and maps. use grid references and lines of latitude and longitude to locate places. 	symbol, key, scale, grid line, grid reference, grid square, easting, northing
Page 24 Unit 4 Types of maps	<ul style="list-style-type: none"> to explain the history of maps and how and why they developed to develop an understanding of the purposes of different types of maps: political, physical, and thematic 	<ul style="list-style-type: none"> relate how maps developed. use political, physical, and thematic maps to find information about places. explain how to use different types of maps. interpret thematic maps that provide data on themes such as population or average temperatures. 	physical map, relief map, thematic map, sea level, elevation, plain, climate, precipitation, population density

Page Nos/ Units	Teaching objectives	Learning outcomes	Keywords and phrases
	Student's and Skills Books	Students should be able to:	
Page 31 Unit 5 Living with the climate	<ul style="list-style-type: none"> to explain the difference between weather and climate to explore how people adapt their lives and buildings to suit the climate to develop students' knowledge about the climatic zones of Pakistan 	<ul style="list-style-type: none"> identify the factors that affect the climate of a place. discuss extreme weather in Pakistan and other parts of the world. give examples of how people adapt their lives to live in extreme climates. explain how climate affects the way buildings, roads, and other parts of the infrastructure are built. 	climatic zone, humidity, precipitation, heat wave, permafrost, foundations, vegetation, desalination, arid, temperate climate, tropical climate, Mediterranean climate, mountain climate, polar climate, tundra, irrigation
Page 38 Unit 6 Forests of the world	<ul style="list-style-type: none"> to introduce different types of forests to develop an appreciation of the importance of forests to the environment 	<ul style="list-style-type: none"> explain how climate and physical features affect a forest. describe how people live in tropical rainforests. explain how forests and woodland improve the environment. compare planted forests in Pakistan and the UK. 	conifer, coniferous, deciduous, mountain range, canopy, emergent layer, tropical rainforest, habitat, basin, plain, erosion, rubber-tapping, desertification, pollution
Page 47 Unit 7 Mountains, plateaus, and valleys	<ul style="list-style-type: none"> to develop an understanding of how the movement of tectonic plates has shaped the land, and continues to do so to explain physical features and their formation: mountains, plateaus, and valleys to explain how contour lines are used on maps 	<ul style="list-style-type: none"> explain how the movement of tectonic plates has changed the landscape. explain how different types of mountains, plateaus, and valleys are formed. use contours to find out about the elevation and shape of a landscape. 	tectonic plate, plate boundary, fold mountain, fault block mountain, volcanic mountain, magma, lava, dome mountain, plateau, rift valley, landform, contour line, elevation
Page 54 Unit 8 Plains and rivers	<ul style="list-style-type: none"> to explain where in the world are plains located to explain the course of a river and the formation of the features of each part of its course 	<ul style="list-style-type: none"> recognize and describe different types of plain. explain how physical features and climate affect vegetation of a plain. identify and describe the features of different parts of the course of a river. 	plain, grassland, desert, prairie, savannah, steppe, pampas, tundra, river plain, channel, sediment, source, spring, rapids, gorge, canyon, tributary, reservoir, irrigation, hydroelectricity, meander, oxbow lake, delta, estuary, river mouth, tide

Page Nos/ Units	Teaching objectives	Learning outcomes	Keywords and phrases
	Student's and Skills Books	Students should be able to:	
Page 61 Unit 9 Landscapes of Pakistan	<ul style="list-style-type: none"> to develop an awareness of the variety of landscapes found in Pakistan to explore the ways in which the physical features of the land affect the development of settlements to explain the importance of mangrove forests 	<ul style="list-style-type: none"> describe the various landscapes of Pakistan and locate examples of them. explain how the physical features of the land affect people's lives. discuss how mangrove forests are important for our environment and why are they disappearing. 	mountain pass, confluence, mud volcano, mudflat, headland, mangrove, deforestation
Page 67 Unit 10 The people of Pakistan	<ul style="list-style-type: none"> to develop an awareness of the differences and similarities between the people of different regions of Pakistan to develop an appreciation of the diversity of languages, cultures, traditions, and occupations that characterize different regions of Pakistan 	<ul style="list-style-type: none"> discuss how Pakistan's rich history has affected people's lives today. explore the distribution of the population of Pakistan. describe the cultures of the people of different regions of Pakistan. 	population density, rural, urban, literacy rate, socioeconomic, ancestral, subsistence farming
Page 73 Unit 11 Migration	<ul style="list-style-type: none"> to demonstrate and explain population distribution within Pakistan and globally to develop an appreciation of global migration to develop an awareness of the reasons why people migrate to explore migration between Pakistan and other countries 	<ul style="list-style-type: none"> explain what makes different people migrate. identify the places to and from where Pakistanis migrate, and give reasons for this. explore the reasons why people migrate to Pakistan. 	migrant, immigrant, emigrant, estimate, expatriate, persecution, normalize, asylum seeker, refugee, internally displaced person (IDP), illegal immigrant, drought

Background knowledge for the unit

This unit explains how observations of deep space help scientists to discover, understand, and explain the structure of the known universe, and how the stars and the planets formed. It helps the students to begin to understand these phenomena.

The stars have been described for many centuries as ‘fixed’, but as early as 1718 CE, scientists made measurements over long periods of time that showed that the stars actually move. Modern technology has enabled scientists to discover that stars move around other very distant stars, and entire galaxies of stars move around other galaxies, but the distances are so vast that this movement is otherwise unnoticeable from the Earth. The positions of the stars in the sky in relation to our solar system have remained the same for many thousands of years.

Two factors affect the observable differences between the positions of the stars viewed from the Earth:

- i) The Earth’s orbit against the background of the stars, because this enabled astronomers in the past to calculate the position of the Earth in its orbit. (Although before the 16th century most of them believed that the Sun and the planets orbited the Earth.) Their instruments enabled them to measure the angles between the stars and other objects.
- ii) The Earth’s rotation, which makes the stars appear to rotate around Polaris, the Pole Star, because this star is directly above the North Pole.

The students could make their own observations of the effect of the Earth’s rotation on the apparent positions of the stars. On a clear evening, after dark, place a camera on the ground facing directly up at the sky with the shutter on a manual setting so that it stays open. The effect will be circular trails of light, as if the stars were moving round

Polaris (the North Star). Even an amateur should be able to get a photo of star trails. (You see trails of light made in a similar way in photos of other moving lights at night, for example, the headlights of moving vehicles.) To get a map of the night sky where you are, go to <http://www.skymaponline.net> and enter the place, date, and time.

Before we proceed

Before undertaking any work on space or the sky, it is vital to ensure that the students understand the danger of looking directly at the Sun, even when it darkens during an eclipse. Specially-made eye protection is available to protect the eyes from the ultraviolet radiation of the Sun that can cause damage to the eyes.

It is useful to remind the students that geographers, astronomers, and others make observations and try to explain them. Sometimes they find new information that challenges their theories, and may lead them to change their explanation a little, to explain the new observations, or they might have to come up with a new theory.

For example, the Sun looks as if it orbits the Earth, because it appears to move across the sky from east to west and to reappear in the east. The brightest planets (Jupiter, Saturn, Mars, Venus, and Mercury) can be seen without a telescope, so even ancient astronomers could observe their movements. They used mathematics to try to explain why, if the planets and the Sun moved around the Earth, the planets appeared to change direction. The first astronomer known to suggest that the planets move around the Sun was Aristarchus of Samos (in Greece), who lived from 310–230 BCE. As scientific instruments improved, notably with the invention of the telescope in 1608 CE, astronomers could observe space more clearly. As instruments such as telescopes, satellites, and spacecrafts improve, modern scientists make new discoveries that help them to improve their theories—and they find new phenomena to explain.

Expected learning outcomes

Students should be able to:

- describe how the stars and planets were formed and explain their movements
- differentiate between different types of physical bodies in space
- explain how eclipses occur
- explain how space exploration, including the use of the Hubble telescope, helps scientists to discover and explain the universe
- explain that space is empty with nothing (not even air) between the bodies in it, and that all objects exert a gravitational pull on others, even in the space
- explain that the Sun is a star, formed when a nebula collapsed, and that stars are held together in galaxies by gravity
- explain that moons orbit planets, planets orbit stars, stars orbit their galaxy's centre of gravity, and galaxies orbit other galaxies

PAGES 2-3

'Constellations'; 'Where did stars come from?'; 'A star is born'; 'The stars'; and 'Galaxies'

Resources

- a star-shaped object
- Skills Book pages 2–3 'Star constellations'

Introduction

A star forms from a nebula (a massive cloud of dust and gas in space). The nebula's gravity makes the dust and gas gather together. The mass becomes hotter and hotter. When it is hot enough for nuclear reactions to begin, a star begins to form. The reactions give out energy that keeps the core of the star hot. This is how the Sun formed.

Stars change, and eventually die out. Their lifespan depends on how much matter they contain. Our Sun is at a 'stable' point in its life: the forces in it are balanced. These forces are the inward force of

the star's gravity and the outward force from the pressure caused by the expansion of gases as they heat up. Studies of other stars have helped scientists to calculate that the Sun will burn up its gases over the next 5 billion years.

After a star forms there is still a large amount of dust and gas around it. The star's gravity pulls together the dust and gas that are orbiting it and this forms planets which continue to orbit around the star's centre of gravity.

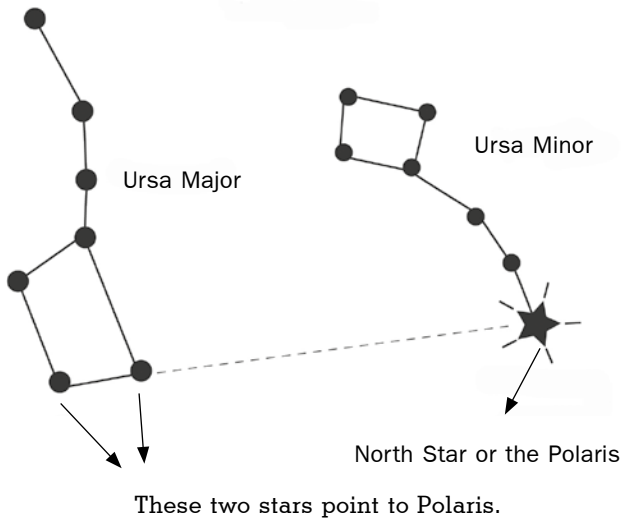
Animations of the life of a star can be found on www.science.nasa.gov, www.bbc.co.uk, and on YouTube ([nebula star formation](#)), also through any Google search for 'How a star is formed'.

Before reading page 2, set some homework, asking the students to look at the sky after dark. It is best to face south. If they do not have a compass, they can usually find which direction is south, with an adult's help. They could use a GPS app on a mobile phone or find their street on a map and check which side of their house faces south. They could use what they know about where the Sun rises and sets to find east and west and so figure out which direction is south.

The stars that are visible depend on the time of year, but Ursa Major and Orion are usually visible and their distinctive patterns make them easy to spot. Students could copy the pictures of constellations in the Student's Book and Skills Book and take them home to help. Point out that these might not appear the same way around in the sky, so they might need to rotate the diagrams to compare them with the constellations they see.

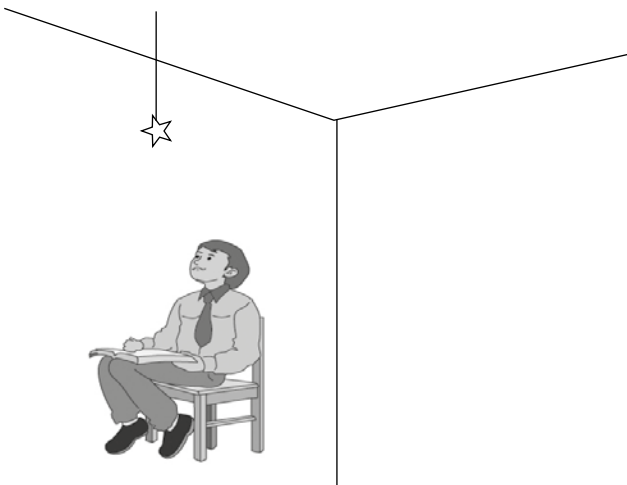
Ask them to make a sketch of the sky, showing where they saw each constellation. They should add the directions east, west, and south.

After completing these activities, you could show them how to spot Polaris, the Pole Star using the two pointers in Ursa Major.



Finding Polaris

Ask the students to look at one or two constellations in addition to Ursa Major and Polaris at different times on the same evening and to make a note of where in the sky they see them. Afterwards, ask if these were always in the same place or if they seemed to move. Ask why this happens. (This is because the Earth rotates.) They should notice that Polaris does not move. Ask them to explain this. It is because Polaris is directly above the North Pole.



Demonstrating that the Pole Star is always above the North Pole

Activity

You could demonstrate this in class. Fix a star shape to the ceiling. A student sits on a chair below the star and looks up at it. The student turns the chair to face different directions (keeping the chair below the star). The star is always above the chair. This is like when the Earth rotates:

Polaris, the Pole Star, is above the North Pole, so when the Earth rotates, the star is always above the North Pole.

Using the Student's Book

Ask the students to read pages 2–3 of the Student's Book.

Ask the students how Polaris and other stars are helpful to sailors. (Sailors have used star maps for many years to find their way at sea when out of sight of land.) Also remind them of what they have learned from their history lessons about the ancient instrument, the astrolabe. Ask them to answer Questions A2, A3 a–b.

Using the Skills Book

Ask the students to observe the sky and look for constellations at night and then draw a star map in their Skills Book on page 3.

PAGES 4–5

'How did our solar system form?' and 'What makes the planets orbit the Sun?'

Resources

- a ball

Using the Student's Book

It is useful to begin this work at a time when one or more planets are visible in the night sky (check on the Internet or in the newspapers). If the students have observed the stars, they will know that these change position in the sky because of the Earth's rotation, but we cannot see this movement because it is very slow, as the stars are so far away. Stars used to be called fixed stars because astronomers could not detect any movement, apart from the apparent movement due to the Earth's rotation and orbit. Find out where the visible planet is likely to be (or, if you are lucky, two or more planets). There are several websites that will help, for example, www.earthsky.org/astronomy, www.space.com, www.nakedeyepianets.com, www.nasa.gov. Some of these also provide pictures of the planets that will help students to spot them if they have binoculars or a telescope.

For homework, ask the students to look at the sky around sunset and watch out for a bright object that moves across the sky. (This will not move very fast, but it will be noticeable.) Remind them not to look directly at the Sun, so this activity is safer just after sunset. Explain that if they see a bright object moving, it is not a star. There are more than 3000 artificial satellites orbiting the Earth, but these move across the sky more quickly than planets. Look near the horizon for Mercury and Venus. Because Mercury and Venus are closer to the Sun than the Earth is, they can only be seen near the Sun. Mercury can be difficult to spot because it is very small and very near the Sun, but Venus can be seen from around one to two hours before sunrise or after sunset.

Stars twinkle because the Earth's atmosphere distorts their light. Most planets do not twinkle because they are much closer to the Earth than the stars are. The only twinkling planet is Mercury, because of the way light scatters when reflected from it. This scattering of light also gives the sky a red tint at dawn or sunset—the only times when you can normally see Mercury.

In class, explain that people have known about the Sun, stars, the Moon, and the planets since ancient times and had different ways of explaining what they observed. Over time they made more observations and measurements and kept changing their ideas bit by bit. Through observations and increasingly accurate measurements of other stars and solar systems made possible by advanced technology, modern scientists can discover how our solar system came into being, and even figure out that it is approximately 4.6 billion years old.

Point out the photograph of the Hubble telescope on page 5 and ask where it is. Ask how the telescope stays in orbit around the Earth. Explain that it was launched by an American Challenger spacecraft and, because it is outside the Earth's atmosphere (so it is in space), it orbits just like the Moon. It needs power for its instruments and this comes from solar energy: it has two very big solar panels.

Demonstrate the following activity to explain the concept of gravity.

Activity

You could hold out an object such as a ball of paper and ask what will happen if you let go of it. Ask what makes it fall to the ground. (The Earth's gravity pulls it.) Explain that gravity affects how everything moves in space.

Ask the students to read pages 4–5 and to answer Question A1, A4 a–c.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how the planets were formed and how they move.
- I learned that there is no air in space.
- I learned that planets orbit stars and that the Sun is a star.
- I learned how space exploration helps scientists to discover and explain the universe.

PAGES 5-6

'Planets in our solar system'

Resources

- 1–2 boxes of chalks (different colours, if possible)
- a big ball of string or twine (you'll need at least 20 metres—possibly more)
- eight large balls (as we are not focusing on scale, these can be the same size)
- eight cards or pieces of paper (strips about a third of A4) each with the name of a planet
- Skills Book page 4 'Planets and years'
- Skills Book page 5 'About the planets'

Using the Student's Book

Ask the students if they can name the planets in our solar system. Perhaps they know a mnemonic (say 'nem-on-ic') for remembering their order from the Sun. Here is an example of a mnemonic (words, pictures, or actions to help us remember something): My Very Easy Maths Just Shows Us Numbers.

The diagram of the solar system on page 5 of the Student's Book shows eight planets. Older diagrams show a ninth planet, Pluto. Scientists are discovering more and more objects that orbit the Sun like small planets for example, an object larger

than Pluto, which they named Eris, was discovered in 2005. Then, in 2006, after the minor planet named '2060 Chiron' was discovered, they decided that Pluto should no longer be classed as a planet. In 2006, the International Astronomical Union defined the term 'planet'. To understand the definition requires a higher level of knowledge than the students will have in Grade 6, but it can be found on the Internet.

In addition to new planets, advanced technology is helping scientists to find more and more moons around the planets. Sometimes other observations suggest that there must be another moon; also the criteria for whether an object is a moon must be applied.

The planets nearest to the Sun—Mercury, Venus, Earth, and Mars—are terrestrial planets made up mainly of rock and metal. The others—Jupiter, Saturn, Uranus, and Neptune—are 'gas giants', made up of hydrogen, helium, and water in different physical states (liquid, gas, or solid ice).

The movement of objects through space, unlike on the Earth, is not affected by forces such as friction and air resistance because there is no air in space. Once moving, an object continues to move because of inertia (the resistance of any physical object to any change in its state of motion, including a change in direction). So the planets continue to move, having been set in motion by movement in the nebula where they originated. The force that changes the direction of their movement is their star's gravity, which pulls them towards the star. This is not strong enough to make them crash into the star, so they orbit this star: that is what makes the Earth and the other planets of our solar system orbit the Sun.

Photographs from the Hubble telescope have helped scientists to discover how distant stars and their planets form and thus to explain how our solar system formed.

Activity

Take the students into a large space where they can chalk on the ground (and rub off the chalk later): the schoolyard, hall, or even the classroom with the furniture moved to the sides. Mark the Sun at its centre. Explain that they are going to make a giant model of the solar system and walk the orbits of the planets around the Sun to help them to find out about each planet's year. Point out that the model cannot be to scale because the distances are so enormous.

Split the class into eight groups—one per planet; give them their planet cards and ask them to decide how far out their planet should be from the Sun. Choose a student to chalk the orbit of Neptune, the farthest planet from the Sun. Another student stands on the Sun holding the end of a piece of string while the first student holds the other end and walks to the closest wall. He/she cuts the string to that length, ties it round a piece of chalk, and chalks a circle, keeping the string taut so that it acts as a compass.

The other groups work inwards from Neptune to decide how far their planet should be from the Sun, cut the string in the same way, and chalk its orbit, each in a different colour. Encourage them to do this quite quickly; it's not a work of art. They will need to cooperate to avoid tangled strings. After this the string is no longer needed.

Ask each group to choose one student to hold the planet card. Each of the eight selected students takes a ball and a planet label and lines up to begin their orbits as if on a straight track. Mark where they begin their orbits. Ask them in which direction they should walk their orbit (anticlockwise). Then they walk in step as you (and the rest of the class) count 'One, two, three, four...' The others watch and check that they stop when they get back to the marker. When the last one stops, ask what they notice. Do the planets keep together or do some overtake others? Which planets have a shorter year than the Earth? Which ones have a longer year?

Now that the students know how planets formed and what makes them orbit the Sun, ask them to explain how the Moon was formed and what makes it orbit the Earth. Ask if any other planets have moons and, if so, which planets.

Discuss which planets are likely to be hotter than the Earth and which are likely to be colder. Mercury is very hot where it is daytime but, because it has the thinnest atmosphere, it cools down on the side where it is night. Its surface has the greatest temperature range of all the planets from 173–427°C in the day at some parts of its surface.

Ask the students to answer Questions B1–4.

Ask the students to look at the photograph of the orrery on page 8 and answer Questions C1 a–c in class.

Using the Skills Book

After the lesson ask the students to complete pages 4–5 of the Skills Book ('Planets and years' and 'About the planets'), which gives more information about the planets: their sizes, gravitational pull, length of day, highest and lowest temperatures, and the length of each planet's year compared to an Earth year. It is useful to explain that the longer an orbit, the more slowly the planet moves, and that the size of the planet also affects this. If you look at the time a planet takes to complete an orbit in comparison to an Earth year, there are enormous increases once you get farther out than Mars. The maths involved is quite complex.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that there is no air in space and that all objects exert a gravitational pull on each other.
- I learned that moons orbit planets, and planets orbit stars.

PAGES 6-7

'Moons' and 'Eclipses'

Resources

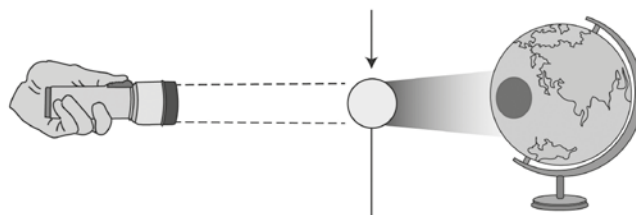
- a small ball
- a large ball
- a torch

Introduction

To understand a solar eclipse, the students need to know that the Moon does not give out light; we see it because it reflects sunlight. When we cannot see the Moon, it is because sunrays are hitting the side of the Moon which is turned away from the Earth.

Activity

Use a small ball, a larger ball, and a torch to demonstrate a solar eclipse.

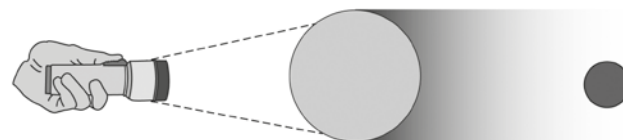


Demonstrating a solar eclipse

This shows how an eclipse affects only part of the Earth.

Explain that there is not a solar eclipse every month because the Moon's orbit around the Earth is not on the same plane as the Earth's orbit around the Sun.

You can use the same equipment to demonstrate a lunar eclipse.



Demonstrating a lunar eclipse

This time the Earth blocks out sunrays so that they do not hit the Moon—so we cannot see it.

Using the Student's Book

Ask the students to read page 6 and look at the illustrations on page 7 of the Student's Book, and invite volunteers to demonstrate a solar eclipse and a lunar eclipse, using balls and a torch. Ask the students to complete Questions D1 a–c.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that a solar eclipse happens when the Moon moves between the Sun and the Earth and blocks out sunrays.
- I learned that there is not a solar eclipse every month because of the shape of the Moon's orbit.
- I learned that there can be an eclipse only on the night of a full Moon, when the Sun, the Earth, and the Moon are lined up, with the Earth in the middle.

Answers to assessment

A 1. Hubble telescope

2.

constellation		a mass of burning gases
galaxy		a vast, very dense mass of dust, rock, and gases
nebula		a pattern of stars
star		stars and other material held together by gravity

3 a) the Orion Nebula

b) The students should use the Internet to find out more about the Orion Nebula. They could write about how astronomers know about this nebula and what they found out by observing it.

4 a) It contains burning gases./It is burning.

b) Students should draw some pictures of stars and write notes to explain how a star is born.

c) A star is a mass of burning gases. Some planets are made of gases (but not burning) and planets orbit stars. Stars do not orbit planets.

