Unit 9
Measures

Five daily lessons

National **Numeracy** *Strategy*

Year 6
Autumn term

Unit Objectives
Year 6

• Use, read and write standard metric units of length, km, m, cm, mm, including their abbreviations and relationships between them.	Page 91
• Convert smaller units to larger and vice versa: m to km, cm or mm to m.	Page 91
• Suggest suitable units and measuring equipment to estimate or