B 1 a) the students' own ideas and explanations that should take into account the planets' distances from the Sun

b) the students' own ideas and explanations that should take into account the planets' distances from the Sun

c) students' own findings

2 a) Neptune

b) Mercury

3 a) Neptune (163.8 Earth years)

b) Mercury (88 Earth years)

c) This is because Neptune is farthest from the Sun, and Mercury is nearest to the Sun.

4 a) A nebula collapsed when its gravity pulled it inwards. A mass of burning gases formed at the centre and became a star, and solid material (rock and dust) formed a thick disc around this. The disc split up and the pieces became planets and moons.

b) energy from the nebula when it collapsed

c) There is no force to stop them.

d) the Sun's gravity

C 1. Explain that each metal disc shows a planet's orbit. Ask them to count the discs and the planets shown as balls.

a) Not all the names of the planets can be seen, but the six discs represent the orbits of Mercury, Venus, Earth, Mars, Jupiter, and Saturn.

b) Uranus and Neptune are missing.

c) These planets had not been discovered at the time when the orrery was made. Uranus was discovered in 1741, and Neptune in 1846.

D 1 a) The Moon blocks out the sunlight.

b) The Earth's shadow hides the Moon.

c) The Moon is not very bright because it has no light of its own but reflects the Sun's light; the Sun is too bright to look at safely.

Answers to Skills Book

Pages 2–3 '*Star constellations*'

- A 1. The students should make their own observations.
2. Students draw star maps.

Page 4 '*Planets and years*'

- A 1.

What I have found out about the planets' years	
Planet	Length of its orbit in Earth years or days
Mercury	88 days
Venus	225 days
Earth	365 days
Mars	687 days
Jupiter	11.9 years
Saturn	29.5 years
Uranus	84 years
Neptune	165 years

Page 5 '*About the Planets*'

- A 1. Mercury, Mars, Venus, Earth, Neptune, Uranus, Saturn, Jupiter
2. Jupiter, Neptune, Saturn, Earth, Venus, Uranus, Mars, and Mercury
- 3 a) false (The greater the mass, the greater the gravitational force, so the statement would be true if it were not for the 'gas giants', which are less dense, since the material a body is made up of affects its gravitational pull.)
- b) false (Although the farther a planet is from the Sun, the lower its mean temperature.)
- c) false (Although the closer to the Sun a planet is, the higher its mean temperature.)
- d) false
- e) true
- B. Jupiter has the smallest day. Venus has the longest day.

- C. The students should notice that the four larger planets have much shorter days than the four smaller planets, although the day length is not exactly consistent with size within these groups. They should deduce that the four larger planets must rotate more quickly than the smaller ones.

Another interesting fact to note if they have checked the planets' years in the Student's Book, is that Venus's day is longer than its year. Also interesting is that the four large planets have very short days but very long years, so they have a lot more days in a year than does the Earth.

Background knowledge for the unit

As the rotation of the Earth, with sunrise and sunset, is a continuous process, a starting point for the Earth's travel around the Sun had to be established. An international congress met in Washington DC in 1884 to determine how to divide the world into time zones. They divided the surface of the Earth into 24 zones (one for each hour of the day and night), each covering 15° of longitude. The time for each zone was to be the time of the meridian (line of longitude) that passed through its centre. Because most nautical charts at the time were based on the Greenwich Meridian, that line of longitude was chosen as the Prime Meridian (0°).

Before we proceed

Students will learn about the Earth's rotation, day and night, and how time zones were created based on lines of longitude. They learn how the Earth's tilt on its axis creates the seasons, how lines of longitude are numbered, and how to use them to calculate the time in different parts of the world. To enable students to make observations of the night sky, this unit can be best carried out during seasons when sunset is quite early.

Before undertaking any work on space or the sky, it is vital to ensure that the students understand the danger of looking at the Sun.

Expected learning outcomes

Students should be able to:

- explain that as the stars are so far away, they appear to be fixed in the same places in the sky, even though galaxies orbit other galaxies
- explain that a year is the time the Earth takes to orbit the Sun (about 365.25 days) anticlockwise, and that a day is the time the Earth takes to rotate on its own axis anticlockwise

- explain that the Earth's tilt causes the seasons, and that the differences between summer and winter are greatest near the Poles

PAGE 10

'What is a year?'

Resources

- pictures of constellations (Student's Book page 2 and Skills Book page 2)

Introduction

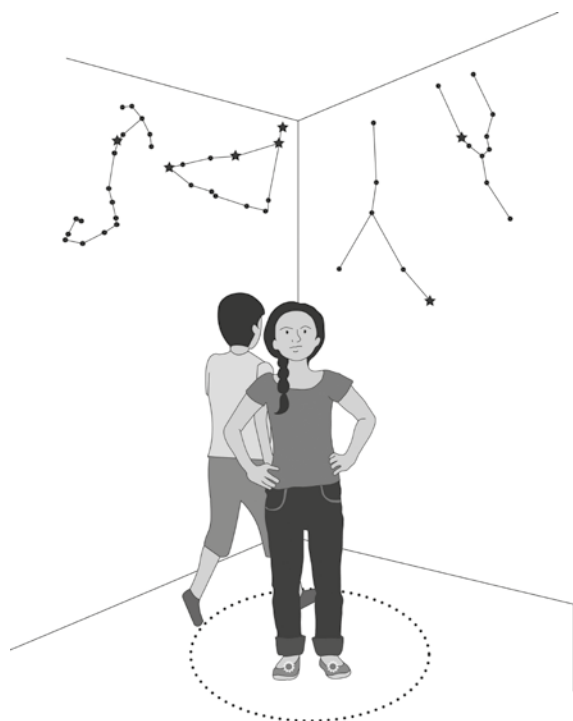
The students will know from unit 1 that we can use the positions of the stars in the sky to calculate the Earth's position in its orbit, and when it is back to where it started the orbit. They will also know that the planets orbit the Sun anticlockwise along almost parallel paths. A year is the time any planet takes to orbit the Sun. The students should know from their work on unit 1 that each planet's year is of a different length.

Ask the students why the constellations of stars appear in different places at different times of the year. They might think the change in the positions of the stars is caused only by the Earth's rotation. If they completed the suggested homework activity, to leave a camera with the shutter open pointing at the sky during a dark evening, they will have recorded the effects of the Earth's rotation on our view of the night sky. Demonstrate the effect of the Earth's orbit as follows:

Activity

Fix a picture of a star constellation to each wall of the room. Ask the students to stand so that they all face the same constellation. Ask them to rotate slowly until they are back at the start. Remind them that a rotation of the Earth takes 24 hours—one full day, so

they are back at the same time as they began. Now ask a student to stand in the centre of the room to represent the Sun. Ask another to represent the Earth. He/she then walks in a circle with his/her back to the student who represents the Sun—always looking at the walls. Another student should guide the one who is walking around to make sure he/she does not fall or bump into anything. The circular path along which this student is walking represents an orbit. Remind this student not to rotate to avoid dizziness. Ask if he/she sees the same or a different view of the sky all the way around the orbit. Explain that the stars stay in the same positions in the sky. They do not move around Earth and they are much farther away from Earth than our star, the Sun. However, as the Earth orbits the Sun we get a different view of the stars. This view changes only slightly each day as the Earth rotates, but during the course of the year, as the Earth moves around its orbit, our view of the stars will change.



Demonstration of the fact that stars have fixed positions in the sky

Using the Student's Book

Ask the students to read the information on page 10 of the Student's Book. Ask how many days the Earth takes to orbit the Sun. Point out that each orbit takes a little more than 365 days. Ask how long that is (6 hours). How many extra hours is that after four years? It is 24 hours extra—a whole day. So that is why we add a day to the length of the year every four years. Point out that even this is not exactly right because the orbit actually takes 365.2563666 days. Ask to find out from 'It's a fact' how this is built into the calendar.

Ask them to complete Questions B1–3 D1 a–f, E1 a–c in their notebooks, and, if possible, use the Internet to check the dates of leap years; alternatively this could be completed for homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the stars do not move around the Earth.
- I learned that the stars move around the centre of their galaxies, but they are so far away that we do not notice this.
- I learned that Earth's orbit round the Sun makes the stars' positions shift a little each day until they are back at the starting position.
- I learned that the Earth takes about 6 hours longer than a year to orbit the Sun so an extra day is added to every fourth year.

PAGE 10-13

'What is a day?' and 'How is time measured?'

Resources

- Skills Book pages 6–7 'Make a shadow clock'

Introduction

At least a day before the lesson, set a homework task to make a sketch of the sky as in unit 1 showing any constellations they recognize. They should add the directions north, east, west, and south. Ask them to repeat this an hour later and, if possible, another hour later, and so on. If they begin as soon as the stars are visible, they might be able to make three or four sketches, depending on the time of year.

Ask the students to compare their sketches of the sky and describe what they noticed about the position of the constellation they watched. (They cannot see it moving but should notice after a couple of hours that it has moved.) Ask if they know why. They have already learnt that the stars appear to move over the course of the year as the Earth travels through space on its orbit around the Sun. Ask what else they know about the Earth's movements. If necessary, remind them that it rotates (spins) and that this makes the stars appear to change positions slightly during the course of the day. They could visit the website <http://www.skymaponline.net> to see a map of the sky where they live.

Using the Student's Book

Ask the students to read 'What is a day?' on page 10 and 'How is time measured?' on pages 11–13. Ask them to discuss with a partner and then report back on how the number 60 is useful in geometry—for example in dividing a circle into segments. (A complete revolution is 360 degrees, which is a multiple of 60.) Elicit that the Earth's rotation is like this. (A complete rotation or revolution is a turn through 360°.)

The students should then look at the photo of the obelisk and find out as much as they can from the shadows they see. Explain that the obelisk is on the north-east side of the temple and ask them to point out the directions of north and east. They could draw a sketch of the photo and then draw lines on their sketch to show these directions. Ask them in which direction the shadows fall (south-east). Ask in which direction the Sun must be (the opposite direction to the shadows—north-west). So, what part of the day is this? (It is past noon.) Ask if the length of the shadows gives another clue. They are not very short, but not as long as the objects themselves—note the length of the obelisk's

shadow) so it is probably not very late. We cannot be more exact because we do not know the date when the photo was taken.

Ask the students to complete Questions A1–4 B4 a–b, in class or for homework.

Using the Skills Book

Before the lesson, on a sunny day, start a shadow clock with the students, who should follow the instructions on pages 6–7 of the Skills Book. They can take turns to record the shadows during the course of the day without taking time out of other lessons. Photograph the complete shadow clock so that it can be compared with another made about a month or so later. Ask how we can use it to tell the time, whether it matters where we put the shadow clock, or which way round. (It should face exactly the same direction, so that the shadows match, but it could be in a place nearby.) Ask them to use it for telling the time and checking their watches.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that a day is the time the Earth takes to make a complete rotation on its axis.
- I learned that when different parts of the Earth face the Sun they have day and that they have night when they turn away from the Sun.
- I learned that as Earth rotates, the Sun appears to move across the sky from east to west.
- I learned that the Sun is low in the sky at sunrise, gets higher towards noon, and then sinks lower towards sunset.
- I learned that this movement makes the directions and lengths of shadows change.
- I learned how to make a shadow clock and use it to tell the time.

PAGES 13–14

'How does sunrise move around the Earth?' and 'What are time zones?'

Resources

- a torch
- a globe
- *Oxford School Atlas for Pakistan*
- Skills Book pages 8–9 'Times around the world'
- Skills Book page 10 'World time zones'

Introduction

Ask the students whether different places in the world have the same timings of sunrise and sunset. Explain that as the Earth moves around the Sun, the parts that face the Sun have day while those parts which are turned away from the Sun have night.

Activity

Invite a student to use the torch while you hold the globe to demonstrate how sunrise moves around the Earth. Make sure you rotate the Earth in the correct direction. (Sunrise travels from east to west as the Earth rotates anticlockwise.) The students should notice that the sunrays (represented by the torch) fall on those parts of the Earth that face the Sun. The ones away from the Sun have night.

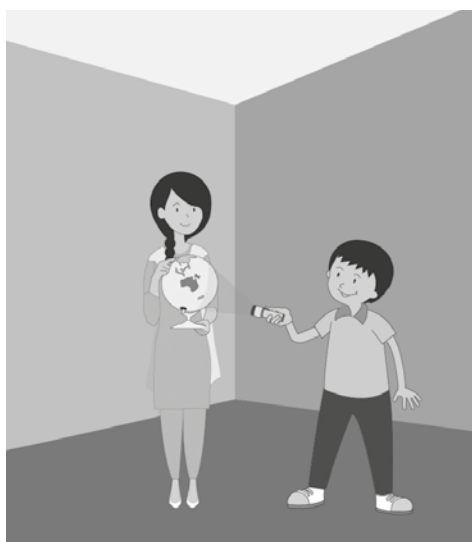


Diagram showing how sunrise moves around the Earth

Using the Student's Book

Ask the students to read 'How does sunrise move around the Earth' on page 13 of the Student's Book. Ask why the people in the very distant past did not need to measure the exact time of day. (They needed only to know when it was night or day. If necessary, they could tell when it was midday by the position of the Sun.) Ask what they have learnt about ancient civilizations that needed more accurate times. (They used shadows.) Explain that they developed other ways of measuring time when there were no shadows or no sunlight, including water clocks and candles. They also made mechanical clocks.

The students should then read the paragraphs on time zones on page 14. Explain that lines of longitude were used for a long time before this to help in navigation, but not for measuring time. Ask them to look at the diagram of lines of longitude on this page. Ask whether lines of longitude are parallel. (No—parallel lines never meet, but these lines meet and cross at the Poles. They are not parallel.)

Ask two students to use the globe and torch again to demonstrate the Earth's rotation and sunrise around the world. Ask how we know when a day begins in one part of the world and ends in a different part.

Ask them to read 'It's a fact' on page 14 to find out how this problem was solved. Look at the diagram of the International Date Line (page 14) and ask which line of longitude it follows. Elicit that the International Date Line is not one straight line but changes direction in places. Ask why this happens. (It would be confusing if parts of a small island had different times and dates, so the line has been drawn so that it goes around islands.)

Ask them to complete Questions F1–3 for homework.

Using the Skills Book

Split the class into groups of three or four and ask them to discuss the scenario shown on pages 8–9 of the Skills Book 'Times around the world' before writing their answers. They will need an atlas to find the cities. They might be able to help one another if some do not know which countries they are in. They could check on the Internet. Let them check their answers on page 10 of the Skills Book 'World time zones'. They should write the time differences

between different cities on this page.

Ask the students which of the cities mentioned in the Skills Book activity has sunrise first: London, Islamabad, Toronto, Sydney, or Honolulu. (Toronto). Honolulu gets sunrise last but it has the latest time in the scenario in the Skills Book. Ask why. (Because it is still one day ahead of the others.)

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the Sun rises gradually round the world from east to west.
- I learned that countries around the world agreed on international time zones separated by lines of longitude.
- I learned that the Prime Meridian is the line of longitude that passes through Greenwich Observatory in London and that the other lines of longitude are numbered away from it to the east and west.
- I learned that longitude 180° is the International Date Line, and indicates where one day ends and another begins.

PAGES 14-15

'Why do we have seasons?'

Resources

- a torch
- *Oxford School Atlas for Pakistan*
- globe or world map
- Skills Book page 11 'Sunrise and sunset where I live'

Introduction

Ask the students what they know about the seasons of the year. Ask what causes the same sequence to happen every year. Some might think the Earth's rotation is the cause; if so, demonstrate the Earth's rotation using a torch and globe, to remind them that this just causes day and night and show them pages 14–15 of Student's Book 'Why do we have seasons?'

Activity

Hold the globe so that the North and South Poles and the axis are perpendicular to the floor. Ask a student to flash the light from the torch toward the globe. Repeat with the globe tilted (as it is normally) on its stand. Ask what difference this makes. They should notice that when the globe is perpendicular, the Poles always have some light, but that the light hits the Equator at right angles.

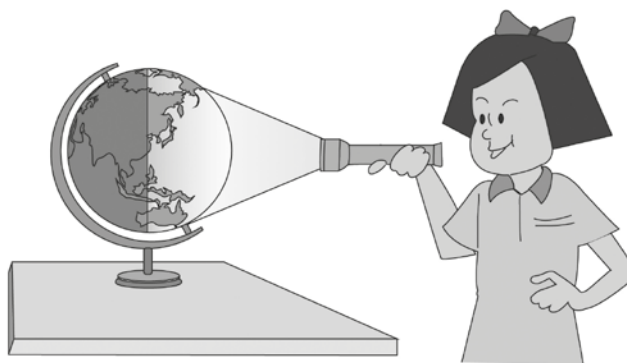


Diagram showing direct sunlight at the Equator and 'glancing' sunlight at the Poles

They should also notice that when the globe is tilted, one Pole has continuous light for some of the time, while the other has continuous darkness, and that one hemisphere has sunlight for longer than the other, but that there is not much difference at the Equator.

Using the Student's Book

They can then read pages 14–15 of the Student's Book, including 'It's a fact'. Provide a map or *Oxford School Atlas for Pakistan*

showing Tromsø, Norway and ask what they notice about this city in early afternoon. (It is dark.) Ask why this is. (Tromsø is near the North Pole so it has very short days in winter, when the northern hemisphere tilts away from the Sun.) What do they notice about Helsinki, Finland at midnight? (It has daylight.) Ask why this is. (It is near the North Pole so it has daylight throughout the night in some summer months because the northern hemisphere tilts towards the Sun.) Ask them to complete Questions C1–2, G1–2, H1 a–d

Using the Skills Book

Ensure that the students know where to find out about the times of sunrise and sunset in the place where they live, e.g. a local newspaper or the Internet. For homework, ask different groups of

students to find the sunrise and sunset times for different months. They should record the times in the table 'Sunrise and sunset where I live' on page 11 of the Skills Book.

They should compare sunrise and sunset timings for different months. Ask them to describe any pattern they see. (Sunrise gets earlier from winter to midsummer and then starts getting later, while sunset gets later from winter to summer and earlier from summer to winter. The difference between the two is greatest in summer and smallest in winter.)

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the Earth's axis is tilted.
- I learned that as the Earth orbits the Sun, the hemisphere that tilts towards the Sun has more hours of daylight and stronger sunlight—summer—while the other hemisphere has winter.
- I learned that in places on or near the Equator, days have approximately equal hours of daylight in summer and winter.
- I learned that the differences in the lengths of the days in summer and winter are greatest at the Poles.

Answers to assessment

- A
1. anticlockwise
 2. China
 3. This comes from the Ancient Sumerians, who divided the day into 2 sections of 24 hours. 12 is a factor of 60—a very useful number in timekeeping because it can be divided by many numbers.
 4. Look for the two pointer stars in the constellation Ursa Major that line-up and point to Polaris, the North Star.
- B
1. anticlockwise
 2. 365.25 days
 3. by adding an extra day to every fourth year, except century years
 - 4 a) 12.00 noon
b) students' own observations
- C
- 1 a) the winter solstice
b) the summer solstice
c) equinoxes
 - 2 a) During the winter, the North and South Poles are tilted away from the Sun.
b) During the summer, the North and South Poles are tilted towards the Sun.
- D
- 1 a) 366
b) The Earth's orbit takes about 6 hours longer than 365 days. This makes an extra day every 4 years. To adjust this extra day there is a leap year every four years.
c) After 4 years the Earth has taken 4 years and almost an extra day to orbit the Sun.
d) Yes, because century years are leap years when the year is divisible by 400.
e) No, because 3000 is not divisible exactly by 400.
f) This depends on the date when the activity is undertaken: leap years are 2016, 2020, 2024, 2028, and so on—years divisible by 4.
- E
- 1 a) 360 degrees
b) 24
c) 15 (360 degrees divided by 24)
- F
1. It does not follow longitude 180° exactly because then it would even go through small islands. This would mean that different parts of an island would have different dates.
 2. They meet and cross one another.
 3. The students' ideas; they should realize that the time at the North or South Pole could be any time. This is because the Poles are on all lines of longitude. Any time would be correct, but having no official time zone in Antarctica is not a problem, because nobody lives there permanently. At the research bases, the organizers decide which time zone to use. At the North Pole there is no land, so anyone travelling there uses the most convenient time zone, for example, the time they used at the most recent land they left, or the time of the nearest land they will arrive at.
- G
1. There would be no seasons. The weather would be similar all year round and the Sun would be just on the horizon all day and night, throughout the year.
 2. Day and night would always be about equal—around 12 hours. The weather would be similar all through the year.
- H
- 1 a) It is dark, like night. This is because the northern hemisphere is tilted away from the Sun in the winter.
b) It is light, like daytime. This is because the northern hemisphere is tilted towards the Sun in summer.
c) Wellington's latitude is 41.28°S. This is in the southern hemisphere. The northern hemisphere is tilted towards the Sun in June (summer) so the southern hemisphere is tilted away from the Sun in June (winter) so it would be dark at midnight in June. In December it would be summer, so there would be light in the early afternoon in December.
d) The difference is because Wellington is in the southern hemisphere and the two cities in Europe (Helsinki and Tromsø) are in the northern hemisphere.

Answers to Skills Book

Pages 6–7 *'Make a shadow clock'*

- A 1–4. The students follow the instructions to make a shadow clock.
- B 1. The students mark out their shadow clock as instructed.
2. The students mark the end of the shadow each hour.
- C 1 a) The direction of the shadows changes because the Sun's position in the sky changes.
- b) As the Sun moves from east to west across the sky, the direction of the shadow moves from west to east.
- 2 a) The shadows get shorter towards noon and then longer.
- b) This is because the Sun rises higher in the sky until noon and then begins to sink lower in the sky. (Note that if 'daylight saving' time is used, this will change the time of the shortest shadow.)
3. The answers will depend on the date when the activity is carried out. Shadows will be longer in winter than in summer because the Sun is lower in the sky due to the Earth's tilt.

Pages 8–9 *'Times around the world'*

- A 1 a) Sunday
- b) Saturday
- c) Honolulu is several hours behind Islamabad.
- B 1 a) London: –4 hours
- b) Toronto: –9 hours
- c) Sydney: +5 hours
- d) Honolulu: –15 hours
- C 1 a) London: –5 hours
- b) The time in the picture story must have been in the summer, when London was using 'daylight saving time', when clocks are moved forward 1 hour. In some countries, especially in northern Europe, clocks are moved forward one hour in the summer so that there is an extra

hour of daylight in the evening. The clocks are then moved back one hour in October. The effect of this is to give an extra hour of daylight in the morning. The purpose of this was to give farmers and other outdoor workers an extra hour of daylight during their normal working day.

Page 10 *'World time zones'*

- A 1. London–Toronto: 5 hours
- London–Islamabad: –5 hours
- London–Honolulu: 10 hours
- London–Sydney: –10 hours
- Islamabad–Sydney: –5 hours
- Islamabad–Honolulu: 15 hours
- Islamabad–Toronto: 10 hours

Page 11 *'Sunrise and sunset where I live'*

- A1–2. Students should record information about the sunrise and sunset timings of their cities.

Mapping the world

Background knowledge for the unit

Ancient maps or map-like drawings dating back to around 8000 BCE have been found. It is known that the ancient Polynesians migrated across millions of square kilometres of the Pacific Ocean around 8000 years ago, but nothing is known of any maps they might have used, although their navigation techniques are known. However, the ancient Babylonians used accurate surveying techniques to help them to draw maps on clay tablets, one of which dates back to around the 25th–24th century BCE. It shows the names of the features, the size of a field, and the name of the person who owned it. Another clay tablet from the 14th–12th century BCE shows the walls and buildings of the city of Nippur in ancient Sumeria.

The earliest surviving map of the world (around 600 BCE) comes from the ancient Babylonians. Other significant map-makers from ancient times include the ancient Greeks. While many of their maps showed the Earth as a flat disc, there were some philosophers who thought the Earth was spherical—notably Aristotle, who is considered to have proved this with his observations that the lunar eclipse is always circular, that ships appear to sink as they move away from the view over the horizon, and that some stars can be seen only from certain parts of the Earth.

The Chinese are known to have made maps since at least the 5th century BCE, although they are not known as great explorers. But an important link between ancient map-making and the huge expansion of exploration, navigation, and map-making by Europeans in the 14th century came from the Islamic scholars of Baghdad, led by the Abbasid caliph, Abdullah Al-Ma'mun, between 813 and 833 CE. He encouraged the work of geographers, scientists, and astronomers, and the collection and translation of ancient Greek books into Arabic.

One of these was Muhammad Al-Idrisi, in the 12th century, who gained knowledge about Africa, the Indian Ocean, and the Far East from merchants and explorers who had travelled to these places and had brought back information about them. On the basis of this information he produced the most accurate map of the world that had ever been drawn at that time.

Before we proceed

For this unit it will be useful to have plenty of examples of different types of maps available, so that the students can use them to learn how to use maps, to identify the purposes of different kinds of maps, and to look for (and use) the key elements: title, north sign, symbols and key, scale, and grid lines.

The collection of maps should include a globe, physical and political maps of the world and of Pakistan, maps of some students' hometowns, tourist maps, street maps, and plans of places such as shopping malls, tourist centres such as wildlife parks, housing schemes, etc.

Expected learning outcomes

Students should be able to:

- relate how maps developed
- interpret and create scale drawings, plans, and maps
- use the key elements of maps: the title, compass rose, symbols, key, and grid lines in order to discern information from maps
- draw simple plans and maps to scale, using the north sign, symbols, and key
- use grid references and latitude and longitude to locate places

PAGES 18–19

'The first maps'**Preparation**

Collect as many different types of maps as possible for the students to look at in order to decide on their purposes.

Resources

- a collection of various types of maps: street maps of towns or cities, tourist maps, physical and political maps of the world, map of continents and countries
- a globe
- Internet access, if possible

Note: (These maps will also be useful for later work in this unit.)

Introduction

Ask the students to read the first paragraph of page 18 and to discuss their own uses of maps. Then ask them to imagine having no maps. Would this matter? If there were no maps what problems would they face?

Activity

Invite the students to look at the collection of maps and to consider what purposes they would be used for. Ask them what features of a map make it useful for a particular purpose: for example, a political map of the world would be useful for finding the location of distant places in relation to their own town, or to find out where countries or cities are because it marks and names different countries, their borders, and their main cities. A street map of a city, however, would be useful for finding the location of a specific street or building, as these would be marked and named on the map. However, it would not give any information about the landscape: hills, mountains, plains, etc.

Ask the students to imagine what the first maps looked like. Why might people have needed a map in ancient times? Many people in ancient times travelled around the world without using maps. Did

they have any information about the places outside their hometowns? They might have relied on information passed on by their ancestors or others in their communities. When they travelled to new places as they migrated or traded, they might have narrated the tales of their travels to others and this is how people gathered information about other places in the world, which eventually became the source of information for creating maps. If no student mentions sea voyages, tell them that people who sailed out to the sea began to make maps to record the places they went to, which could also help with their future sea voyages.

Using the Student's Book

Ask the students to read about the ancient maps shown on page 18 of the Student's Book. Ask them what the Babylonian map has at its centre (Babylon) and point out that many old maps show the hometown of the map-makers at their centre. They worked outwards from the places they knew best. Ask the students what they can tell from the map about the Babylonians' knowledge of the world and about the land around their city.

Ask them to look at the map drawn by Ptolemy, an ancient Greek. Ask what they can see on the map; for example: 'What is the blue part in the south?' (the sea; the Bay of Bengal); 'What is the paler part?' (the land); 'What are the yellowish patches?' (mountains; the Latin word '*mons*' means mountain). They should be able to see the word 'India' on the map. Ask what river and its tributaries they can see towards the west. The distinctive delta might at first suggest the Indus, but look more closely at the land nearby and at the labels. The label *Gangeticus Sinus* shows that the river is the Ganges. ('*Sinus*' means bay, so this part of the sea is named 'the Bay of the Ganges', now the Bay of Bengal.) Farther north, on the land, *India extra Gangem* means India beyond the Ganges (now Bangladesh and Bhutan). Farther west we can see *India pars intra Gangem* (India within the Ganges). The students might now be able to identify the mountains and possibly some of the cities.

After this they should discuss Question A1 about Ptolemy's map and report their answers.

Then ask the students to read page 19 of the Student's Book and compare Muhammad Al-Idrisi's map from the 12th century with the modern map of the same area on page 20. They should be able to

identify parts of Asia, Africa, and Europe, the Indian Ocean, the Mediterranean Sea, the Caspian Sea, the Red Sea, the Persian Gulf, and the Black Sea. Several rivers, including the Nile, can also be identified.

Ask them to complete Questions A1 a–e.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that people began to draw maps in ancient times.
- I learned that there are different types of maps for different purposes.
- I learned that the first maps were drawn by navigators and explorers, and by scholars who learned from them.

PAGES 19–21

'How are maps read?'

Preparation

Ask the students to bring in any map they have used with their parents or others to find a place, for example, a tourist map of a place they visited on holiday, a street map of a town or city, a road map showing roads linking towns, a railway map, or a map of a park or other large site.

Resources

- maps brought by the students to school
- sets of any small objects (some in multiples, for example, 3 pairs of scissors, 2 pencils, 3 pens, 4 rulers, 6 coins, a book)
- large rulers (e.g. 1 metre) or long tape measures
- a compass (if possible, one compass per group of 4)
- Skills Book pages 12–13 'The sixteen points of the compass'

Introduction

Explain that maps have essential elements that help people to use them. Ask them to find these on their maps and to say what information they give: the title says what the map is about; the north sign indicates the north direction and helps the user to find the other compass directions. Ask what symbols they can see on their maps and how they know what the symbols mean. (There should be a key.) Note that symbols can be small icons, lines, or areas of colour or shading.

Ask the students to compare their own maps with those of others in the class and say what they notice about the sizes of the areas shown on the maps: the entire world, a continent, a group of neighbouring countries, a country, a province, a city, etc. Discuss the amount of detail each map can show and introduce the idea of scale (the number of times smaller the map is than the real area). Ask if their map has grid lines. If they have a map with lines of latitude and longitude, explain that these are a special type of grid lines which are used to locate places on Earth.

Activity

(If lesson time is limited, this could be a homework activity, using a list of small objects the students are likely to have at home.)

Place sets of small objects on the floor (so that groups of students can easily see them) and invite the students to look at them from above and make a quick sketch of them. Then ask them to draw a map of the objects. The challenge is that their map should fit into a rectangle measuring 10 cm by 8 cm! They should not spend too long on this.

Ask how they fitted the objects into the small rectangle. They will have used a scale—even if it was not exactly accurate. If any students used an accurate scale, invite them to explain how they did it.

Using the Student's Book

Ask the students to read pages 19–20 and ask them to identify the differences between the photograph and the aerial view of the furniture on page 21. Ask them to look at the plan of the same furniture. Then ask what information the photographs and the plan give. (The photographs show exactly what the furniture looks like, but from different views: shape, pattern, and colour, but not

size.) The plan shows the exact size of the space the furniture takes up on the ground and its shape as seen from above. It does not show what the furniture looks like and it does not show its height. Ask the students if they can think of a way of showing height on a plan. (They could use colour for anything above specific heights, shading it darker the higher an object gets but most plans are floor plans that do not show height.)

Tell them that this time they are going to try to draw a plan that is as accurate as possible in shape and scale.

The students should complete the exercise on page 21; 'Draw a plan of your classroom'. Ask them to complete Question C1.

Using the Skills Book

This activity reinforces and extends the students' understanding of compass points and how to use a magnetic compass.

Show the students a compass and ask which of the key elements of maps involves the compass (the north sign). Ask which direction is north from the classroom, and how the compass helps them to check. Remind them how to use a compass: the moving magnetic pointer points north, so place the compass on a flat surface, not near any metallic, magnetic, or electronic items; wait for the pointer to settle, then turn the compass so that the 'N' is aligned with the pointer. Ask the Students to point north, then south, then east, then west. Ask which directions are: between north and east, east and south, south and west, and west and north. Ask how many compass points they now know (eight). Explain that the compass can be split into much more accurate directions by adding others between these.

Ask the students to turn to page 12 of the Skills Book, 'The sixteen points of the compass' and to look at the drawing of a compass. Ask how many compass points it shows (16). Ask the students to read the information to find out what we call the direction that is halfway between north and north-east. They can complete the activity, finding out about the other points of the compass.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the different types of information shown by photographs, aerial views, and plans.
- I learned how the key elements of maps help us to use the map: title, north sign, symbols, key, scale, and grid lines.
- I learned how to draw a plan using a scale.
- I learned how the compass can be divided into sixteen points.

PAGES 21-22

'How are grid references used?'

Resources

- Skills Book page 17 'Grid references'

Using the Student's Book

Remind the students of what they learned previously about grid lines, where they used the numbers that run from west to east (left to right) along the bottom of the map and up the side of the map (from south to north) to identify a square on the map. To help them to remember that we give the number along the bottom of the map first, point out the mnemonic 'First go along the corridor, then go up the stairs'. Introduce the geographical terms for these numbers: 'eastings' because the numbers along to bottom are numbered towards the east, and 'northings' because the numbers up the side are numbered towards the north.

Ask the students to read the information about grid lines and to give the easting for the orange square (76), then the northing for the orange square (25), and finally, the complete grid reference for the orange square (7625).

They should answer the Questions on page 22.

Answers to exercise 'About Grid references on page 22:

- A 1 a) 7433 b) 7027
 c) 7033 d) 7633
 2 a) green b) orange
 c) blue d) purple

Then they should complete Questions D1–2.

Using the Skills Book

Ask the students to complete the activity on page 21 of the Skills Book 'Grid references'.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the numbers across the bottom of the map are called eastings because they are numbered towards the east.
- I learned that the numbers up the side of the map are called northings because they are numbered towards the north.
- I learned that a grid references gives the easting first and then the northing.

PAGES 22–23

'What is a grid square?'

Resources

- maps collected for the first lesson of this unit
- rulers

Introduction

Explain that, just as the compass can be divided into smaller sections for greater accuracy in stating direction, grid squares can be divided into smaller sections for greater accuracy in locating places. Explain that these smaller sections are not marked by extra lines on the map because this would make the map difficult to read; instead we have to estimate where they would be drawn. Show them how this is more accurate than it might seem.

Using the Student's Book

Ask the students to look at the map on page 23 of this book. Tell them that first they are going to locate some features using grid references in the way they used them for finding the coloured squares on page 22. Ask them to find the features at grid references B4, C16, and E4. Ask them to give grid references for Karachi University, Steel mills, and Karachi Port.

They should complete Questions B1–3.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how to locate places on a map using a grid square.

PAGE 23

'How are maps drawn?'

Resources

- maps collected at the start of this unit

Using the Student's Book

Tell the students that they are going to look at maps of small areas and to learn about the symbols they use. If possible, show them a map of a small area, such as a tourist resort or feature that uses symbols.

Ask them to use the key to find the meanings of the symbols and then give them practice at locating specific features on the map using the symbols.

Tell the students that they are going to use what they have learnt to help them to draw a map of a small area, their school. It will be useful for them to walk around the school to check where features and objects are located.

They should follow the instructions on page 23. The students should draw a frame for their map, then add the main features. Lastly, they should use colours and symbols as instructed.

Remind them to make a key that explains the symbols. For homework, they could add grid lines to their map (not too close together: 2–4 cm,

depending on the size of their map).

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how symbols are used on a map.
- I learned how to draw a map of a small area, using symbols.

PAGES 24-25

'How are places located on a map?'

Resources

- *Oxford School Atlas for Pakistan*
- a globe
- rulers
- Skills Book pages 14–15 'Where latitude meets longitude'
- Skills Book page 16 'Drawing a route on a world map'

Introduction

Ask the students if a map of the world would have grid lines. They could look at one in *Oxford School Atlas for Pakistan* or on a globe. Remind them that maps can use lines of latitude and longitude or the type of grid lines they have just learnt about. Explain that maps of large areas, such as a country or the world, usually use lines of latitude and longitude.

Using the Student's Book

Ask the students to look carefully at the map of the world on page 24. They should look carefully at the lines of latitude and longitude. Ask how these are different from the grid lines they learned about in the last lesson. Remind them that grid lines are numbered in one direction across the map and in one direction up the side of the map. Ask how latitude and longitude are different:

- Latitude lines are numbered north and south from the Equator (0°). They go from 0° to 90° both north and south. The North and South Poles are at 90° .

- Longitude lines are numbered east and west from the Prime Meridian (0°). They go from 0° to 180° east and west.
- Unlike vertical grid lines, longitude lines are not parallel.
- Both latitude and longitude lines are really imaginary circles that go around the Earth.
- In grid references we give the easting (the number along the bottom of the map) and then the northing (the number up the side of the map). With latitude and longitude, it is the other way around: we give the number up the side of the map (latitude) and then number across the bottom (longitude).

Ask the students to read page 24 and to complete the exercise on page 25.

Using the Skills Book

Ask the students to complete the table on page 14, using information on pages 14–15 of their Skills Books, 'Where latitude meets longitude'. Ask them to complete 'Drawing a route on a world map' on page 16.

Explain that, like grid squares, the spaces between lines of latitude and longitude can be divided into smaller sections for greater accuracy. Ask them to look at a map, where they will see that there is a very large gap between each degree of latitude or longitude. Explain that these gaps are divided into 60 sections called minutes. (Each of these can be further divided into 60 seconds, but we shall not use those in this activity.)

Show the students how to find the location indicated in Faisal's first message, and then ask them to complete the table for the others.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how to use lines of latitude and longitude to find places on a map.
- I learned how to use lines of latitude and longitude to describe the locations of places on a map.
- I learned how grid squares can be used to locate places and features accurately.

Answers to assessment

A 1 a) The students' own responses. These should include ideas about the blue part in the south (the sea—the Bay of Bengal), the paler parts (land), and the yellowish patches (mountains). They should recognize the word 'India' and identify the Ganges, some of the mountain ranges and possibly some of the cities.

b) The students' own ideas, which should include India, Pakistan, Bangladesh, and Bhutan.

After this they should discuss the questions about Ptolemy's map and report their answers.

c) the students' own responses, supported by references to *Oxford School Atlas for Pakistan*

d) the students' own responses, supported by references to *Oxford School Atlas for Pakistan*

e) They should be able to identify these as mountains.

- B 1 a) Lyari b) Sarjani town
c) Taiser town and Super Highway
d) Airport e) Korangi f) Lyari River
- 2 a) H3 b) B3 c) D3, E3
d) E5 e) E6 f) C4 g)

B4

- 3 a) Medical University
b) Quaid-e-Azam Mausoleum
c) Clifton
d) Karachi Port

C.

View	Plan
1	d
2	a
3	b
4	c

- D 1 a) 7749 b) 7743 c) 8245
d) 7950 e) 8447 f) 7946
g) 8149

- 2 a) a star b) a circle c) a circle
d) a star e) a circle f) a heart

Answers to Skills Book

Pages 12–13 'The sixteen points of a compass'

A 1 a–c) Check that the students have marked in the correct places.

- 2 a) 90°
b) 45°
c) 180°
3. 22.5°

Pages 14–15 'When latitude meets longitude'

A. Students top read these messages and e-mails carefully.

B.

1	Pakistan	2	England, UK	3	Scotland, UK
4	Iceland	5	the USA	6	China
7	Australia	8	Sri Lanka	9	Pakistan

Page 16 'Drawing a route on a world map'

A 1–2. Check that students marked the following places:

Pakistan, England, Scotland, Iceland, the USA, China, Australia, and Sri Lanka.

Page 17 'Grid references'

- A 1 a) i) 2461
ii) 2360
iii) 2559

- b) i) railway station ii) library
iii) shopping mall iv) bank
v) park vi) swimming pool

Background knowledge for the unit

Maps represent three-dimensional places in a two-dimensional form (length and width), so they show the outlines of land masses and other features. To represent the third dimension (height/depth) they use colour-coded keys.

Generally, physical maps show colours according to conventions such as: blue for water (darker blue for deeper water), and brown, shaded through green/yellow for land elevation. Different colours may be used on larger scale maps.

The size of an area is indicated by the scale of the map. For instance, if the scale of a map is 1:100,000, it means that 1 cm on the map equals 100 km on the ground.

The most commonly used maps of the world or large regions of the world, such as continents are:

- 1) political maps that show the borders of countries; they usually mark and name capital cities and, sometimes, the major rivers. Large lakes may also be marked and usually named.
- 2) physical maps that show and name geographical features such as mountain ranges, deserts, rivers, lakes, and often main roads and railways.

Thematic maps show information about the physical geography of regions or countries, such as: climatic regions, average temperatures, average annual rainfall, forests, or land elevation. They can also show information about the human geography of regions or countries: population density, life expectation, literacy, and types of industry (and even more specifically, details such as gemstone production, coal mines, or hydroelectric power output).

It is useful to use a political map alongside a physical or thematic map to identify the countries, which are not always named on these maps in order to avoid clutter.

Relief maps show the shape of the land by representing features such as mountains in a way

that shows their shape as well as by using a colour key to denote their height.

More detail can be shown on large scale maps of smaller regions, in which contour lines are drawn to link land of the same elevation. Where contour lines are far apart, the land slopes gently; where they are close together, the slope is steep; where contour lines meet and run along the same line, there is a cliff.

Before we proceed

In this unit the students will use different types of maps to find information about places including some with very high and very lowland elevations, such as Peru, the Dead Sea, and Djibouti. They will compare the land elevations, annual rainfall, and population density for places around the world, and use information from physical maps, relief maps, and weather and climate maps to draw comparisons between different places of the world.

Expected learning outcomes

Students should be able to:

- explain the purposes of different types of maps
- use thematic maps that provide data such as average annual temperature, rainfall, or population density
- identify relationships between information from different maps
- use combinations of thematic maps to help them answer questions

PAGES 28-29

**'Maps and globes' and
'Types of maps'****Preparation**

Collect as many different types of maps as possible for the students to look at in order to decide on their purposes.

Resources

- a globe
- different types of maps

Using the Student's Book

Show the students a globe and a map of the world, and ask them about their differences. List their responses. They should note that:

- the globe is spherical but the map is flat
- they can see all parts of the world at once on a map, but only half of it on a globe
- they can use a globe, but not a map, to show how the Earth rotates
- the globe shows the distances between countries more accurately than the map does
- the globe shows that the area on the western side of the map is connected to the area on the eastern side.

Ask the students about the purposes for which a globe or a map of the world would be more useful. If necessary, ask them to think about planning long-distance journeys; learning about the Earth's shape, rotation, or orbit; or comparing the sizes of countries.

Activity

Ask the students to look at a rectangular map of the world to answer the following questions:

Which city is farther from Anchorage, Alaska: Vladivostok, Russia, or London, UK? (London. If the students did not realize that the shorter distance is west from Anchorage to Vladivostok, ask them to use the globe to check.)

They should now be able to answer the following question correctly, and explain their answer:

Which city is nearer to Beijing, China: Vancouver, Canada, or New York, USA? (Vancouver, going eastwards from Beijing)

Ask the students to read pages 28–29 and to complete the activity on page 29 and Questions B1 a–c.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that globes and different types of maps can show the Earth in different ways.
- I learned that on a map of the world we can see the entire world at once, but on a globe we can only see a part of the Earth at any one time.
- I learned that a globe shows distances between places more accurately than a map does.

PAGES 29-31

'Physical maps' and 'Relief maps'**Resources**

- *Oxford School Atlas for Pakistan*
- Skills Book page 18 'Mountain ranges of the world'

Introduction

Tell the students that they are going to compare political and physical maps. Ask what land elevation means. If necessary, explain that it means the height of the land above or below sea level.

Using the Student's Book

Ask the students to compare the physical and political maps of the world on page 30 with the political map in *Oxford School Atlas for Pakistan*. Ask what information each map gives about the world. They should notice that a political map shows the borders and names of the countries, as

well as their coasts, and the seas, oceans, and main rivers. Where there is space to do so, it also shows the capital cities.

The physical map also shows the elevation of the land with different colours and a key. It names the mountain ranges, some of the main mountains, and other physical features such as deserts, plains, and plateaus. Ask if it is possible to find where, in each country, the highest and lowest land elevations are located. Ask them to identify which parts of countries have lowland and which have highland. This is possible because of the shading and the use of raised relief to show mountains. The students could then be asked to describe the landscapes of different countries: for example, the United States, Brazil, Chile, Peru, or the Netherlands.

Ask the students to read pages 29–30. Ask what the two maps on page 30 tell us about land around the world. Ask what information it gives that we cannot find out from the map on page 29. (The first map gives highest elevation of each country and the second gives the lowest elevation of each country.) Ask the students to describe how the land is shaded in the maps that shows countries by their lowest and highest land elevations.

Ask them to use the two maps (with the help of a political map of the world) to find any countries where all the land is somewhere between –500 and +2000 metres (Jordan is probably the easiest to find). Other questions they could answer, using the maps on page 34 include: In which countries is all the land higher than 500 metres? (An example is Mongolia.) Which countries have some land higher than 2500 metres and some lower than 100 metres? (An example is Egypt.)

Ask the students to use the tables on page 35 to find out about some of the places that have the highest and the lowest land elevations on Earth. Ask if they notice anything about the places that have the lowest land elevations. (Many have lakes or inland seas, because streams and rivers run downhill, and water collects on lowland.) Explain that these lakes and inland seas have very salty water (for example, The Dead Sea in Jordan is famous for its very salty water). Tell them that they will find out more about one of these saltwater lakes in their next lesson.

The students can then complete Questions A1–2, C1–3, D1, E1, F1.

They can complete unfinished questions as homework

Using the Skills Book

The students should use the maps in this unit of the Student's Book to help them to complete the map in the Skills Book 'Mountain ranges of the world' on page 18 to show the mountain ranges that are higher than 1500 metres, the deserts, and the plains they know. They should also make a key for the map, using colours.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how maps are marked to show the coasts, borders, and names of countries.
- I learned to use the shading and key on maps to find out about the elevation of the land.

PAGES 31–32

'Scaling up'

Introduction

Remind the students of their previous learning about scale and ask them what the scale of a map shows. Explain that world maps have to be drawn using a very small scale so that they can fit on a page of a book, but maps of a country can have a larger scale, depending on the size of the country.

Using the Student's Book

Ask the students to compare the scales of the maps of the world in this unit with the scale of the map of Djibouti, in Africa. Ask which map has the largest scale. (The map of Djibouti because it has a greater area on the page for each kilometre on the ground.) Ask what they can find out from this map of Djibouti that they could not find out from the world map. They can see much more detail in the land elevation in different parts of the country, the names of mountain ranges, mountains, many more rivers and lakes, many more towns, and even some of the main roads.

Ask the students to find the places in Djibouti that have the highest and lowest land elevations. The

highest is Moussa 'Ali, in the north-west (2021 metres). The lowest land is around the shores of the lakes—below sea level. Ask if they remember, from their last lesson, the part of Djibouti where the land is lower than –155 metres (155 metres below sea level): this is on the shores of Lake Assal. Ask what they learnt about these inland lakes and seas that are below sea level. (They have very salty water.) Ask the students to look at the map of Djibouti and to say whether the rivers are running into, or out of, Lake Assal, and how they can tell. They should notice the elevation of the land the rivers cross. If they cannot figure this out, ask if the rivers will run uphill or downhill. They should then know that both of the rivers marked on the map must be flowing into the lake.

Explain that rivers carry sediment (particles of rock and soil), which they deposit in the sea or in a lake. This is what makes the sea salty—it is also what makes lakes like Lake Assal salty. Ask if any rivers could flow out of the lake. (No—because the land around it is higher—and rivers cannot flow uphill.)

The students should then use the maps to help them to answer Questions A3 a–e.

Discussion and review

Ask the students what they have learnt about maps and grid references in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how to use physical maps to find out about the elevation of land in different parts of the world.
- I learned how raised relief maps show the shape of the land clearly, as well as its elevation.
- I learned how larger scale maps can show greater detail than small scale maps.
- I learned how the water in lakes and inland seas below sea level becomes salty.

PAGES 33–35

'Thematic maps'

Resources

- Skills Book pages 19–20 'Showing information on a map'
- Skills Book pages 21–22 'How well do you know the world?'

Introduction

Tell the students that they are going to learn how maps can be used to show information about weather and climate, or about population, that helps us to compare different places.

Using the Student's Book

Ask the students to read the paragraph that introduces thematic maps on page 33, then the paragraph on temperature map, and to look at the temperature map. Ask what information this map shows. They could also explain the key. Ask them to identify a country that has a hot climate, then invite them to ask questions that others can answer by looking at the map.

Ask the students to look at the rainfall map on page 34. Ask them what information this map shows. They could also explain the key. Ask them to identify a country that has a dry climate, then invite them to ask questions that others can answer by looking at the map.

Ask the students to use both maps to help them to list countries that are: i) hot and dry; ii) hot and wet; iii) cold and dry; iv) cold and wet. (Examples: i) Mauritania, Mali, Niger, and Chad in north-west Africa; Saudi Arabia and Oman in Asia; and Central Australia; ii) Venezuela and parts of Brazil in South America; Myanmar, Malaysia, Indonesia, Papua New Guinea, and parts of China in Asia; iii) parts of Greenland, northern Canada, and Russia; iv) small areas of Greenland and Russia. (Few very cold places have a high annual rainfall.)

Ensure that the students know the meaning of 'population', and introduce the term 'population

density'. Ask what this means. If necessary, explain that it means the number of people living in a given area (usually 1 square kilometre or 1 km²).

Ask the students to look at the population density map. Ask them what information this map shows. They could also explain the key.

Ask them to identify three countries that have very high population densities, then invite them to ask questions that others can answer by looking at the map. They can then compare the information on the population density charts with the information shown on the map.

Now ask them to compare the population density map with the temperature map and the rainfall map. Ask if they can find any relationship between population density and climate. Ask them to explain any relationship they find: for example, Australia has a low population density, but it has a large area that is hot and dry (desert).

Also ask the students to compare the population density map with the physical map on page 29.

Ask if they can find any relationship between population density and land elevation. Ask them to explain any relationship they find: for example, mountainous areas, such as the Himalayas, have low population densities.

They can then complete Questions E2 a–b, E3 a–b, E4–5.

Using the Skills Book

They could then proceed to the exercise in the Skills Book on pages 19–20, or complete this for homework. Explain that their task is to use information from a chart that lists world squash champions in order to create a distribution map of squash champions that will show very clearly which countries have produced the most world squash champions, as well as the most male and female champions.

They should complete pages 21–22 as homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how to use thematic maps to find out about average temperatures and rainfall for different countries.

- I learned how to use a thematic map to find out about population density around the world.
- I used information from temperature, rainfall, and population density maps to answer questions about how climate affects population density.
- I learned how to record and present information using a distribution map.

Answers to assessment

- A 1. a physical map or relief map
 2 d) the height of the land above or below sea level
 3 a) Moussa 'Ali
 b) Lake Assal
 c) Djibouti, Obock, or Tadjoura
 d) Randa, Adailou, Sibhi, Bankouale, or Day
 e) the students' own responses, using information from the text and maps in the Student's Book
- B 1 a) Albania is in Europe with its western shore on the Mediterranean Sea. It has borders with Greece, Macedonia, Kosovo, and Montenegro.
 b) Its capital city is Tirana.
 c) They should use a political map.
- C 1 a) in northern Asia and Europe
 b) Hungary, Ukraine, Russia, north Kazakhstan, Mongolia
 2. the students' own responses, supported by the table and map
 3 a) China
 b) any South American countries except Suriname, Guyana, Paraguay, or Uruguay
 c) Nepal
- D 1.

Country	Continent	Highest land elevation (metres)	Lowest land elevation (metres)
Chile	South America	6000–7000	0–100
Pakistan	Asia	8000–6000	0–100
Portugal	Europe	2500–3000	0–100
Mali	Africa	1000–1500	0– –100
New Zealand	Oceania	3000–4000	0–100

- E 1. any country that has land below sea level, especially islands and countries whose coasts are below sea level; examples from this unit: USA (New Orleans area), Thailand (around Bangkok), the Netherlands; also parts of Jordan, Syria, Djibouti, China, and Kazakhstan.
- 2 a) Most people in Greenland live around the coasts, especially the south; inland is mainly glacier or covered with ice all year round; the south coast has the warmest climate.
 b) It is a large country but the land is mainly covered with ice and the climate is very cold.
- 3 a) The climate map of the world in *Oxford School Atlas for Pakistan* shows that most of Australia has a dry, semi-desert climate.
 b) The population density map of the world in *Oxford School Atlas for Pakistan* would show that most of the population in Australia lives near or around the coast.
4. students' own responses
5. The population density of Egypt is 95 per sq km but in areas along the banks of the River Nile and on the coast, near the Nile Delta it is more than 1000 people per sq km. This is because most of the land is desert or mountain, but the land is flatter and has a lower elevation around the Nile and at the coast.
- F 1. Mauritania is in north-west Africa. It has the Sahara Desert in the eastern half of the country and a few mountains in the centre and north. Students should use a political map and a physical (relief) map.

Answers to Skills Book

Page 18 '*Mountain ranges of the world*'

- A 1 a-b) Check that the students mark the mountain ranges as instructed.

Pages 19–20 '*Showing information on a map*'

- A 1. Students to read information on page 24.
B 1 a-b) Check that the students mark the countries of the respective players in the correct places.

Page 21–22 '*How well do you know the world?*'

- A 1. Check that the students have marked the map in the correct places.
B. Check that the students have marked the map in the correct places

UNIT 5

Living with the climate

Background knowledge for the unit

Climate affects a region's agriculture, buildings, infrastructure, clothing, and many aspects of everyday life. These differences are more noticeable when extreme climates are compared: for example, in extremely cold regions, such as parts of Russia, the permafrost makes the digging of foundations for buildings very difficult. As a result, most buildings are placed on pillars, which requires a smaller volume of land to be dug out, and pipelines for sewage and water, and cables for electricity and communication are kept above the ground, rather than laid underground.

Homes in different climates are noticeably different: for example, in regions that have a lot of snow, roofs tend to be steep and flat roofs are rare; in hot, sunny climates, many homes have window shutters that can be closed to keep out strong sunlight, and white or light colours are used to reflect sunlight. Towns and buildings in hot climates are designed to provide shade and to allow air to circulate easily.

Physical features such as mountains, plains, valleys, lakes, rivers, and forests affect the local climate. Urban and rural places in similar locations can have different climates.

Night temperatures in valleys are lower than on any surrounding hills because, in the winter, heavier cold air drops down into the valleys. This can cause fog or mist. In the summer, winds make the air colder on the hills.

Places on the sheltered side of mountains have less precipitation than those on the windward side because they are in a rain shadow. They can have much higher temperatures in winter than places on the windward side of the mountains.

In summer, forests have lower temperatures than plains because they trap heat. Forests also reduce wind speed, whereas open plains offer little wind

resistance. Trees can store large amounts of water, whereas water easily evaporates from plains, so forested areas have higher humidity, while plains tend to be dry, or even arid.

Urban areas are usually warmer than nearby rural areas, mainly because the buildings trap heat and release it slowly back into the atmosphere. The heat released from energy consumption in homes and industry also increases the temperature of the atmosphere of urban areas.

Before we proceed

It is useful to begin with the students' own experiences of different climates. They could be asked to prepare a presentation on a place that has a different climate from that of their hometown, focusing on a description of the climate and anything they noticed about how it affects everyday life, buildings, cities, agriculture, etc.

Questions such as 'How are the homes different from ours?' and 'Why do you think the homes were built like that?' are useful for focusing on the effects of climate.

If possible, the students could also exchange information with their friends or family who live in a different climatic zone.

Expected learning outcomes

Students should be able to:

- distinguish between weather and climate
- identify the factors that affect the climate of a place: latitude, elevation, landforms, land mass size, distance from the sea, and ocean currents
- identify the main climatic zones of the world
- describe how people adapt their lives and buildings to suit the climate

PAGE 38-39

'What is the difference between climate and weather?'

Resources

- a globe
- *Oxford School Atlas for Pakistan*
- Skills Book page 23 'Weather or climate?'

Introduction

Ask what climate means. Ask 'Is climate the same as weather?' Explain the main factors that affect climate.

1. Latitude / distance from the Equator

The Earth's curvature means that the farther an area is from the Equator, the lower the air temperature. Near the Poles, sunlight has to pass through a larger area of atmosphere and the Sun is at a lower angle in the sky. Also, white and lighter colours reflect more light than darker colours, so the ice and snow near the Poles reflect more sunlight than most land surfaces.

2. Land elevation / altitude

Locations at a higher altitude have colder temperatures. Temperature usually decreases by 1°C for every 100 metres in altitude because air pressure is lower at higher altitudes. As air rises, air pressure decreases. You can demonstrate this using a bicycle pump. As you depress the pump this puts pressure on the air that is to be forced into the tyre. This increase in temperature is enough to be felt (safely) by hand. If you release air from a tyre, the air is under less pressure as it escapes, so the air expands and cools; so air escaping from a tyre feels cool.

3. Size of the land mass / distance from the sea

Water heats up and cools down much more slowly than land. So places near the sea are usually cooler in the summer and warmer in the winter than inland places at the same latitude and elevation.

4. Warm or cold sea currents

Many places near the sea have a maritime climate. As well as the difference made by being near the sea, warm ocean currents also give them a warmer and wetter climate than places at the same latitude and elevation that are not affected by ocean currents. Cold ocean currents have the opposite effect.

5. Wind

The prevailing wind is the main wind direction in a place. If the prevailing wind crosses an ocean or sea it can increase the rainfall. When prevailing winds blow over land areas, they can help to create a desert climate. An example of this is Kuwait.

Using the Student's Book

Ask the students to read page 38, then ask what factors, other than latitude, affect climate. These are:

- land elevation—the height of the land
- the size of the land mass—larger land masses tend to have greater differences between summer and winter than smaller ones
- distance from the sea—because the sea warms up and cools down more slowly than land does, places near the sea tend to have milder climates than inland places
- warm or cold sea currents—the seas flow in directions influenced by the Earth's rotation and other factors.

Then ask the students to look at the map of the world's climatic zones and to name places that have:

- a polar climate
- a temperate climate
- an arid climate
- a tropical climate
- a Mediterranean climate (note that this type of climate is not restricted to areas around the Mediterranean Sea—other places can have a similar climate)
- a mountain climate

Activity

Show the students a globe and ask different student volunteers to come forward and point out parts of the world that have very hot climates, then very cold climates. Ask how they knew. They should have chosen, for very hot climates, places between the Tropics of Cancer and Capricorn, and for very cold climates, places near the Poles. If necessary, remind them of the meaning of latitude, and that latitude has a great effect on climate, but that there are other factors that affect climate, too.

Ask them to point out any places near the Equator that have a climate that is not very hot, and anywhere within the Arctic Circle that is less cold than other places at around the same latitude. Ask them to explain their choices, and tell them that they are going to find out about the factors that affect climate.

Using the Skills Book

Ask students to complete the Skills Book activity 'Weather or climate?' on page 27 to help them to understand the difference. The students could work in pairs on this activity, and then give feedback to the class. They should now have a clear idea about the difference between weather and climate.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the difference between weather and climate.
- I learned about the factors that affect the climate of a place.
- I learned about the Earth's main climatic zones.

PAGES 39-40

**'Living with the climate'
and 'What is extreme
weather?'**

Resources

- *Oxford School Atlas for Pakistan*
- Skills Book page 24 'Locating places in different climatic zones'

Introduction

Tell the students that they are now going to locate countries in their respective climatic zones. Explain that this will also reinforce what they learned in units 3 and 4 about types of maps and key elements of maps.

Using the Student's Book

Ask the students to look again at the map of climatic zones on page 38. Ask them to find out the climatic zone of Pakistan. For this, they should remember how to use the key of a map. Point out that there are different climates within Pakistan, but the map does not show all of them because its scale is too small. Then ask them to use the key to find other countries with similar climates. They will need to use *Oxford School Atlas for Pakistan* or a political map of the world marked with the names of the countries.

Ask the students to read 'Living with the climate'. Ask what they have learned from this section before they proceed to the next section 'What is extreme weather?'

First, remind them that weather can change from day to day or even several times during the day, and that climate is the weather pattern of a place recorded over a long period of time. Ask them to give some examples of extreme weather. These could include flooding caused by very heavy rains over a short time, drought, very hot or very cold weather, or very strong winds.

After reading this section, the students should complete Questions D3 a-b, E1-2.

Using the Skills Book

Ask the students to turn to page 24 of the Skills Book 'Locating places in different climate zones'. Explain that some climates are very cold, like those of the ice cap and polar tundra, and others are very hot like those of hot deserts.

They will need *Oxford School Atlas for Pakistan* to locate the cities mentioned in Question 2.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned to use a thematic map to find places that have a similar climate.
- I learned some examples of extreme weather and how this is different from very cold or very hot climates.

PAGES 41-42

'Polar climate'**Resources**

- Oxford School Atlas for Pakistan
- a globe
- a torch

Introduction

Ask the students what they know about polar climates, and why these places are very cold. Ask if polar climates are wet or dry. Ask them to explain their answers before they read the Student's Book pages 41–42 'Polar climate'.

Using the Student's Book

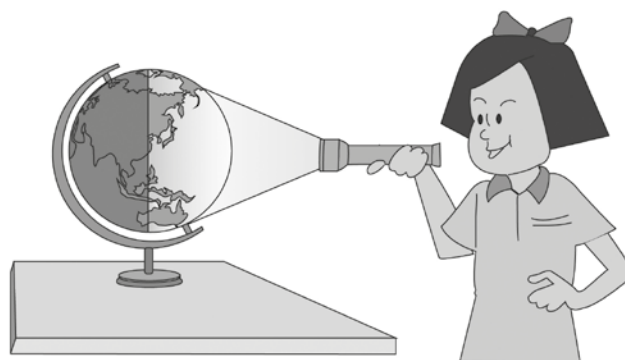
Ask the students to read 'Polar climate' to find out how accurate their ideas about this type of climate were. After they have read this introductory paragraph, ask why does it snow so little in the Arctic and why are the winters so long and dark there?

Explain that humidity means the amount of water in the air. They might remember that when water evaporates from lakes, rivers, land, and sea into the air, it increases the humidity in the atmosphere. Remind them that the warmer the air, the more easily the water evaporates (becoming water vapour). When water vapour cools in the atmosphere, it forms droplets of water (mist, fog, and clouds). This falls to the ground as rain or drizzle, and in cold weather as snow or sleet. In cold climates such as the Arctic, water does not evaporate because the sea is frozen, and hence there is very little humidity there.

The students should then use the maps and the globe and torch to help them to answer Questions A1–2.

Activity

Demonstrate with the help of a torch and a globe why winters are long and dark in the Arctic. Hold the torch, which will represent the Sun, at an angle so that its light falls directly on the Equator. During the winter, the Arctic is tilted away from the Sun and that is why it receives very little sunlight. Hence its winters are long and dark.



Demonstrating that the Arctic is tilted away from the Sun during winters

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the climate of a place with a polar climate is influenced mainly by its distance from the Equator.
- I learned that polar climates have very little rain or snow because the air has very little water vapour.
- I learned that the low humidity in polar climates is because the sea freezes in the winter; water does not evaporate into the air.

PAGES 42-43

'Living in a very cold climate'**Resources**

- room thermometer, or make a note of daily/weekly record of air temperatures for your city or town each day

Preparation

For a few days before the lesson, make a note of the air temperature for your city or town each day. Also find out the lowest-ever recorded temperature for your area.

Introduction

Tell the students that they are going to find out how people live in very cold climates. Ask them what they think the temperature of the place where they live is at that time. If you have a thermometer, place it in a shaded place outdoors to measure the air temperature. The students can then check their estimates against this. If not, tell them the temperatures for your area for the past few days. Then ask them if this is hot, warm, cool, or cold.

Inform them of the lowest temperature that has ever been recorded for your area. Then explain that some places in the Arctic Circle have temperatures as low as -44°C , which is much colder than the air in a freezer (typically around -20 to -18°C). Ask what problems people who live in such places might face.

Using the Student's Book

Ask the students to read page 42 'Living in a very cold climate' and 'How are the houses built?' Explain that when a building is constructed, the foundations are first dug deep into the ground, otherwise the weight of the building will push it down into the ground. You could show them a photo of the Leaning Tower of Pisa in Italy, which was built on poor foundations, so that it sank unevenly into the ground until it settled on solid rock.

However, in Arctic regions, the permanently frozen ground, called permafrost, is really very hard to dig into. Though the permafrost seems solid, if the top part of it melts in warm weather, the foundations of the buildings will be insecure. The builders dig smaller, deep foundations for pillars on which buildings are supported.

Ask why pipes and electrical cables are laid above the ground in Yakutsk, Russia. The students can read the blog from the resident of Yakutsk. If possible, ask them to look this up online in order to read any updates. They might even be able to communicate with the writer via the blog. If so, encourage them to prepare some questions they would like to ask about life in Yakutsk.

Ask them to complete Questions B1–3, C1–2, E3.

Discussion and review

Ask the students what they have learnt in the lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how a very cold climate affects people's everyday life.
- I learned how a very cold climate affects how buildings are constructed and how pipes and cables can be laid for important services such as water, sewage, electricity, and communication.

PAGES 43–45

'Living in a very hot climate'

Resources

- a weather thermometer or make a note of the air temperature for your city or town each day
- Skills Book page 25 'Living in places with very hot and very cold climates'

Preparation

For a few days before the lesson, make a note of the air temperature for your city or town each day. Also find out the highest-ever recorded temperature for your area.

Introduction

Tell the students that they are going to find out how people live in very hot climates. Remind them of what they found out about the temperature where they live.

Inform them about the highest temperature that has ever been recorded for your area. Then explain that some places near the Equator have average summer temperatures of between 44°C and 46°C —sometimes even higher. The highest ever temperature recorded in Kuwait was 53.8°C on 31 July 2012. This is the highest recorded temperature in Asia and the third highest in the world. Temperatures in Kuwait are hardly ever lower than 10°C , even at night in the winter.

Ask why places near the Poles have very cold climates and why places near the Equator have much warmer climates. The students should now be able to explain this easily, referring to the distance of the Equator and the Poles from the Sun.

Using the Student's Book

Ask the students to read 'Living in a very hot climate' on pages 43–45. Ask how the hot, dry climate of Kuwait affects the land and vegetation. Ask what makes the climate there so hot and dry, apart from its nearness to the Equator. They might be able to compare the climates of Kuwait City and Quito in Ecuador (which is on the Equator) and explain the differences. Point out the difference made by the land—its elevation and the landforms (mountains, plains, valleys, and plateaus).

The students can complete Question D1 orally, as a whole-class activity before continuing to read about life in Kuwait City, including how the climate affects the way in which houses are built. Ask them to identify as many features as they can that help to keep houses cool. Also ask how the problems of living in a very dry climate with very little water are solved.

They might be able to explain how some of the problems of living in a hot, dry climate can be solved and complete Questions D2 a–f, E3–4.

Using the Skills Book

Ask the students to use what they have learned from the Student's Book to help them complete the Venn diagram on page 25 'Living in places with very hot and very cold climates'.

Discussion and review

Ask the students what they have learnt in the lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how latitude, land elevation, and landforms affect the climate of a place.
- I learned how people solve the problems of living in a very hot, dry climate.

Answers to assessment

- A 1. Arctic regions have very long days throughout the summer, with 24 hours of daylight for some of the time. In winter they have very short days, with 24 hours of darkness for some of the time.
- 2 a) The land is very flat, with very low vegetation, and hardly any trees.
b) Trees grow very slowly in cold climates and the soil that is not frozen is not deep enough for their roots.
- B 1 a) Accept the students' own ideas, which should include how to keep warm; how the cold climate affects their everyday activities; and how their homes, other buildings and the infrastructure are built.
b) The students should write their own questions and find out their answers from the Internet or reference books.
- 2 a) Permafrost makes it difficult to dig foundations because the frozen ground is very hard.
b) They dig deep but small areas for pillars which rest on solid rock deep in the ground. The buildings are erected on these pillars.
- 3 a) Students should write their own responses. These might include whether or not they would be able to play outdoors, the type of clothes they would wear, etc.
b) Students should write their answers. They might like to ask him about his profession and whether he has ever travelled to another region with a different climate.
c) Students should discuss their questions with their friends and tell you their answers.
- C 1 a) Oulu, in Finland, Tromsø, in Norway, Barrow in Alaska, and Reykjavik in Iceland; students's own research
b) Cities on smaller land masses, nearer the sea, or at lower elevations, and sheltered by mountains have less extreme climates.

- 2 a) Students should find out the average annual temperatures and rainfall for these cities.
 b) Reykjavik has higher annual rainfall than Yakutsk.
 c) Reykjavik has higher average temperatures than Yakutsk.
- D 1. land elevation, landforms, such as plains, mountains, and plateaus and distance from the sea
- 2 a) It is near the Equator, on very flat land.
 b) It has an arid climate which is very hot, so people need to find ways to stay cool and to keep homes, other buildings, and streets cool. There is very little water because there are no lakes or rivers and very low rainfall. Strong winds blow across the flat land of the nearby desert, causing dust storms.
 c) They use sea water that is desalinated (has the salt removed) in desalination plants.
 d) Very hot temperatures can kill plants but they grow some crops in temperature-controlled glasshouses and polytunnels. These let in sunlight but control the temperature.
 e) Wind-towers with openings make the air move around buildings and thus keep them cool, and narrow streets with tall buildings provide shade from the Sun.
 f) Buildings are painted white or a light colour to reflect the sunlight during the day. They have courtyards that provide shade during the day, but the walls absorb heat from the Sun. This warms the air at night.
- 3 a) the students' own descriptions; a long period of high temperature which is higher than the regular climate of a certain place
 b) floods in Lahore during 2011–2014; heatwave in 2014; coldest December in 2013
- E 1 a) temperature, sunshine, rain
 b) weather, year
- 2 a) very cold, rain

- b) rain at any time of the year
 c) cold all the year, very cold
- 3 a) false (Temperatures are quite high in the summer.)
 b) true
 c) true
 d) true
 e) true
 f) false (There is no precipitation in Yakutsk so it never rains or snows there.)
4. The coastal areas of Thatta and Badin are often flooded by sea water when the sea level rises during the rainy season. People move to safer places and return to their homes once the sea level goes down. The Indus plain is also flooded during the rainy season and people have to be displaced to safer areas.

Answers to Skills Book

Page 23 'Weather or climate?'

- A 1 a) weather b) climate c) climate
 d) climate e) weather f) climate

Page 24 'Locating places in different climatic zones'

- A 1–2. Check that the students mark the map in the correct places.

Page 25 'Living in places with very cold and very hot climates'

- A 1. Check that the students write the relevant statements in the correct parts of the Venn diagram.

Forests of the world

Background knowledge for the unit

There are many definitions of forest. 'Forest' usually means a collection of trees, but there is no agreed minimum size or precise distinction between a forest and a wood, although woods are generally agreed to be smaller than forests. A forest is not just a group of trees, but includes the soil that supports the trees, and the water and air around them. This makes up a complex ecosystem that supports many living things, including shrubs, vines, grasses, and other herbaceous (non-woody) plants, mosses, algae, fungi, insects, mammals, birds, reptiles, amphibians, and microorganisms.

Forest habitat

A forest is usually a habitat for numerous animal species, depending on its location and climate, for example:

Asia

Eastern Himalayas: Asian elephant, snow leopard, panda, tiger, one-horned rhino

Mekong River Forest: tiger, rhino

Borneo and Sumatra: orangutan, rhino, pygmy elephant, tiger, elephant

Yangtze River Forest: giant panda, snow leopard

Amur-Heilong Forest (north-eastern China and eastern Russia): tiger, leopard

Africa

Namibia: elephant, black rhino, white rhino

Madagascar: lemur, tortoise, gecko, chameleon

Congo Basin: mountain gorilla, chimpanzee, elephant

South America

Amazon Forest: jaguar, macaw, black spider monkey, poison dart frog

Temperate deciduous forests

(eastern USA and Canada, most of the Europe, and parts of China and Japan)

An enormous variety of animal life, such as insects, spiders, slugs, frogs, turtles, and salamander; various birds, e.g. hawks, cardinals, snowy owls, and woodpeckers; and mammals, including deer, raccoon, opossums, porcupines, and foxes. Animals of the temperate deciduous forest have to adapt to the changing seasons, migrate, or hibernate in the winter.

Types of forests

Latitudes between 10°N and 10°S of the Equator are mainly covered with tropical rainforests.

Tropical rainforests receive rainfall in all months of the year and have a hot, humid climate, with average monthly temperatures between 18°C and 35°C. There are also tropical dry forests in some regions whose climates are warm all year. They do not necessarily have a low annual rainfall; in fact, many tropical dry forests have several hundred centimetres of rain per year, but they have long dry seasons lasting several months. These droughts affect all the living things in the forests. Examples of tropical dry forests are Doi Inthanon National Park, in the north of Thailand, and Chacachare, in the Republic of Trinidad and Tobago. Other examples are in Sri Lanka and Guatemala.

Deciduous forests lie between 45°N and 45°S in the temperate climatic zone. Coniferous forests are found at very high altitudes with very cold climates, mainly in the northern hemisphere.

Most forests that are made up mainly of broad leaf trees have many more species of living things than those made up mainly of conifers.

Some forests, such as tropical rainforests and temperate deciduous forests, have numerous tree species in a small area; coniferous forests have a few species over a large area.

Around 66% of the world's forests are in just ten countries. About 80% of the Earth's plant biomass is contained in forests, mainly under the ground in roots and in rotting plant material.

Primary forests are natural forests, although most have had new trees planted. Planted forests are planted for a purpose. Most forests are a mixture of primary and planted.

The benefits of forests

A report by the FAO (Food and Agriculture Organization of the United Nations) in 2016 concluded that, although agriculture is the main cause of deforestation, forests and trees actually support sustainable agriculture. They do this by stabilizing the climate and soil. They also provide protection from water erosion and flooding and provide shade from sunlight, and shelter from wind and storms. In addition, they provide a habitat for insects and other species that pollinate plants, as well as animals that feed on insects and other species that destroy crops.

The FAO report describes projects in Costa Rica, Chile, the Gambia, Georgia, Ghana, Tunisia, and Vietnam that have shown that agricultural productivity can be increased without deforestation, and even while reversing deforestation.

Forests provide food, energy, and income for hundreds of millions of people around the world.

Non-food products include timber, paper, charcoal, and other wood products, both for construction and energy; cork, tar, turpentine (used for thinning paints and furniture polish) rubber, and creosote (used for protecting timber and in the chemical industry). Numerous chemical products are by-products of wood.

Food products from forests include those from trees growing naturally, such as Brazil nuts, other nuts, fruits, berries and seeds; also edible fungi grow among the trees.

Food also comes from the animals of the forest habitat, such as fish, shrimps, oysters, crabs, and cockles from mangrove estuaries; and honey from bees in numerous forests.

Rubber-tapping

A rubber tree takes about six years to grow enough for its sap (latex) to be harvested. The tapper

makes a thin, diagonal cut to remove a thin slice of bark and fixes a small bucket below this to collect the latex. Latex runs out for about six hours and then stops. Usually about 2.5 litres of latex can be collected each day from a single tree. The next day the tree can be tapped again, but most rubber-tappers tap different trees the next day.

A dilute acid is added to the latex, which is left to thicken in shallow metal pans. This forms a soft block of thickened latex.

The block of thickened latex is then passed through rollers to squeeze out the water. Then it is washed to remove the acid, and rolled again, to squeeze out the water.

After rolling, the sheet of raw rubber is hung to dry on a rack over a wood fire. The smoke from the fire stabilizes the rubber. This rubber is then sold to manufacturers.

Before we proceed

It is useful to show students the maps of world ecosystems from *Oxford School Atlas for Pakistan*, to help them identify the countries where different types of forests are located.

Also help them identify the climatic zones of the countries where these forests are found.

Reference books about forests and trees will be useful in finding examples of coniferous and deciduous trees. The students could also find information on websites such as www.pakistangeographic.com/forests.html and Forest, Wildlife, and Fisheries Department of Pakistan <http://fwf.punjab.gov.pk>, and the Food and Agriculture Organization FAO www.fao.org.

Expected learning outcomes

Students should be able to:

- describe the climates of different types of forests
- compare primary and planted forests
- explain how forests and woodland improve the environment
- identify the characteristics of the main layers of a tropical rainforest
- explain some of the ways in which people make a living in forests

PAGES 48–49

‘What is a forest?’; ‘Types of forests?’; ‘Coniferous forests’; and ‘Deciduous forests’

Resources

- *Oxford School Atlas for Pakistan*
- Skills Book page 28 ‘Planted forests’
- access to the Internet, if possible

Introduction

Ask what is meant by a forest. Point out that there is no real distinction between a wood and a forest, although most people agree that a forest is bigger than a wood. If they have visited a forest, students could describe how a forest is different from other landscapes; the difference made by the trees to the weather, local climate, other plants, and wildlife.

Show them the map of the world’s main forests, and explain the difference between primary forest and planted or semi-planted forest.

Activity

Ask the students to use the Internet or reference books to find out about the different types of forests found in different climatic zones. They could mark a world map to show the locations of the world’s coniferous and deciduous forests.

Using the Student’s Book

Ask the students to read the following sections of pages 48–49 ‘What is a forest?’; ‘Coniferous forests’; and ‘Deciduous forests’. Then ask them to describe coniferous and deciduous forests, giving examples of some of the trees and to say what kind of climate is suitable for each type of forest and why. Ask why some parts of Pakistan are suitable for coniferous trees, although Pakistan is not in a cold climatic zone. (Because the coniferous forests grow at high altitudes, where temperatures are much colder than in the lowlands, e.g. Juniper forest in Ziarat, Murree, and northern areas of Pakistan.)

Using the Skills Book

Ask the students to do page 28 ‘Planted forests’ and ask what a planted forest is and how it differs from a primary forest. Using *Oxford School Atlas for Pakistan*, help them locate the countries listed on the page and mark them on the blank political map of the world.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the factors that affect the type of forest that grows in a place.

PAGES 49–51

‘Tropical rainforests’ and ‘Layers of the rainforest’

Resources

- *Oxford School Atlas for Pakistan*
- Skills Book page 26 ‘Layers of a tropical rainforest’
- Skills Book page 27 ‘The climate of a tropical rainforest’

Introduction

Tell the students that they are now going to find out more about tropical rainforests, and ask them to look at the map on page 50 that shows the tropical rainforests of the world. Ask them which latitudes most tropical rainforests lie between. Also ask them to name any countries at the same latitudes as these forests that do not have tropical rainforests. Ask them to explain why some tropical regions have rainforests while others do not. Point out that some tropical regions have arid climates—deserts, which do not support trees; others have tropical dry forests (see Before we proceed).

Explain that forests, particularly rainforests, can be split into horizontal layers. Each layer has a different collection of plants and animals depending upon the amount of sunlight, water, and food available. From the ground upwards, these layers are:

- forest floor—rotting leaves, animal dropping, and dead trees, which form new soil and provide nutrients for the plants; living plants, including ferns, grasses, fungi, and tree seedlings
- under canopy—bushes, shrubs, and young trees that can survive in the shade under the canopy
- canopy—branches, twigs, and leaves of mature trees, where the tops of the tallest trees get most of the sunlight
- emergent layer—in tropical rainforests, where a few scattered trees rise above the canopy

Activity

If possible, show the students an example near the school of any area of vegetation and ask what they notice about the heights of the plants. (They are usually different heights, with some needing more sunlight than others which survive in the shade.) Explain that forests are like this: some trees grow taller than others and there are many plants that grow well in shady places, while some reach the sunlight by climbing up others.

Using the Student's Book

Ask the students to read 'Layers of the rainforest' and to look at the diagram of a rainforest. Ask them to describe the layers of a rainforest without referring to the Student's Book. Then ask them to give an example of a tropical rainforest tree, saying which layer of the rainforest it belongs to, and why this layer suits it. They should be able to name the kapok tree and to say why it is suited to the emergent layer. After reading this section, the students should complete Questions A1–2.

Using the Skills Book

Ask the students to turn to page 26 of the Skills Book 'Layers of a tropical rainforest'. They should try to complete this without referring to the Student's Book. They can proceed to page 27 'The climate of a tropical rainforest', or complete this for homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the climate of a tropical rainforest

- I learned how different trees and other plants survive together in a tropical rainforest.
- I learned that a tropical rainforest can be split into layers, with the tallest trees growing to the top layer—the emergent layer.

PAGES 51–52

'Making a living in the rainforest of Brazil'

Resources

- *Oxford School Atlas for Pakistan*
- pictures of products of the Amazon rainforest

Introduction

Ask the students to locate Brazil on a map of the world. Ask them to describe its location (continent, neighbouring countries, seas/oceans, and latitude). Ask them to find the main river in Brazil, and to name it. They should be able to describe the climatic zone of the area around this river (the Amazon). Using a physical map of Brazil/South America, they should be able to describe the land there (whether it is mountainous, a valley, a plain, or a plateau).

Activity

Show the students some pictures of the products of the Amazon rainforest: rubber and Brazil nuts (if possible show the nuts in their shells—perhaps use nutcrackers to open them for the students to eat.) Explain that the nuts grow in pods—around 10–21 nuts in each pod.

If you are unable to find Brazil nuts, show them pictures of Brazil nuts and tell them that a pod is approximately the size of a baseball. Its outer shell is very hard. It falls from the trees when it ripens.

Using the Student's Book

Ask the students to read the sections about rubber-tapping and Brazil nut harvesting. After they have read these, ask if they think the workers face any dangers. (Many workers are injured, or even

killed by Brazil nut pods falling from trees as these are hard and quite heavy. They also face possible danger from some of the animals of the rainforest.)

Ask if rubber-tapping and Brazil nut harvesting harm the rainforest, and why not. Inform them that rubber trees have a wax-like liquid called latex in their bark which is tapped by rubber-tappers. Ask them to name some of the products made from rubber. Give them examples like rubber shoe soles, balloons, tyres, pencil erasers, etc. Ask them to complete Questions B1–3.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that the rainforests contain trees that are very useful to people: for example, the rubber tree and the Brazil nut tree.
- I learned how Brazil nuts are harvested and sold without harming the trees and rubber-tappers collect latex without harming the trees, and sell it to rubber manufacturers.

PAGES 52–53

‘What is the difference between primary and planted forests?’; ‘Why do people plant forests?’; and ‘Urban planted forests’

Resources

- Skills Book pages 30–31 ‘Advantages of planted forests’

Introduction

Remind the students about the term ‘primary forest’ and ask them to explain it. Point out that there are very few forests that have grown completely naturally, but most forests began as primary forests, and new trees have been planted in and around them. Ask if they have visited, or heard of, a forest that was planted specially, and if they know what the trees were planted for. Tell

them that they are going to learn some of the reasons why people plant forests and about some examples.

Using the Student’s Book

Ask the students to read the sections of pages 52–53 ‘What is the difference between primary and planted forests?’, ‘Why do people plant forests?’, ‘Urban planted forests’, and ‘It’s a fact.’ Point out the photo of the Shelterbelt Forest on Sanjiang Plain, China, and ask how it is useful. Explain that for centuries, dust storms from the Gobi Desert have affected the major cities of China like Beijing and are a major cause of desertification. Since 1978, the Chinese government has started planting forests to address this issue and it has been quite successful in this regard. The vegetation has increased and the intensity of the dust storms has decreased.

Explain that, as well as protecting the land from dust storms, a planted forest could be useful in another important way, and ask what this might be. (A forest can protect the land from wind that could cause soil erosion, where soil is blown away by the wind, leaving the land much poorer for farming. It could also help to prevent soil being washed away, as the tree roots hold the soil.)

Ask the students not to refer to the Student’s Book, and invite volunteers to say what they have learnt, and to give examples of primary and planted forests. Also ask why people plant forests, apart from making the environment look pleasant. If they do not mention it, remind them of the information in ‘It’s a fact.’ and ask how forests can help to protect the environment. Explain that carbon dioxide is a gas that is released into the air when animals (including humans) breathe, and that many human activities, such as industry and transport, release carbon dioxide into the air. Point out that carbon dioxide replaces other useful gases in the air, such as oxygen, which we and other animals need in order to stay alive. Carbon dioxide is one of the gases that help to keep the Earth warm, but too much carbon dioxide leads to global warming. Trees and other plants take in carbon dioxide during the day, when they use energy from sunlight to produce glucose from carbon dioxide and water. They build new material from glucose. So large forests are important for reducing the amount of carbon dioxide in the air. The tropical rainforest of Brazil makes a huge difference to the entire world this is why many countries are helping Brazil to protect its forest.

Ask the students to complete Questions C1–3.

Using the Skills Book

Show pages 30–31 of the Skills Book to the students that feature a series of quotations from different people about a new forest that is being planned for land in a rural area that is being used for farming.

They could read the quotations in groups and discuss the effects of the planned forest and then write what they think each group of people would want the planners to do. Visit each group and ask them to explain their answers. Each group could also plan a presentation for the rest of the class, or they could arrange a mock ‘consultation meeting’ with different students taking the roles of the people described on the pages. Encourage them to represent their characters’ views in a persuasive but polite way.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the differences between primary and planted forests and can describe some examples of each type of forests.
- I learned some of the purposes for which forests are planted, including to help reduce climate change.

PAGES 53–54

‘How do forests help a city?’

Resources

- Oxford School Atlas for Pakistan
- Skills Book page 29 ‘How forests cool a city’

Introduction

Tell the students that forests are an important part of our environment. They affect the atmosphere of the neighbouring towns and cities.

Using the Student’s Book

Ask the students to read ‘How do forests help a city?’ on pages 53–54. Invite the students to explain what makes the air in cities warmer than the air in the surrounding countryside, and how a forest can help to cool the air in a city. Ask them to complete Question C4.

Using the Skills Book

Show the students the diagram on page 54 and ask them to discuss how a forest could help to improve the atmosphere and keep the air in a neighbouring town/city cool, and where it could be planted. The students could also discuss whether everyone in the city or town would be in favour of planting new forest, and give reasons to support their answers. This is an opportunity for a class debate, also using what has been learned in previous lessons.

The students could complete this exercise on page 29 for homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how a forest can help to cool hot air in a city.
- I learned how trees can help to prevent air pollution in a city.

PAGES 54–55

‘A planted forest in Pakistan: Changa Manga’ and ‘A planted forest in the UK: Kielder Forest’

Introduction

Ask if any of them have visited Changa Manga Forest near Lahore, in Punjab. They could tell the others about their visit. If not, tell them that Changa Manga is one of the oldest planted forests in the world and was once the largest, but it is now much

smaller than it used to be, because of clearing forests. Changa Manga is on a plain in a region with a hot, dry climate, and before the forest was planted, scrubland was cleared of bushes and irrigation canals were dug. The first trees to be planted were chosen because they could adapt to this type of climate: *sheesham* and *kikar* (coniferous trees, whose wood is useful for many purposes, and parts of the trees have medicinal uses); also white mulberry (a broad-leafed tree that has many medicinal uses as well as being a grown for feeding silkworms). Eucalyptus trees were planted later.

Ask if any student knows the purpose of Changa Manga forest, where planting began in 1866. They might remember from their history lessons that this was during the time of British rule, and that the British were keen to build railways for transporting military personnel and goods as well as crops such as tea. The forest provided wood for railway construction and for fuel for steam trains. Tell the students that they are going to find out about the new purposes for Changa Manga and another forest in England that was planted with different coniferous trees for a different purpose, but now has a very similar purpose to Changa Manga.

Using the Student's Book

Ask the students to read the sections of pages 54–55 'A planted forest in Pakistan: Changa Manga' and 'A planted forest in the UK: Kielder Forest' and to look at the photos of the forests. Then they should use *Oxford School Atlas for Pakistan* to find the locations of the Kielder and Changa Manga forests.

Ask the students what Kielder forest was planted for (timber). It is still one of the UK's main sources of timber for various industries. Ask them to compare these two planted forests. They should comment on the types of trees, the wildlife, and the new purpose for each forest. Ask them if using wood as a material or fuel is harmful to the environment or whether it could be helpful. Explain to them that a forest where new trees are planted to replace the ones that have been cut down can be in better condition than a forest left to nature. It can also provide a sanctuary for wildlife. The students could find out more from <http://fwf.punjab.gov.pk>. Ask them to complete Questions C2 a–e.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that forests that are planted for timber can become pleasant places for recreation and for protecting wildlife.
- I learned about the similarities and differences between a planted forest in Pakistan and another in the UK.

Answers to assessment

- A 1 a) Tropical rainforests are found between the Tropics of Cancer and Capricorn. Their climate is hot and humid. They receive rain throughout the year and the average temperatures each month are between 18°C and 35°C. The world's largest tropical rainforest is in Brazil.
- b) between 10° north and 10° south of the Equator
- c) a hot climate with no dry season, and rain during every month of the year
- 2 a) Emergent layer: the topmost layer, which receives the most sunlight. Leaves are big and leathery or hairy, with a pointed shape that lets water run off easily.
- Canopy: the second layer, which has shorter trees that do not need much sunlight. The leaves are so dense that they form a canopy and block out sunlight to the lower layers. Most of the animal and plant life of the forest is found here.
- Under canopy: the third layer, which has shorter trees than the canopy and need even less sunlight, but need shelter from heavy rain. They get water that drips off the leaves of the canopy trees.
- Forest floor: the bottom layer, which is very cool and shaded, so very few plants grow there, apart from those that do not need much sunlight, such as shrubs, mosses, ferns, and bushes. Some small trees can grow up to 3.5 metres, while other forest floor plants grow up till the trees to reach sunlight.
- b) It is an emergent tree that grows very quickly to the top of the canopy, where plenty of sunlight reaches it. It has a thick trunk and many roots that spread out to support the tree in shallow soil. These large roots help the tree to take up water. Its leaves turn to face the Sun and their fan shape helps the rain to run off them.

- c) Some plants do not need much sunlight; others can climb up the taller plants to reach the sunlight.
- B 1 a) They make a small cut in the bark of the tree and fix a cup to collect the latex that runs out. Later in the day, they go back to collect the cups of latex. The next day, they tap different trees.
- b) The rubber-tappers and Brazil nut harvesters look after the forest by making sure they do not damage the trees. They are aware of the fact that they need the forest so that they can make a living out of it. The rubber-tappers tap different trees each day and hence do not damage them. The Brazil nut harvesters collect Brazil nut pods that have fallen and cut down other nuts carefully.
- c) Bolivia, Brazil, and Peru
- 2 a) kapok tree, Brazil nut, rubber tree
- b) The government pays them to help them make a living from the trees in the wild. Only wild trees are tapped, so no forest is cut down to plant rubber trees. They tap different trees each day.
- c) Each morning they go along forest trails to gather the pods of nuts that fall from the trees.
- They open the pods using a machete and then take out the nuts. They put the nuts in large bags and carry them to a nearby house or settlement near a road or river. Then they hand over the nuts to the people who transport them by road or river to processing plants in towns.
- 3 a–b) Accept the students' own responses.
- The acai berry is a small, round, dark purple fruit, similar to a grape, but smaller and with less pulp. It grows on the acai palm in rainforests. It is used in making fruit juices and other healthy food products. The leaves are used for making hats, mats, baskets, brooms, and roof thatch. The trunk wood is used in construction as well as for producing dietary minerals.

- C 1. The students' own responses should include the effects on farmers (who might lose some of their farmland); people in nearby villages, towns, or cities (who could benefit from the reduction in pollution and flooding and fresher, cooler air, and enjoy visiting a forest for recreation); local businesses (whose trade could benefit from visitors).
- 2 a) gyps vulture, blue bull, urial, spotted deer, peacock, partridge, various species of monkey
- b) They can go to the zoo, walk in the forest, ride on the train, visit the pagoda, water turbine, or waterfall. They can also go to the children's play area, on the boating lake, and have a picnic.
- c) students' own responses
- d) The forest could help to prevent flooding, because trees take up a lot of water from the soil. It could provide shelter from wind and hot sunshine. It provides a pleasant place for a day out. It brings tourists to the area; this could provide income for local businesses. It could also make local roads and railways busier. This might lead to improved roads for the area which could be useful for local people and businesses.
- e) the students' own responses, using information from this unit and from leaflets from Changa Manga, and the Internet
3. The correct answer is 'b'
- 4 a) true
- b) false
- c) false

Answers to Skills Book

Page 26 '*Layers of a tropical rainforest*'

- A 1. emergent, canopy, under canopy, forest floor
2. Answers will vary. Plants might include: banana, coffee, Brazil nut, rubber, tea, kapok.

Page 27 '*The climate of a tropical rainforest*'

- A 1. hot; Tropics of Cancer; Capricorn; humid; rises; clouds; cool; condenses; rain; tree canopy; under canopy; nutrients; dead plants and animals decompose quickly; shallow; nutrients; water.

Page 28 '*Planted forests*'

- A 1. Check that the students mark and label the planted forests in the correct places.
2. a–b) students' own responses

Page 29 '*How forests cool a city*'

- A 1. students' own answers

Pages 30–31 '*Advantages of planted forest*'

- A 1. Students should read the information.
2. students' own responses

UNIT 7

Mountains, plateaus, and valleys

Background knowledge for the unit

Mountains

There is no exact definition of a mountain, nor any precise distinction between a hill and a mountain, although mountains usually have steeper sides than hills and are usually higher than 300 metres.

There are three main types of mountains: volcanic, fold, and fault block, all formed by plate tectonics: when parts of the Earth's lithosphere (the crust and upper part of the mantle) move upwards, downwards, or sideways on top of the asthenosphere (the part of the mantle that is immediately below the lithosphere which has a viscous consistency). The main mountain ranges are found along tectonic plate boundaries.

The movement of magma (molten rock) can form volcanic mountains. Magma collects in magma chambers (pools beneath the surface of the Earth), where it stays until it either cools to form igneous rock, moves into another magma chamber, or erupts as a volcano. Magma rises through cracks in the crust because it is less dense than the surrounding rock. It can form a dome mountain where it pushes a large area of rock upwards.

Plateaus

A plateau is an area of high ground (a high plain), with a fairly flat surface and usually with one or more steeply sloping sides, or even cliffs. Plateaus can be formed in different ways. Magma rises from the mantle, pushing large, flat areas of rock upwards, in a similar way to dome mountains, but wider and flatter. Where lava spreads outwards from cracks and weak areas in the crust, this can form a plateau. Plateaus can be formed where glaciers erode mountain ranges, leaving high areas between the main mountain ranges. A plateau can also be formed where water erodes the softer rock of mountains or other landforms, leaving a high, flat area of harder rock.

Valleys

A valley is an area of lowland between mountains. It is usually longer than it is wide. Most valleys are V-shaped or U-shaped, depending on how they were formed. V-shaped valleys are usually formed by fast-flowing water in streams or rivers. U-shaped valleys are usually formed by glaciers. Rift valleys are formed by the movement of tectonic plates.

Before we proceed

A useful way to introduce the topic of mountains and of helping the students to notice the significant similarities and differences between mountains is to provide as many photos of different mountains as possible, and ask the students to work in groups to sort them into sets, according to similarities they notice. They can then give each set a name or description that distinguishes it from the other sets before learning how each type is formed into its distinctive shape.

In a similar way, a selection of photos of plateaus can be used to help the students to come up with a definition of a plateau.

Photos of different types of valleys can be sorted in a similar way to the photos of mountains, to encourage the students to notice their distinctive features before learning how each type is formed.

Expected learning outcomes

Students should be able to:

- explain that tectonic plates are parts of the Earth's crust and the top layer of the mantle that have been split up into massive pieces
- explain how the movement of tectonic plates has formed the landscape
- explain how different types of mountains, valleys, and plateaus are formed
- use contours to find out about the elevation and shape of a landscape

PAGES 58–59

'How were mountains formed?'; 'The internal forces that form mountains'; 'Types of mountains'; and 'Fold mountains'

Resources

- Oxford School Atlas for Pakistan
- 5 towels (about the same size) in different colours
- 2 boxes of books, or other heavy items
- Skills Book pages 32–33 'Tectonic plates and mountains'

Introduction

Remind the students of how they sorted the photos of mountains into sets (see Background knowledge, above) and the descriptions they gave to each set, according to the appearance of the mountains. Explain that the shape of mountains depends on how they were formed, and that they are going to learn about the main ways in which mountains are formed.

Ask them to look at a physical map of the world to find and name the main mountain ranges on each continent.

Using the Student's Book

Ask the students to read the sections on page 58 'How were mountains formed?' and 'The internal forces that form mountains'. Tell them that they are going to carry out an investigation to show how the force of tectonic plates pushing against one another forms mountains.

Activity

Set up the investigation to find out how fold mountains were formed (page 59). The students should follow the instructions on page 59 and then complete the exercise. Tell them that the boxes of books or other heavy items represent tectonic

plates moving towards one another and pushing against one another. The towels represent the edges of the tectonic plates. Ask the students to use what they observe to help them to explain how tectonic plates form mountains when they push against one another. (The forces push the edges of the tectonic plates upwards so that layers of rock fold into ripples.)

Ask the students to read 'Fold mountains' and complete Question D1 a.

Using the Skills Book

Ask the students to do pages 32–33 'Tectonic plates and mountains' using a physical map of the world to help them to locate and name the mountain ranges listed. They should leave out the section on volcanoes until after the next Student's Book pages have been completed.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the locations of the world's main mountain ranges.
- I learned that mountains are formed by forces caused by movements within the Earth.
- I learned that fold mountains are formed where two tectonic plates push against one another.

PAGE 60

'Fault block mountains'

Resources

- Oxford School Atlas for Pakistan

Introduction

Tell the students that they are now going to find out about two other ways in which mountains are formed. Explain that tectonic plates can pull apart with immense force that sometimes makes them break along weak points or cracks.

Using the Student's Book

Ask the students to read 'Fault block mountains' to find out what happens. Ask them to compare the photos of the fault block mountains with the photos of fold mountains on page 59 and to describe the differences they can see. If they find this difficult, draw their attention to the folded ripples shown in the layers of rock in fold mountains and the straighter layers with sharp breaks in fault block mountains. They should also use *Oxford School Atlas for Pakistan* to find the locations of the mountains in the photos. Ask the students to complete Question A1 a.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

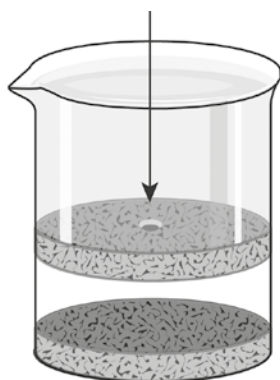
- I learned how fault block mountains are formed.

PAGE 61

'Volcanic mountains'

Resources

- *Oxford School Atlas for Pakistan*
- a beaker
- enough clay to make two layers of clay that will just fit into the beaker, as shown in the diagram below
- water mixed with flour to thicken it (the paste should be a fairly thick liquid)
- Skills Book pages 32–33 'Tectonic plates and mountains'



Introduction

Tell the students that they are going to find out how some volcanic mountains form. Explain that volcanoes can be:

- Active (erupting or likely to erupt): Most scientists consider a volcano as active, if it has erupted in the last 10,000 years; has exhibited unusual seismic activity; or produced significant new gas emissions.
- Extinct (no written records of its activity): It is unlikely to erupt again because there is no longer a supply of magma.
- Dormant (not known to be active): It has shown no sign of volcanic activity but there is still a supply of magma.

Activity

Put a layer of clay in the base of the beaker. Explain that this represents rock below the Earth's crust. Pour some thickened water onto the clay (about 1–2 cm deep). Explain that this represents a magma chamber (a pool of magma that has collected under the Earth's crust). Make a hole about 5 mm diameter in the other layer of clay and push this onto the water, explaining that this represents rock in the Earth's crust. The water should come upwards through the hole (a little might escape at the sides of the layer of clay.) Explain that this is what happens because of the downward pressure of the rock: magma escapes upwards with great force through cracks and holes in the rock.

Using the Student's Book

Ask the students to read 'Volcanic mountains' on page 61, including 'It's a fact.' Ask them to complete Questions A1 b, D2 a–b.

Using the Skills Book

The students can complete the exercise on pages 32–33 of the Skills Book 'Tectonic plates and mountains', using a political map to help them to locate the countries. They should mark the volcanoes as accurately as they can, but the map might help them only to place these in the correct countries.

Ask what they notice about the locations of the main mountain ranges of the world and many of the volcanoes. (They are all close to the boundaries of tectonic plates.)

Discussion and review

Ask the students what they have learnt in this lesson. They could summarize this as follows:

- I learned how cone volcanic mountains are formed when magma under the Earth's crust is forced upwards and escapes onto the Earth's surface.

PAGE 61

'Dome mountains'

Resources

- *Oxford School Atlas for Pakistan*
- Skills Book page 34 'Formation of mountains'

Introduction

Ask the students to look at the photo of Castle Dome Peak in Arizona and to describe its appearance. Ask what is unusual about it. They should notice the flat-topped mass of rock. Ask how it could have formed. Explain that these mountains were formed by volcanic activity that was different from the formation of a cone volcano. They might be able to locate these volcanoes on maps and note their position in relation to tectonic plate boundaries.

Using the Student's Book

Ask the students to read the information about dome mountains and study the diagram on page 61. Ask them to explain how a dome mountain is formed (if possible, without looking at the Student's Book). Ask them to point out the similarities and differences between the two types of mountains. Ask them to complete Questions A1 c–d, D2 c, D3.

Using the Skills Book

Ask the students to re-read the pages of this unit and then to complete page 34 of the Skills Book 'Formation of mountains' and to write the correct headings for and label the diagrams. Different students could also use the diagrams to explain to

the rest of the class how each type of mountains is formed.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the differences between cone and dome mountains.
- I learned how dome mountains are formed when magma pushes a block of rock upwards.

PAGE 62

'Plateaus'

Resources

- *Oxford School Atlas for Pakistan*

Introduction

Tell the students that they are going to find out about a landform called a plateau. Ask if anyone can describe a plateau. Explain that a plateau is a type of plain, so the land is fairly flat, but it is on high ground.

Using the Student's Book

Ask the students to read 'Plateaus' on page 62. They should look at the photos of plateaus on these pages and notice how these are different from plains on lowland. Then they should use *Oxford School Atlas for Pakistan* to find the location of each of the plateaus mentioned.

Invite the students to explain the different ways in which plateaus can be formed.

Ask them to complete Questions B1 a–d.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the meaning of plateau and how a plateau is different from a plain or a mountain.

PAGES 62–64

'Valleys' and 'Rift valleys'**Introduction**

Ask the students to define a valley (an area of lowland between mountains). A valley is usually longer than it is wide. Ask if they can give examples of any valleys they know.

Using the Student's Book

Tell the students that valleys are formed in different ways and ask them if they have any idea about how a valley is formed. They could make a note of their ideas before reading pages 62–64 including 'Rift valleys' and looking at the photos of the different types of valleys. Ask them to look at maps in *Oxford School Atlas for Pakistan* to find the locations of these valleys.

Ask the students to name the three main types of valleys they have read about. Write the names of these valleys on the board: V-shaped, U-shaped, and rift valleys. Then invite volunteers to describe how each type of valley is formed. They could write notes about each type of valley and then, in their notebooks, write explanations of how they formed, using diagrams to help.

Ask them to complete the Questions C1–3.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned to recognize the main types of valleys.
- I learned how these different valleys are formed.

PAGE 65

'Landforms on maps'**Resources**

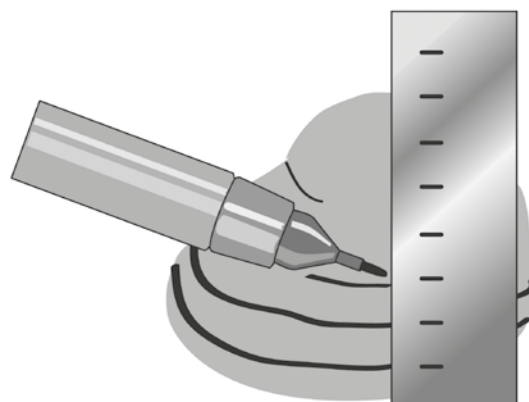
- modelling clay, a very large stone, or small piece of rock (about the size of a closed fist)
- an indelible felt-tipped marker pen (fine) in a dark colour (black is best)
- a ruler
- a map that has contour lines
- Skills Book page 35 'A contour model'

Introduction

Ask the students if they have seen contour lines on a map and, if so, whether they know what they are for. Tell them that they are going to learn how to interpret contour lines, which show not only the elevation of the land, but also its shape.

Activity

If you have enough clay or stones and indelible marker pens the students could carry this out in groups; if not, it could be presented as a demonstration.

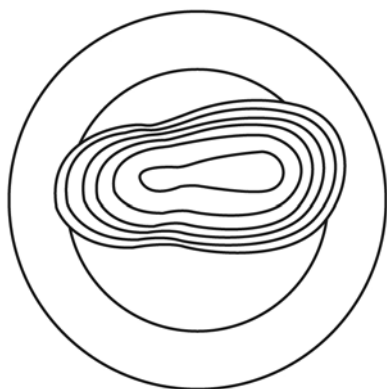
**Demonstrating how contour lines are drawn**

Make a hill-like shape from the clay (or use a large stone); it should have a gentle slope and a steep slope.

At several points around the base of this hill, measure points that are 1 cm above the base of the hill. Measure vertically, not along the side of the hill. The base represents sea level. Mark each point with the marker pen, then join up all the dots, keeping the line 1 cm higher than the base, as shown in the diagram.

Repeat this for a line that is 2 cm higher than the base; then a line 3 cm higher than the base, and so on, until you reach the highest point that you can mark.

Point out that each line joins places of the same height above the base, and ask the students to look at the hill from each side and then from above. From above they will see something like this:



View of the 'hill' from above

Ask what they notice about the lines on the steep side of the hill. (They are close together when viewed from above.) Ask what they notice about the lines on a gently-sloping side. (They are much farther apart.)

The students should then draw pictures of the 'hill' viewed from different sides, marking the contour lines. They should then draw a view from above, with the height marked on each contour.

Show the students a map that has contour lines and point out different sections of the map (using grid references, if these are included on the map). Ask them to describe the land in each section you choose. These should include a gentle slope, a steep slope, and a cliff, as well as places where there are hills of different heights side by side, or mountains with more than one peak.

Using the Student's Book

Ask the students to read page 65 'Landforms on maps'. In their notebooks, they can also draw some hills viewed from above, with contour lines, for a partner to draw these hills as they would be seen from the side.

Using the Skills Book

Ask students to complete exercise 'A contour model' in their Skills Book on page 35.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned what contour lines look like on a map.
- I learned how to use contour lines to find out the elevation and shape of the land on a map.

Answers to assessment

- A 1 a) normal
b) an active cone volcano
c) Both are formed by magma pushing up from under the Earth's crust.
d) A volcano erupts but a dome mountain does not: instead, the magma forces a huge section of rock upwards.
- B 1. a plain on high ground
a) lava flows (e.g. the Columbia Plateau) and the movement of tectonic plates (e.g. the Tibetan Plateau)
b) to the south, the inner Himalayan range; to the north, the Kunlun Range; to the north-east, the Qilian Range (An answer giving 'the Himalayas' is approximately correct.)
c) Cascade Range; Rocky Mountains
d) Both are on high ground, surrounded by mountains. Both have rivers running from them.
- C 1. A valley is an area of lowland between mountains. It is usually longer than it is wide.
2 a) V-shaped
b) U-shaped
3 a) Tectonic plates pull apart so that a huge block of bedrock drops to a lower level between the two plates, or tectonic plates grind past one another.
b) Examples: (tectonic plates pulling apart) East African Rift Valley, Ethiopia; (tectonic plates grinding past one another) Californian Rift Valley, USA
- D 1 a) A labelled diagram showing how fold mountains form where tectonic plates push against one another, as on page 69.
b) A labelled diagram showing how fault block mountains form where pieces of tectonic plates drop down between two faults, as on page 70.
- 2 a) magma
b) lava
c) cone volcano; dome mountain

3.

Name of the mountain or the mountain range	Country	Type of mountain
Rocky	Canada	fold
Karakoram	Pakistan	fold
Sierra Nevada	USA	fault block
Mayon	Philippines	cone volcano (active)
Castle Dôme Peall	Arizona, USA	dome

Answers to Skills Book**Pages 32–33 'Tectonic plates and mountains'**

- A 1–2. Check that the students mark in the correct places.
3. students' own observations

Page 34 'Formation of mountains'

- A 1–2. Check that students have written the correct headings and labels.

Page 35 'A contour model'

- A 1. Students should look at the picture and draw the contour lines of the island.
2. Students should draw contour map of the land.
- B 1. Students should draw a contour map of the land.

Plains and rivers

Background knowledge for the unit

Plains

Plains are large areas of flat or gently sloping lowland. There are different types of plain, formed in different ways:

- erosion of highland by glaciers and streams
- volcanic eruptions causing magma to spill across the surface of the land
- tectonic activity, where a number of small pieces of continental crust collide and then join up; later, glaciers, rivers, and streams running down from mountains erode the mountains and leave debris on the plains
- deposits from melting snow and heavy rains, which fill rivers and overflow their banks, flooding the surrounding land; they deposit the mud, sand, and silt that they would normally carry downstream, building up floodplains; examples include the Indus and the Nile floodplains
- rivers and streams rushing down from steep mountains and valleys towards flatter land; water carrying sediment is spread across flat land in fan shapes which become alluvial plains; an example is the Huang He River (Yellow River) in China
- build-up of sediment on the ocean floor from rivers forms stretches of lowland called coastal plains; these form beside seas or oceans with mountains or plateaus between the plain and the inland area; the submerged parts of coastal plains are the continental shelves; an example is the Atlantic Coastal Plain along the eastern coast of North America, which has underwater plains that slope down gradually under the ocean

There are large plains in North America, South America, Asia, and Eastern Europe, Central and

North Africa, South Africa, and Australia.

The Eurasian Steppe is the largest plain on the Eurasian Plate. There are mountains around this plain where smaller tectonic plates collided and formed this large plate.

The North American Plain formed on the North American Plate as the Pacific and the North American Plates collided, and the pressure forced the Rocky Mountains upwards. Most of the rain comes with winds that blow from the Pacific Ocean on the west. Hence, the eastern, sheltered, side of the mountains on the North American Plain has too low an annual rainfall for trees, but enough for grass and small flowering plants.

Rivers

Rivers are bigger and wider than streams, but there is no precise distinction between a river and a stream. A river or stream is a natural flow of fresh water whose source begins on high ground (or several sources that produce streams that meet). It can be difficult to find the exact source of a river.

The course of a river consists of the upper course (near the source), the middle course, and the lower course. Each course has distinctive features because of the landforms it flows through, the amount of water the river carries, the force of the water, and how the river changes the landforms.

Rivers and streams alter the land they flow through by erosion and by deposition of sediment.

Some rivers disappear underground, where they may form subterranean (underground) lakes, and eventually flow out from under the ground.

Rivers usually run from inland to a coast, because land near the coast is usually lower than inland; or they might flow into a lake. If a lake is below sea level, no rivers or streams run out of it.

The mouth of a river is where it meets the sea, but people disagree over the exact locations of the

mouths of rivers. They also disagree over the length of a river because of different ways of measuring a river that passes through a lake, or they disagree over which tributaries to include. This is why the published lengths of many rivers vary.

Before we proceed

A useful way to introduce the topic of plains is to provide photos of different plains (including deserts, tundra, prairies, savannahs, and floodplains), and ask the students to work in groups to describe the distinctive features of plains.

In a similar way, a selection of photos of rivers and streams can help the students to come up with a definition of a river or stream.

Expected learning outcomes

Students should be able to:

- recognize and describe different types of plains
- identify and describe the features of different parts of the course of a river
- describe the climate and vegetation of plains
- explain how rivers can change the landscape

PAGES 68-69

'What is a plain?'; 'What are plains like?'; 'Grasslands'; and 'Deserts'

Resources

- photographs of plains (including deserts, tundra, prairies, savannahs, and floodplains), rivers, and streams (including different parts of the courses of rivers)

Introduction

Ask the students to look at a collection of photos of different types of plains and to say what is similar about them. They should be able to come up with a definition of a plain (a large, wide area of flat land). Ask how the plains are different—they

are all fairly flat but the vegetation will differ because of the different climates. Ask if the town or city where they live is on a plain.

Using the Student's Book

Ask the students to read 'What is a plain?' and 'What are plains like?' on page 68.

They should then read 'Grasslands' and 'Deserts'. Ask what causes the differences between deserts and grasslands. Ask them to complete Questions A1-2.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the locations of the world's main plains.
- I learned the main ways in which plains are formed.

PAGES 69-70

'Arctic tundra'; 'River plains'; and 'Locating plains on the world map'

Resources

- Oxford School Atlas for Pakistan

Introduction

Tell the students that they are going to find out about other types of plains: Arctic tundra and river plains. Ask where they would look on a map of the world for Arctic tundra plains (in and around the Arctic Circle). What do they think the conditions are like on these plains? They should know from their previous work on climates, that the Arctic and Antarctic Circles have cold climates, few trees grow there, the ground has permafrost (a permanently frozen layer), and even the top layer of the ground is frozen for most of the year, while in some places it remains frozen throughout the year. They could locate the Arctic tundra on the map on page 70.

Ask them to name any river plains and locate them on the map. They should be able to find the Nile floodplain in Egypt and the Indus Plain in Pakistan.

Using the Student's Book

Ask the students to read 'Arctic tundra' to find out more about these plains. They could also describe what it is like there, referring to the photo on page 69. Ask how plains have lakes and bogs, even though very little rain falls there.

They should read 'River plains', after which they could try to explain how rivers form plains, without referring to the Student's Book.

Point out the map on page 70 and ask the students to use the key to find out about the main plains. As a class activity, they could take turns to name a plain for the others to give its highest and lowest elevations. Keep a record of these so that afterwards, the students can identify the elevations of the main plains found on each continent.

After reading this section, the students should read 'It's a fact.' and then complete Questions B1–4, using a political map in *Oxford School Atlas for Pakistan* to help them to identify the countries where the plains are located.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the different types of plains in different regions of the world.
- I learned how plains are formed.

PAGES 71–72

'Rivers' and 'The upper course of a river'

Resources

- *Oxford School Atlas for Pakistan*

Introduction

Explain that this section is about the different stages of rivers, called courses: the upper course (beginning with the source of the river), the middle course, and the lower course (near the sea). Tell the students that they are going to find out about the courses of rivers by referring to the River Indus in Pakistan and how it affects the landscape it flows through, beginning with the source and learning about some features of the upper course of a river.

Ask where rivers come from. The students might remember from their previous learning about the water cycle, that rivers come from rainfall and ground water (or from a glacier). Remind them that the source of a river is usually a tiny spring that comes out of high ground and flows downhill, and point out the photo of the tiny spring on page 71 which is the source of one of the largest rivers in England, the Tyne.

Using the Student's Book

Ask the students to look at the diagram of the upper course of a river (page 71) and ask what determined the course of the river. (Did the river flow this way because there was a valley, or did the river cut the valley?) Explain that when water flows downhill, it follows the easiest route, but over time it cuts away and erodes the rock. Ask if they are surprised that water can wear away rock. To help them understand this, ask them to think about the force of water coming out of a tap turned on fully, or through a hosepipe—then imagine this water carrying tiny bits of grit and soil (called sediment). The force of these tiny particles of sediment can wear away a lot of rock over millions of years. (Note that softer rock wears away more easily than harder rock.)

Now ask the students to read pages 71–72, about 'Rivers' and 'The upper course of a river'. Then ask if they remember the word for the place where a river starts as a tiny spring (the source), what we call a young river as it begins to flow downhill (a stream), and how the stream changes the landscape over time. Ask them to describe the shape of the valley that the stream cuts (V-shaped) and about any small landforms that are common in the upper courses of rivers (spurs and interlocking spurs).

Invite volunteers to describe other features of the upper course of a river, and how they are formed

(rapids, waterfalls, gorges, canyons). They might be surprised to see the size of the gorge cut by the River Allen, which is not at all unusual, because of the power of the fast-flowing water and the abrasive action of the stones and sediment it carries. Explain that fast-flowing water carries sediment (bits of sand, soil, and silt) but once it slows down, it deposits (drops) the sediment. They might find it interesting to know that since this photo was taken, the river flooded its banks and washed away sections of the footpath where the photographer stood! The sediment and other material that was washed away was deposited farther downstream. Ask them to complete Questions C1–2.

Discussion and review

Ask the students what they have learnt in this lesson. They could summarize this as follows:

- I learned that rivers begin at a source, which is a small spring where water pushes through a weak point in the ground.
- I learned that in the upper course, the ground slopes quite steeply and the river flows quickly, carrying sediment.
- I learned that the force of the fast-flowing water of a river in its upper course cuts many features in the landscape.

PAGES 73–73

'Dams' and 'The middle course of a river'

Resources

- Skills Book page 39 'Erosion and deposition'
- Skills Book page 40 'Fertile floodplains of the River Nile'

Introduction

Tell the students that they are going to learn about the middle course of a river, where the fast-flowing water reaches land that slopes much less steeply. Ask how this change in the landscape will affect the flow of the river. (The gradient here is gentle and sideways erosion has enlarged the river

channel. The river channel has also deepened, and the river flows more powerfully and has a larger volume of water. Because the river channel is larger, there is less friction, so the water flows faster. It spreads out sideways where the land is flatter, creating a floodplain.)

Discuss what the students know from previous lessons, and from history studies, about the floodplains of the Indus and the Nile rivers, and how these floodplains have been useful since ancient times because of the rich soil deposited by the river, and for irrigation.

Using the Student's Book

Explain that the features of the middle course of a river are different from those of the upper course, and that human activity has changed the features of the middle course of some rivers. Ask what kinds of human activity might change the middle course of rivers. These include the construction of canals that take away river water for irrigation and transport, and dams that have several purposes. Ask how a dam changes a river. (It stops the flow of water so that the water builds up to form a lake. So a dam would not be useful on a wide plain, as the plain might flood, but it would be useful in a valley, which could contain a lake.)

Ask the students to read the information about dams and to look at the photo of the Tarbela Dam on page 73.

After they have read this, ask them to explain how the Tarbela Dam has changed the course of the River Indus and the landscape the river flows through, and how the dam is useful (if possible, without looking back at the Student's Book).

Tell the students that they are now going to learn about the natural features of the middle course of a river, focusing on the Indus. They should read 'The middle course of a river' to find out why rivers take a much more winding course when they reach their middle course. After they have read it, see if they can explain this winding course—and how oxbow lakes form, without looking back at the book. Ask them to complete Questions C3–4, E1.

Using the Skills Book

Ask the students to re-read the pages of this unit and complete page 40 of the Skills Book 'Fertile floodplains of the River Nile'.

They should try to remember what they have read—or take notes, to help them to complete

page 39 of the Skills Book 'Erosion and deposition' for homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the different natural features of the middle course of a river.
- I learned how human activity has changed the features of the middle course of rivers, through building dams, and how dams are useful.

PAGES 74-75

'The lower course of a river'

Resources

- Skills Book page 36 'The course of a river'
- Skills Book pages 37–38 'Parts of a river'

Introduction

Tell the students that they are going to find out about the lower course of a river, where the rivers approach the sea, and have collected a lot of water and become deeper and wider. Ask what the part of the river where it meets the sea (mouth) is called. Explain that here rivers are usually flowing through much flatter, lower land. Introduce two new words that they will encounter for the different forms of the mouth of a river: delta and estuary. They have probably heard of the Indus and the Nile Deltas. Ask/Explain what the terms mean before they read the next section of the Student's Book.

Using the Student's Book

Ask the students to read 'The lower course of a river' on pages 74–75. They should look at the photos and map of rivers on these pages to find out what a delta looks like from the air. Ask how the delta got this name. Then ask them to describe the differences between a delta and an estuary.

Invite the students to explain how each of these types of river mouth were formed. Ask them to complete Questions D1–3, E2.

Using the Skills Book

Ask the students to re-read the pages of this unit to remind them of what they have read about the three parts of a river to help them to complete page 36 of the Skills Book 'The course of a river'.

For homework, they could complete the crossword on pages 37–38 of the Skills Book 'Parts of a river'.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the meaning of the word delta and the different ways in which a delta is formed.

Answers to assessment

A 1. a large, wide area of land that is flat, or almost flat

2 a–c)

Type of grassland plain	Climate	Example
steppe	temperate with very low rainfall, hot summers, and cold winters	Eurasian Steppe
prairie	temperate with a warm summer and cold winter, and low rainfall	Great Plains of North America
pampas	warm temperate, with warm summers and mild winters, and low annual rainfall	Pampas of South America
savannah	tropical savannah: warm throughout the year, with a dry, mild winter and more rain in summer, but fairly low annual rainfall	Serengeti Plains of Central Africa

B 1 a–b) students' own answers

- 2 a) They have very dry climates; few trees grow there; the land is flat.
- b) Desert plains have a very hot climate; Arctic tundra plains have a very cold climate. Desert plains are near the Equator or the Tropics; tundra plains are near the Poles.
- 3 a) northern regions of the USA and some parts of Canada
- b) Europe and northern Asia, stretching from Moldavia, through Ukraine, Russia, Kazakhstan, Xinjiang (China), and Mongolia and Manchuria, with part in Hungary
- c) Northern Tanzania to south-western Kenya

4 a–b)

Type of plain	Countries	Vegetation
Steppe	Mongolia, Russia, Siberia	grass
Prairie	Canada, the USA	grass
Pampas	Argentina, southern Brazil, Uruguay	grass
Savannah	Kenya, Tanzania	grass
Desert	Afghanistan, Algeria, Angola, Australia, Botswana, Chad, Chile, China, Egypt, Eritrea, India, Iraq, Jordan, Kazakhstan, Kuwait, Libya, Mali, Mauritania, Mexico, Mongolia, Morocco, Namibia, Niger, Oman, Pakistan, Peru, Qatar, Saudi Arabia, South Africa, Sudan, Tunisia, Turkmenistan, United Arab Emirates, Uzbekistan, Western Sahara, Yemen, the USA	very little
Tundra	Alaska (USA), Canada, Finland, Greenland, Russia, Sweden	grass and low-growing plants; very few trees

C 1 a) source

- b) spur
- c) interlocking spurs
- d) gorge

2. The students' own explanations should include:

- The river flows fast and carries sediment that erodes the rock and cuts a V-shaped valley.
- It flows around harder rock, leaving spurs, or a series of spurs called interlocking spurs.

- A fuller answer will include reference to cascades, rapids, and waterfalls, and how they are formed; also the formation of gorges or canyons.
3. A floodplain is formed in the middle course of a river, where the river spreads out across gently-sloping land.
 4. Students should draw a sketch of the river based on the photo on page 88, with the directions 'upstream' and 'downstream', and the right bank, and the left bank correctly marked. The slope on the right of the meander shows the direction in which the river is flowing:
- D 1. The nearest coast might be on the far side of higher land, but the river cannot flow uphill.
2. delta, estuary
 3. It deposits sediment where it slows down: for example where it spreads out to form a delta, and in the middle course, on the insides of bends.
- E 1
- a) meanders, oxbow
 - b) outside, inside
 - c) cliff
 - d) sediment, beach
- 2
- a) mouth
 - b) delta
 - c) estuary
 - d) sediment

Answers to Skills Book

Page 36 'The course of a river'

- A
- | | |
|---------------|-----------------------|
| 1. source | 2. interlocking spurs |
| 3. waterfall | 4. riverbank |
| 5. meander | 6. oxbow lake |
| 7. floodplain | 8. estuary |

Pages 37–38 'Parts of a river'

- A
- | | |
|------------------|---------------|
| 1. Across | Down |
| 2. delta | 1. stream |
| 3. deposits | 3. downstream |
| 4. tributary | 6. upstream |
| 5. estuary | 10. erode |
| 7. sediment | |
| 8. spring | |
| 9. channel | |

Page 39 'Erosion and deposition'

- A
1. middle course
 2. students' own responses
 3. students' own responses

Page 40 'Fertile floodplains of the River Nile'

- A
1. Egypt, Sudan, South Sudan, Ethiopia, Kenya
 - 2–3. students' own responses

UNIT 9

Landscapes of Pakistan

Background knowledge for the unit

Pakistan has many different types of landscapes: coast, plateau, plain, hill, mountain, river, valley, desert, and forest. The northern, north-eastern, and western parts are mountainous, with the Indus Plain to the east and south-east, and the coastal plain to the south.

Some of the world's highest mountains are in northern Pakistan, including Nanga Parbat, Gasherbrum I, Broad Peak, and Gasherbrum II, all of which are more than 8000 metres high.

Mountain passes

A mountain pass is a gap of lower land through a mountain range or over a ridge. This gap is often the low point in a ridge. A common site for a mountain pass is just above the source of a river; so the pass is close to a watershed (highland that separates water flowing in different directions downhill). Some passes are very short, with steep slopes to the top of the pass; others are valleys, several kilometres long. The tops of many passes are the only flat land in an area.

In the mountainous areas of Khyber Pakhtunkhwa and Gilgit-Baltistan in the north, and FATA and Balochistan in the west and south-west, mountain passes provide very important gaps in the highland for roads. These roads have developed from ancient trade routes: for example, the Karakoram Highway, on the ancient Silk Route. The Karakoram Highway is known as the Asian Highway or, in China, as the Friendship Highway; it was built through cooperation between the governments of Pakistan and China. Construction of the 1300 kilometres-long road began in 1959 and it was opened in 1979. It runs from Kashgar, in the Xinjiang region of China, to Abbottabad, in Pakistan. The N-35 highway extends the Karakoram Highway south-west from Abbottabad to join the Grand Trunk Road (N-5) at Hasan Abdal. This links Islamabad

and Rawalpindi to the end of the Karakoram Highway.

Many roads also follow valleys, for example, Peshawar, Bannu, and Kohat valleys in Khyber Pakhtunkhwa; Neelum, Hunza, Swat, Naran, and Chitral valleys in the north, and Quetta and Ziarat valleys in Balochistan.

The largest plateaus are the Balochistan Plateau and the Potohar Plateau (mainly in Punjab); the largest plain is the Indus Plain in the east and south-east; the main river system is the Indus and its tributaries.

Before we proceed

While focusing on the varied landscapes of Pakistan, this unit also provides an opportunity to consolidate the students' learning about the natural physical features themselves (mountains, plateaus, valleys, plains, rivers, deserts, and forests), which were introduced in previous units.

There are also opportunities to develop students' understanding of how the landscapes affect the lives of people who inhabit them and how these physical features have influenced the development of settlements.

Expected learning outcomes

Students should be able to:

- locate and describe the various landscapes of Pakistan
- explain how physical features of the land affect people's lives
- explore and discuss how and why settlements developed in particular places in Pakistan

PAGES 78-79

'What is the land like in Pakistan?' and 'Mountain landscapes'**Resources**

- *Oxford School Atlas for Pakistan*
- Skills Book pages 41–42 'Mountains of Pakistan'
- Skills Book page 43 'Mountain passes'

Introduction

Ask the students to name as many physical geographic features as they can. List these on the board. They should include: mountain, coast, valley, plateau, plain, desert, river, and forest.

If they do not mention mountain passes, ask what they know about these. They will probably have heard of the Khyber Pass and Khunjerab Pass, and possibly others in Pakistan.

Ask them to discuss mountain passes in small groups for a few minutes and to come up with a definition of a mountain pass. Invite each group to give their definition, which should indicate that a mountain pass is a gap of lower land through a mountain range or over a ridge.

Using the Student's Book

Ask students to identify the locations of the most mountainous parts of Pakistan. They can check their answers by looking at a physical map of Pakistan. Encourage them to describe the locations of the mountains by referring to the provinces where they are located and using compass directions. This is an opportunity to do some revision of compass points and on using the key of a physical map, where different shades of colour are used to show land elevation. Remind them of the meaning of elevation (height above or below sea level).

Ask the students to read the sections of page 78 'What is the land like in Pakistan?' and 'Mountain landscapes' and to look at the map and photos and read the captions. They should also read the

two 'It's a fact' panels on pages 79–80. Ask what they notice about the elevation of mountain passes.

Ask how mountain passes have influenced transport routes. Also discuss how the landscapes of mountains, valleys, rivers, and passes have influenced trade routes and the development of settlements. By referring to physical and political maps of Pakistan, they should observe that the routes of roads and railways are planned around valleys and mountain passes. Also elicit that most settlements have developed along valleys and passes, especially where two valleys meet, or a pass meets a valley. Ask them to complete Questions A1–3.

Using the Skills Book

The two activities in Skills Book on pages 41 and 42 'Mountains of Pakistan' and 'Mountain passes' on page 43 will help to consolidate students' learning about these parts of Pakistan. These could be completed during the lesson or given as homework.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the names and locations of the main mountain ranges of Pakistan.
- I learned the names and locations of the main mountain passes that link parts of Pakistan and link Pakistan with neighbouring countries.
- I learned how landforms have influenced the development of roads, railways, and settlements in mountainous areas of Pakistan.

PAGES 79-80

'Skardu: a city in the mountains'**Resources**

- *Oxford School Atlas for Pakistan*

Introduction

Tell the students that they are going to find out about a town situated in a mountainous region of Pakistan: Skardu, the capital of Gilgit-Baltistan. Ask them to find Skardu on the map on page 78.

This is an opportunity to focus on the effect of landforms on the development of settlements. Ask the students to discuss, in groups, why Skardu developed in this location. Invite feedback. Tell them that Skardu is in a valley, and discuss what makes a valley a suitable place for a settlement. They should also notice the location of Skardu in relation to communication links: mountain passes and valleys, where roads can be built.

Using the Student's Book

Ask the students to read about Skardu and to consider what it might be like to live there. They can then complete Questions B1–3 using *Oxford School Atlas for Pakistan* and the Internet to find out more.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how the city of Skardu developed in the Karakoram Mountains.
- I learned about life in Skardu.

PAGES 80–83

'Plateaus'; 'The Potohar Plateau'; 'The Balochistan Plateau'; 'Plains and lowlands'; 'Rivers'; and 'Valleys'

Resources

- *Oxford School Atlas for Pakistan*

Introduction

Explain that this section begins with plateaus. Some students might know what a plateau is (a large area of fairly flat or gently sloping land at a high elevation; a high plain). Ask them what they know about the location of the two plateaus of Pakistan (the Potohar Plateau and the Balochistan Plateau), and ask what they know about these plateaus (province, main towns or cities, and other features such as rivers, canals, roads, and railways).

Using the Student's Book

Ask the students to read about the Potohar Plateau and the Balochistan Plateau, and then ask them to identify the similarities and differences between the two plateaus: elevation, what the land is like, cities or towns, and any other features they notice.

Now ask the students to read pages 82–83, about 'Plains and lowlands', 'Rivers', and 'Valleys', after which they could try describing these without looking back at the Student's Book. Ask how the River Indus affects the plains it flows through and how it could have influenced the growth of settlements. Ask them to complete Questions C1 a–d, D1 a–c.

Discussion and review

Ask the students what they have learnt in this lesson. They could summarize this as follows:

- I learned about the physical features of the two largest plateaus in Pakistan.
- I learned how river basins are formed by rainwater running down mountains.
- I learned about the main rivers and valleys of Pakistan.

PAGES 83–85

'The coast'; 'Ports'; and 'Mangrove forests'

Resources

- *Oxford School Atlas for Pakistan*

Introduction

Ask what they know about the coast of Pakistan. (It is to the south of the country, bordering the Arabian Sea; the only provinces with a coastline are Balochistan and Sindh.) If any students have been to the coast, they could say where they went and anything they remember. This way you could build up a list of features of the coast, such as mud volcanoes, mangrove forests, bays, cliffs, beaches, ports, and docks.

Using the Student's Book

The students should now read about the coast and ports on pages 83–84, and look at the photos, including the captions. They could use *Oxford School Atlas for Pakistan* to locate the main ports and suggest why they developed in these places.

Ask about the industries around the coast. They should know about tourism, fishing, transport, and industries that develop around cities, including the steel industry in Karachi.

Ask what the students know about mangrove forests. (They grow in water near the sea—in river estuaries where the water is salty but not as salty as the sea itself.) They can then read about the mangrove forests on pages 84–85. Now ask why mangrove forests should be protected. Ask them to complete Questions E1–2.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about some features of the coast.
- I learned how ports developed on the coast of Balochistan and Sindh.
- I learned about the importance of mangrove forests.



Resources

- *Oxford School Atlas for Pakistan*
- Skills Book page 44 'Deserts'

Introduction

Ask the students to look at the physical map of Pakistan in *Oxford School Atlas for Pakistan* to help them to locate the deserts. Ask what they know about deserts. (They are usually plains with a very hot arid climate.) Ask if any animals live there (livestock belonging to people who live there, and some wild animals, mainly a variety of reptiles).

Using the Student's Book

Ask the students to read page 85 about 'Deserts', including 'It's a fact'.

Ask them to explain why the main natural wildlife consists of reptiles. (These animals can squeeze into small areas of shade between rocks for shelter; they can burrow, run, dive into loose sand, swim across loose sand; they are cold-blooded, so they need to bask in the sunshine some of the time to keep their bodies warm; they are more active in the warm seasons and in the warmer parts of the day.)

Ask if the students found anything about the desert population surprising. (The Thar Desert has quite a high population for a desert, and it has towns and other settlements. Not all the inhabitants are nomadic.)

Ask them to complete Questions F1–3.

They could use the Internet to find out more about deserts before completing the Skills Book activity.

Using the Skills Book

Ask the students to re-read the pages of this unit to remind them of what they have read about the deserts of Pakistan.

They could first try to complete the Skills Book activity on page 44 'Deserts' without referring to the Student's Book; then, if necessary, they could use the Student's Book to help them to fill in any gaps.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned the names and locations of the main deserts of Pakistan.
- I learned about some of the animals, plants, and human inhabitants of the Thar Desert.

Answers to assessment

- A 1 a) Mountains are a barrier to travel, as roads and railways have to find a way either around them or through a tunnel.
- b) The mountains form a barrier between Pakistan and China and between Pakistan and Afghanistan, so that there are few roads between the countries; these roads follow mountain passes. The high mountains cause difficulties for building railways.
- c) No; a railway was built but it was closed in 2006 after floods damaged and blocked it.
- 2 a) Kashgar, Karakul, Tashkurgan, Sost, Passu, Shishkot, Karimabad, Nagar, Chait, Gilgit, Chilas, Dasu, Kamila, Madyan, Abbotabad
- b) The students' own responses should focus on the opening up of routes between the two countries, and co-operation between Pakistan and China on road links for trade as far south as Gwadar in Balochistan (China-Pakistan Economic Corridor). They should also refer to the 'adventure tourism' industry, which at present attracts mainly Pakistanis and overseas citizens of Pakistan, and mountaineers and cyclists who visit the area.
3. Khyber Pass
- B 1. The students' own responses, should mention the dry climate with cool summers and cold winters, and what they know of travel routes to and from Skardu, and how these are affected by the winter weather. They should describe the landscape: beautiful valleys, waterfalls, lakes, and high mountain peaks of Gilgit-Baltistan that attract tourists; fruit farming, livestock, fish and honey bee farming, the mineral and gemstone mining industry, and annual events such as the harvest festival and Shandur Polo festival.

- 2 a-b) The students' own notes should mention anything they think might be important that they do not know about Skardu, including questions they would like to find answers to.
- c) The students' own notes should indicate where they will find answers to their questions, such as tourist information centres and websites, the government of Gilgit-Baltistan website, and other Internet sites.
- d) The students' own answers should be supported by evidence from the sources they used.
3. Bagrot, Kaghan, Soan Sakaser, Urak
- C 1 a) Indus, Ravi, Sutlej, Jhelum, and Chenab
- b) The students' own responses should be supported by evidence from the sources they used. They should include the irrigation canal system; dams for hydroelectricity, and for a water supply for domestic use and industry; the fertile soil of floodplains of the Indus and, in places, transport.
- c) It floods each year, leaving rich mud on the land.
- d) Layyah, Sukkur, Hyderabad, Dera Ismail Khan
- D 1 a) The Balochistan Plateau is higher (up to 900 metres).
- b) They are the world's second largest salt mines, and produce more than 350,000 tonnes of salt each year. The mines have also been developed as a tourist attraction that attracts about 250,000 visitors per year.
- c) Rainwater running down the mountains forms lakes in hollows. The water carries sediment from the mountains that leaves the soil rich and fertile. When the water dries up in these hollows, called 'basins', it leaves mineral salts, which gives rise to the nickname 'salt lakes'.
- E 1 a) any five from: beach, mud volcano, bay, mudflat, mangrove forest

- b) Karachi Port, Port Qasim, Gwadar Port
- c) It has a deep natural harbour that is suitable for large ships, so it has been used for international trade since the late 19th century.
- 2 a) The governments of Pakistan and China worked together to develop this port, which can handle container ships, so it is useful for trade between the two countries. The management of the port was handed over to China in 2013. It links the other ports, in particular Gwadar, to Karachi, from where goods can be shipped to other countries or taken by road, rail, or river to other parts of Pakistan and neighbouring countries.
- b) Gwadar Port is on a hammerhead headland with bays on its either side. This makes it an ideal site for a port.
- 3 a) They have built ports and roads, and cut down mangrove forests (but now they are trying to restore and protect these).
- b) Mangrove forests; they are disappearing through deforestation to make way for homes, farming, harbours, and so on, and because dams built on the rivers reduce the flow of fresh river water to the coast. This makes the water in the deltas too salty for the mangroves to survive. Water pollution has also killed some of the mangrove forests. This is a problem because mangrove forests are an important habitat for wildlife, including shrimps. They shelter farmland near the coast from the sea, and they protect the land from becoming too salty from sea water.

F 1.

Desert	Province	Area in square kilometres
Thar	Sindh and Punjab	50,000 sq km
Cholistan	Punjab	25,000 sq km
Thal	Punjab	20,000 sq km
Kharan	Balochistan	20,000 sq km

- 2 a) The highest land is in the north.
b) true
c) true
d) false (The Khyber Pass links Peshawar with Kabul in Afghanistan.)
3. the students' own discussion notes and explanation giving reasons

Answers to Skills Book

Pages 41–42 'Mountains of Pakistan'

- A 1. Students to write the names of provinces in the correct places on the map.
- B 1–2. Check that the students mark the map in the correct places.
- 3 a) Northern areas of Pakistan
b) Khyber Pakhtunkhwa and Balochistan
c) Sindh and Punjab

Page 43 'Mountain passes'

- A 1–3. students' own markings

Page 44 'Deserts'

- A 1. vegetation; thorny trees; bushes; vegetation, Thar; Kharran; Thar; towns; villages; nomads; snakes; chinkaras; grasses; food; livestock

The people of Pakistan

Background knowledge for the unit

The population of Pakistan is made up of twenty or more different ethnic groups, many descended from very old, and even ancient, civilizations, including the Gandhara and Indus Valley civilizations, providing a rich variety of social, cultural, and religious traditions. This unit explores how some of those traditions give the different regions of Pakistan their unique cultures, and how they are also united by shared parts of their history and by the country's official languages, with many Pakistanis speaking, or at least understanding, more than one language.

Before we proceed

Students will learn about the population distribution of Pakistan, (building on their previous learning about population density) and use maps to find out about population densities. They will learn about the different languages spoken by the people of different regions.

They will have opportunities to compare and contrast the educational opportunities and outcomes of people from different regions, family values and traditions, the occupations, and arts and crafts that predominate in different regions.

Parts of the culture of the people of different regions that the students will learn about includes dress (including traditional costume), music and dance, sports, cuisine, language, festivals, and traditions connected with saints and Sufis.

Expected learning outcomes

Students should be able to:

- use a population density map to find out about the population densities of different regions of Pakistan
- ask questions to help them to learn about the people of different regions of Pakistan
- why some regions are more densely populated than others

- explain that the people of Pakistan come from a variety of different ethnic traditions
- explain that more than seventy different languages are spoken in Pakistan and that the official language is Urdu, with English being used for official purposes

PAGES 88-90

'The rich history of Pakistan' and 'Population distribution of Pakistan'

Resources

- Skills Book pages 45–47 'Where do people live?'

Introduction

The students should know, from unit 9 'Landscapes of Pakistan', about the physical geography of each province, and from unit 5 'Living with the climate', about the climates of these regions. This provides a useful starting point for work on unit 10 and the students could work in groups to list all they know about a specific province—each group working on a different province and then presenting their ideas to the class. It is probable that these will focus mainly on climate and landscape, perhaps with some mention of industry.

Elicit what they know about the people of each region, beginning with the similarities, which will include: most are Pakistanis; most are Muslims; many speak, or at least understand, Urdu, English, and a regional language. Now ask about the differences, which might include: their origins (ethnic and geographical), their traditions, languages, and culture.

Tell the students that they are going to learn about the rich variety of cultures in Pakistan and about the people of the different provinces.

Using the Student's Book

Ask the students to read 'The rich history of Pakistan' and 'Population distribution of Pakistan' on pages 88–90 of the Student's Book, including 'It's a fact'. Also ask them to look at the photographs and map. Remind them of the introductory discussion, where it was established that cities have higher population densities than rural areas, and ask if this means that most of the people of Pakistan live in cities. The answer is no, because, although the cities themselves have a high population density, most of the people live in the rural parts of Pakistan. Ask what they have learnt about the origins of the people of Pakistan and about the history of its civilizations.

Ask about the most and the least densely populated areas and what they noticed when they compared the population density map with the physical map on page 96 of the Student's Book. Ask why Balochistan and Gilgit-Baltistan have low population densities. Ask them to complete Questions A1–2 in their notebooks.

Using the Skills Book

Ask the students to use the population density map in the Student's Book to help them to complete the blank map on page 45 of the Skills Book 'Where do people live?'. They can also use what they have learnt to help them to complete pages 45–47 of the Skills Book where they consider the factors that affect population density, in particular, the landscape.

Revise the meaning of population density (the number of people living in a given area, usually 1 km²). Ask which parts of Pakistan have high and low population densities. They might recall that mountainous areas and deserts tend to have lower population densities and coastal plains and fertile plains (such as the Indus Plain) have higher population densities; also, obviously, that cities have greater population densities than rural areas.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned that most people in Pakistan live in rural areas.

- I learned that population densities are greater in urban areas than in rural areas.
- I learned about some of the ways in which physical geography affects population density.

PAGES 90–92

***'Literacy and education';
'Family values and
traditions'; 'Languages';
'Occupations'; and 'Arts
and crafts'***

Resources

- the students' notes from their homework, about the languages and employment sectors of their families and neighbours
- Skills Book page 48 'Literacy in urban and rural areas of Pakistan'
- Skills Book page 49 'Languages of the people of Pakistan'
- items or pictures of products that are made in Pakistan

Activity

Before beginning this lesson, it will be useful if the students carry out a homework activity that involves finding out as much as possible about the languages spoken, and the employment sectors of people in their families and the immediate neighbourhood of their homes. This will require some help from their families. Explain that employment sector means the industry or profession a person works in, for example: medicine, agriculture, forestry, local government, police, steel, mining, retail, banking, etc. They should not record the names of the people whose languages and employment sectors they record, just the numbers of people for each.

They could record their results in tables, like this:

Draw tables like those the students used for their individual surveys (possibly using a computer spreadsheet), on which the students can amalgamate the results of their homework. They

should ensure that they record the total number of people in the survey.

Ask what conclusions they can draw from their results (examples: the main employment sector in their neighbourhoods; the main languages spoken in their neighbourhoods). They could compare these with the official statistics for their province (available from the Pakistan Bureau of Statistics www.pbs.gov.pk).

Ask if the results would be similar or different for a different neighbourhood or province. They could check these with the same official source. Tell them that they are going to refer to these later in the lesson.

Using the Student's Book

Ask the students to read 'Literacy and education'; 'Family values and traditions'; 'Languages'; 'Occupations'; and 'Arts and crafts' on page 90–92.

Ask what the students have learnt from this unit about literacy and education across Pakistan: the provinces, and the types of area with the highest percentages of literacy. Ask if they can explain why urban areas have a much higher literacy rate than rural areas. Also ask about the possible reasons why Punjab has the highest literacy rate in Pakistan, and Balochistan the lowest.

Ask how many generations of their own families live together and how this affects the life of the family; for example, how family decisions are made, how family members care for one another when necessary, how children are brought up, and so on.

Ask how many languages the students recorded in their surveys. Did these include any listed on page 90 of the Student's Book, or any that were not mentioned there? Ask if any members of their families or their neighbours speak or understand more than one language. Which were the most common languages? They could compare this with other provinces (see Pakistan Bureau of Statistics www.pbs.gov.pk).

Ask if any employment sectors in their survey were more common than the others. They could also compare this with the national statistics for their own province and for other provinces. Ask why different employment sectors have higher numbers of employees in some provinces than in others.

Employment sectors of my family and neighbours in _____ (name of city, town, or village, and province)

Number of people included in my survey _____

Employment sector	Number of people

Languages spoken by my family and neighbours in _____ (name of city, town, or village, and province)

Number of people included in my survey _____

Language	Number of people

The students could discuss what they know about local arts and crafts. Ask which of those shown in the photos in this unit interests them the most, and why. Ask them to complete Questions A2, B1, C1 a–b, D1–3 or this could be completed for homework.

Activity

Allocate one lesson to a presentation of the arts and crafts of Pakistan. Divide the class into groups of 4–5 students and ask them to prepare a brief presentation. They could bring items from their homes or print pictures and say something about them, e.g. in which province these objects are produced; what they are used for; whether they are inexpensive or expensive; the process of producing these objects, etc.

Using the Skills Book

The activities and discussion in class will provide information to help them to complete pages 48–49 'Literacy in urban and rural areas of Pakistan' and 'Languages of the people of Pakistan'.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the similarities and differences between the languages and cultures of people in different parts of Pakistan.
- I learned how literacy, education, occupations, cultures, and languages vary in different parts of Pakistan.
- I learned about traditional festivals, arts, sports, and music in different parts of Pakistan.

PAGES 92–95

'Dress'; 'Cuisine'; 'Influence of Sufis and saints'; 'Festivals'; 'Music and Dance'; and 'Sports'

Resources

- students' collections and notes from their homework, about dress, cuisine, the influence of saints and Sufis, festivals, music and dance, or sports in their region and across Pakistan

Introduction

This lesson provides an opportunity for the students to explore what makes the people of any region or country distinct and different from others, and how their interests, traditions, and customs influence the place where they live. In this way they should develop their understanding of different people and places.

Before beginning the lesson, it would be useful to split the students into groups, and to allocate one of the following topics to each group:

- dress
- cuisine
- the influence of Sufis and saints
- festivals, music, and dance
- sports

Explain that the people of any region or country have their own characteristics, interests, customs, traditions, and so on, that make them special, unique, and different from the people of any other region or country. Tell the students that they are going to consider some of the things that make the people of Pakistan different from people of other countries. Tell them that this will also help them to learn about the shared values and cultures of the people of Pakistan.

Each group should find out about how their allocated topic affects the people of Pakistan generally, and those where they live in particular. For example, if their topic is dress, they should collect examples of anything special about the way in which the people of their region, as well as other regions of Pakistan, dress and draw comparisons. They should also make notes about the influences on how people dress, e.g. culture, climate, etc. Similarly, other groups should research cuisine, the influence of saints and Sufis, festivals, music and dance, or sports.

Tell them that they can display their collections/ notes in the classroom. This could be a small wall display and a table top area. Also, allow time for the students to look at one another's displays.

Activity

Allocate each group about 5 minutes to present their findings to the class, and a few more minutes to answer questions.

Invite the students to say something about what they have learnt from the other groups about the different regions of Pakistan, and what makes the people of each region distinct and different from those of other regions. Examples could include how some sports, like cricket, are popular in all regions of Pakistan, and how each region has unique sports of its own. Using cricket as an example, the students could also say something about how cricket links Pakistan with other countries, such as Australia, Zimbabwe, and the United Kingdom; and how different countries also have other sport preferences, such as football, skiing, or ice hockey.

Using the Student's Book

Ask the students to read pages 92–95.

Ask the students to complete Questions C1 c, D4 a–c.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarising the lesson, for example:

- I learned how the special interests of different regions or countries help to create a character for a region or country.
- I learned about the similarities and differences between the cultures of people in different parts of Pakistan.

Answers to assessment

- A 1 a) This is because of the geographical location of Gilgit-Baltistan and the land features and climate of Balochistan. The students' own explanations should refer to the difficulties of living in mountainous or desert landscapes and in very hot, dry climates or climates with very little rain, or great variations of temperature.
- b) It is a fertile plain that has supported agriculture for many centuries and has a milder climate than the north and west. Cities and towns have developed on the flat land along the banks of the River Indus and on the coast. The River Indus has long provided water for irrigation.
- 2 a–b) i) false (People in many parts of Pakistan learn arts and crafts from their elders.)
- ii) false (Tourism has developed in Balochistan and Gilgit-Baltistan, but not in FATA.)
- iii) true (Many languages are spoken all over Pakistan.)
- iv) true (Farming is the main industry across Pakistan, especially in rural areas; these three provinces/territories have large rural populations.)
- B 1. The students' own responses should mention advantages such as increased employment and income for local people as well as improved transport links; also possible disadvantages, such as deforestation, loss of farmland, pollution of the air, water supplies, and the ground, and harm to beautiful scenery.

- C 1 a) rural areas
b) Punjab
c) Sindh
- D 1 a) agriculture, forestry, fisheries, livestock farming, business and trade, public and private sectors, etc.
b) Khyber Pakhtunkhwa
2. the students' own responses; (For example: they are mainly subsistence farmers, and no one has invested money in mining there.)
- 3 a) Khyber Pakhtunkhwa
b) Khyber Pakhtunkhwa
c) Sindh
d) Gilgit-Baltistan
- 4 a) the students' own responses
b) the students' own responses
c) The students' own responses, which should say why the fair or festival is held and give some ideas about why it is important.

Answers to Skills Book

Pages 45–47 'Where do people live?'

- A 1. Check that the students mark the map correctly.
- B 1–6. Check that the students provide the correct answers.
- C 1. Check that the students complete the table with the correct answers.
- 2 a–c) students' own observations

Page 48 'Literacy in urban and rural areas of Pakistan'

- A 1 a–c) Check that the students mark the map correctly.
- 2 a–b) students' own observations

Page 49 'Languages of the people of Pakistan'

- A 1–2. students' own observations

Background knowledge for the unit

International migration means moving from one country to another to settle there. After the partition of the Indo-Pak subcontinent in 1947, huge numbers of people migrated across the India-Pakistan border at the same time. Around 6.5 million Muslims migrated to Pakistan from India, and about 4.7 million non-Muslims migrated from Pakistan to India. Most of the migrants about 81% settled in Punjab, with 18% settling in Sindh; small numbers went to other provinces. By 1951, 5.3% of the total population of Pakistan consisted of these migrants, but since then, very few migrants have moved between these two countries.

Pakistani emigrants

Emigrants are people who move away from their country to another country. In 2015, about 7 million Pakistanis (approximately 4% of the total population) were living in 140 countries around the world. In addition to contributing to the economy of their host countries, most of the Pakistani emigrants were contributing to their own country's economy through payments they sent back to Pakistan.

Emigrants from Pakistan have migrated mainly to the Middle East and western countries. After huge rises in the price of oil in the 1970s, there was enormous economic development in the oil-producing countries of the Middle East. These countries, with low population densities, encouraged immigrants. Many of these returned in the 1980s and 1990s. The Middle Eastern countries affected by the Gulf War between 1990 and 1991 also attracted large numbers of immigrants, many Pakistanis, who continue to emigrate to Middle Eastern countries, mainly to Saudi Arabia.

Thousands of skilled and semi-skilled workers emigrated to Britain in the 1950s, encouraged by

their host country, which was desperately short of industrial workers after the Second World War. Many professional Pakistanis (including many doctors and other healthcare professionals) emigrated to the UK, the USA, and Canada in the 1960s and 1970s, and they continue to emigrate there and to Australia.

Migration within Pakistan mainly occurs from rural to urban areas; Punjab has more of this type of migration than any other province. There is very little migration to Balochistan from other provinces, and the exact figures are not known for FATA or Gilgit-Baltistan. Most of these internal migrants go to large cities: Karachi, Lahore, Faisalabad, Rawalpindi, Multan, Peshawar, Quetta, and Islamabad. Karachi has the highest number of internal migrants.

The natural increase of a population (births minus deaths) is higher in rural areas than in urban areas. In rural areas, farming is the main occupation; forestry and cottage industries are minor employers; small number of labour work as shopkeepers and artisans; and there are few opportunities for permanent unskilled work. These are 'push factors' for migration from rural to urban areas where there is industrial development, and more opportunities for employment. In cities there are also opportunities for work in trade, transport, banks, insurance, telecommunications, service industries, and other economic activities. These are 'pull factors' for migration.

Other factors that cause internal migration, (both rural-rural and rural-urban) are natural disasters such as earthquakes and floods, and regional conflict, when people move to safer places, mainly cities.

Before we proceed

Students will explore the reasons why people migrate, including: work, religious reasons, family reasons, education, escaping from wars or conflicts, and escaping from natural disasters such

as floods or earthquakes. They will learn about migration around the world, to and from Pakistan and within Pakistan, and about the 'push and pull' factors that have influenced this.

This unit also explores mass migration, in particular the mass migration across the Pakistan–India border after Partition in 1947.

Students will also learn about the effects of migration on individuals, on their host countries, and on their home countries.

Expected learning outcomes

Students should be able to:

- ask questions to help them to learn about migration
- identify the 'push and pull' factors of migration
- discuss the advantages and disadvantages of migration

PAGES 98–99

'What does migration mean?'; 'Why do people migrate?'; 'Migration for work'; and 'Migration for religious reasons'

Introduction

Ask the students to define the word migration. If necessary, explain that it means moving from one place to live in another. Ask them to suggest causes or reasons why people migrate. List their answers and explain that they are going to learn more about what makes people migrate and what it is about some places that makes people want to migrate to them. Introduce and, if necessary, explain the terms 'emigration' and 'immigration'.

Using the Student's Book

Ask the students to read 'What does migration mean?' and 'Why do people migrate?' on page 98 of the Student's Book, including the information in the illustration about 'push and pull' factors. Ask if

their list from the introductory discussion includes all the reasons for migration given in the Student's Book. Invite students who wish to speak about any experiences of migration in their own families. They might be able to identify some of the 'push' factors that made them want to move away from the place where they lived, and the 'pull' factors that drew them towards the place where they live now.

Ask the students to read the rest of these two pages, including 'It's a fact', to find out more about why people migrate. They might have their own experiences to contribute, such as family members who have emigrated, or who migrated across the Pakistan–India border after Partition. Ask them to complete Questions A1 a–b, A3 a–b, B1–3.

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned about the 'push' factors that make people want to emigrate.
- I learned about the 'pull' factors that draw immigrants to a place.
- I learned about some of the ways in which immigration and emigration affect the places people emigrate from and the places that receive immigrants.

PAGES 100–101

'Migration to escape violence, wars, or conflicts'; 'Migration as a way of life'; and 'Migration due to natural disasters'

Resources

- the students' cuttings and notes from their homework about migrants who fled from danger
- Skills Book page 50 'Migration vocabulary'
- Skills Book page 53 'Where are the world's refugees?'
- calculators

Introduction

Before this lesson it is useful to ask the students to look for news articles from the recent or more distant past about events related to violence, wars, or conflicts that have caused people to migrate to seek refuge. They could collect newspaper cuttings, refer to the Internet, or make notes from TV or radio broadcasts. Also ask them to find out about natural disasters that have led to migration. Encourage them to look for accounts from migrants themselves and to find out how migration affected them.

Activity

Invite the students to tell the class what they found out about migration to escape from violence, wars, or conflicts. They could recount some of the stories of migrants who fled for their own safety. Their findings could be written up and displayed on a timeline showing this type of migration throughout history. Tell the students that they are going to read about these types of migration and also about people who migrate as a way of life.

Using the Student's Book

Ask the students to read 'Migration to escape violence, wars, or conflicts'; 'Migration as a way of life'; and 'Migration due to natural disasters', including 'It's a fact' on pages 100–101.

Ask if they have learned anything new to add to their timeline about migration to escape violence, war, or conflict to their display about migration caused by natural disasters. They could discuss these topics in groups and come up with questions; for example: What happened to the migrants after they left their homes? Did they get any help? Who helped them? They could make a note of anything they would like to find out.

Ask what they learned about people who migrate as a way of life—why they do this and how it might affect aspects of their lives such as the types of homes they live in and their children's education.

It is useful to spend some time re-reading 'It's a fact' with the students to ensure that they understand the different types of migration and the vocabulary used to describe them. Ask them to complete Questions A2 a–b, A4, E1 a–d in the Student's Book.

Using the Skills Book

Ask the students to complete Skills Book page 50 'Migration vocabulary' for homework. They can use words given in the text related to migration. They should also complete Skills Book page 53 'Where are the world's refugees?'.

Ask the students to name the countries they know that have taken in refugees and then ask them to read the table of countries with refugees on page 57 of the Skills Book. Explain that it shows the total number of refugees living in the countries, not the numbers the countries accepted each year—the numbers have been changing over the years as more arrive in, or leave, the countries. Ask them to consider the numbers of refugees compared with the countries' total populations. They can then calculate the percentage of each country's population that is made up of refugees:

Number of refugees ÷ total population × 100

Example: refugee population of China = 301,052

Total population of China = 1,364,270,000

Refugees as a percentage of the total population:

$301,052 \div 1,364,270,000 \times 100 = 0.022\%$

Discussion and review

Ask the students what they have learnt in this lesson. They could make a note of this, summarizing the lesson, for example:

- I learned how people have migrated throughout history to escape from danger.
- I learned about the lifestyles of people who migrate regularly as a way of life.

PAGE 101

'Advantages and disadvantages of migration' and 'Illegal immigration'

Resources

- Skills Book pages 51–52 'Net migration'
- Skills Book pages 54–55 'Internally displaced persons'

Introduction

This section of unit 11 provides enough material for 2–3 lessons and homework sessions.

Before the first lesson, it is useful for the students to watch, listen, or read the news and take note of any migration that is taking place, and how the migrants' needs are being met.

To begin the lesson, ask the students about any migration issues that have been in the news. Ask what migrants need when they arrive in a new country and how these needs are being met.

Also ask them about the advantages and disadvantages of migration:

- for migrants (considering the reasons why they migrated)
- for their new country
- for the country they have left

Using the Student's Book

Ask the students to read 'Advantages and disadvantages of migration' and 'Illegal immigration' on page 101 of the Student's Book. The students should be able to complete Questions C1 a–c, D a–c, F1–4, before continuing to the activity below.

Activity

After the students have read the given pages, ask them to consider all they have learnt about migration, and, in groups of about 6–8, to plan a short role-play about migrants arriving in a new country. They should consider what feelings the migrants might experience when they set off from home, during their journey, when they first arrive in their new country, and after they have been there for a while. Some of them could enact the parts of people who deal with migrants, the people the migrants meet on their journey, and those they meet in their new country.

Once they have planned their role-play, they could each work on their roles for homework. The role-play of each group can then be presented during another lesson, with the rest of the class watching and noting anything they think might be incorrect for discussion afterwards.

Using the Skills Book

Skills Book pages 51–52 'Net migration' can be completed after the Student's Book work has been finished. Ask the students if it is possible for a country that accepts a large number of refugees to have a population that hardly changes—or even reduces. Ask how this is possible, then explain that there is a term that describes this—net migration.

Explain that net migration means the number of immigrants who arrive minus the number of emigrants who leave. Also point out that some of the emigrants are actually former immigrants who stayed for a year or more and then returned to their home country or moved on to another country. The students need to be aware that net migration can be a negative number, and could begin by reading the table on Skills Book page 51 to identify countries that had negative net migration, including Pakistan. Re-reading unit 11 of the Student's Book will help them to realize how this might have come about (including the large numbers of Pakistanis who have emigrated to the United Arab Emirates and Saudi Arabia).

Remind the students that internally means within their own country and displaced means forced to leave the place where they lived. Ask about the reasons that force people to leave the place where they live to become internally displaced. They should read the introduction to check their answers. Ask them to complete Questions A1–3 working with a partner.

They can also complete this exercise for homework.

Discussion and review

Ask the students what they have learnt in these lessons. They could make a note of this, summarizing the lesson, for example:

- I learned the meaning of net migration.
- I learned about the effects of illegal immigration.
- I learned about the effects of migration on migrants, and on their host countries.

Answers to assessment

- A 1 a) work or better pay, religious reasons, family reasons, education, escaping from wars or conflicts, escaping from natural disasters such as floods or earthquakes
- b) work—Pakistani emigrants to the UK, Canada, Australia, Saudi Arabia, and other countries; religious reasons—after Partition of India Pakistan in 1947, people crossing the Pakistan/India border; family reasons—people from many countries going to join their emigrant families in many countries (Pakistanis to countries such as the UK, Canada, and Australia); education—people from many countries go to the UK, the USA, Canada, and Australia for higher education; wars or conflicts—Afghan migrants to Pakistan, people from Democratic Republic Congo and from Syria to many other countries; natural disasters—people within Pakistan who migrated because of floods or earthquakes
- 2 a) Iraq, Iran, Bangladesh, Burma, and Somalia
- b) They are mainly asylums seekers and waiting to be resettled in developed countries.
- 3 a) United Arab Emirates and Saudi Arabia
- b) for highly-paid work
4. They are large countries that had small populations, which could not supply the workforce they needed across many sectors for development.
- B 1 a) Some emigrated to escape from poverty, low income or unemployment, or for opportunities for better quality healthcare and education; others found they could earn more there.
- b) England, as well as other parts of the UK, needed large numbers of doctors and, other professionals, and steel and textile workers were needed after the Second World War. Britain also needed labour to rebuild the country. When Pakistani communities developed in British industrial towns, this provided opportunities to set up halal restaurants and takeaways, bakeries, and shops there.
- 2 a) The students' own discussion should include: the loss of health professionals and other professional workers; the loss of skilled manual workers; loss of working members of communities; but also the gains to families in Pakistan who received money from their emigrant family members, who were now earning more than they would have in Pakistan.
- b) The students' own discussion should include: the economic growth they helped England to achieve; changes to the communities they joined, hostility and conflict where they were not welcomed; changes in the shops and restaurants in the communities where Pakistanis settled.
3. The students' own answers, based on their research, should include problems of transport when large numbers of people were on the move, the unrest and conflict between groups of people, and problems of homelessness for some when they arrived in their new country.
- C 1 a) the students' personal responses
- b) The students' own explanations should consider: benefits such as employment/improved pay; opportunities for learning and for helping their families; also the support many give to developmental projects that help others in Pakistan.
- c) students' own observations
- D 1 a) the students' own responses (The answer is: the USA in 2015 with 46,627,102 immigrants and Germany followed with 12,005,690.)
- b) the students' own responses (The answer was Pakistan until June 2014, and Turkey by the end of 2014, but later figures are not known at the time of writing. The students could find out if this has changed again.)
- c) conflict and natural disasters

- E 1 a) economic migrants
 - b) refugees
 - c) asylum seekers
 - d) internally displaced persons
- F 1 a–c) The students' own responses should include the problems faced by immigrants in a new country and by those who already live there, for example:

For immigrants:

meeting their basic needs of food, clean water, sanitation, accommodation, and access to services such as healthcare and education; also finding work and adjusting to living in a new culture, and sometimes facing hostility

For people in the host country:

providing for the migrants' needs and helping them to provide for themselves;
mistrust of migrants they do not know;
misunderstanding of the migrants' culture

- 2 a) The students can refer to reliable Internet sources like the websites of 'The United Nations High Commissioner for Refugees' agency.

Country	Number of refugees in 2015
Syria	4.9 million
Afghanistan	2.7 million
Somalia	1.1 million
South Sudan	800,000
Democratic Republic of Congo	475,506

- b) Reasons: Afghanistan —war; Syria— war; Somalia—civil unrest; South Sudan—civil unrest; Democratic Republic of Congo—civil unrest
3. the students' class discussion on: 'Should Pakistan keep taking in refugees?'
4. The students' own research about nomadic cultures of the world should compare these with the people of the Thar Desert.

Answers to Skills Book

Page 50 'Migration vocabulary'

A 1-2.

- a) asylum
- b) asylum seekers
- c) persecution
- d) refugees
- e) migrants
- f) emigrants
- g) immigrants
- h) economic migrants
- i) internally displaced persons
- j) illegal immigrants
- k) expatriate

Page 51–52 'Net Migration'

A 1. emigrants

2. It grew.

- B
- 1 a) Australia, Canada, Saudi Arabia, the United States, the United Kingdom
 - b) China, Democratic Republic of Congo, Pakistan, Sudan, Syria
 - c) Canada encouraged immigrants because of its low population density which developed the need for workers in the country.
 - d) conflict, civil unrest, poverty, and natural disasters such as volcano eruptions, etc.
- 2 a) Australia
- b) It attracted many immigrants, because it offered job opportunities and high quality of living.
- 3 a) Syria/Afghanistan
- b) The students' own responses from research, which focus mainly on the war in Syria, with its consequent damage to homes, buildings, and the infrastructure (including schools, hospitals, electricity, and water supplies, and supplies of food to some parts of Syria).

Talk about Afghan refugees. Since 1979, about 4 million refugees have migrated to Pakistan to escape from the Soviet-Afghan war in their country and they continue to migrate to Pakistan for refuge whenever there is unrest in their country. About 2 million refugees have also returned to Afghanistan.

Page 53 'Where are the world's refugees?'

- A 1 a-b) Chad: 3.43%, China: 0.022%
 Ethiopia: 0.68%, Iran: 1.25%, Jordan:
 9.9%, Kenya: 1.21%, Lebanon:
 25.59%, Pakistan: 0.81%, Turkey:
 2.09%, Uganda: 11.28%

Pages 54–55 'Internally displaced persons'

- A 1 a) internally displaced person(s)
 b) They have not crossed an international border.
- 2 a) FATA and Khyber Pakhtunkhwa
 b) They have experienced civil unrest or natural disasters such as earthquake, floods, etc.
 c) 1,565,400
 d) FATA
 e) Jalozai, Hangu, New Durrani, and Togh Sarai
- 3 a) Students' own responses, which should indicate a district with a high number of IDPs (especially a high number for its size), such as Bannu.
 b) Students' own responses, which should take into consideration the size of the district and the number of IDPs and anything they can find out about the infrastructure there (medical provision, education, water, and utility supplies, food production, and so on) and how the district could cope with large numbers of migrants.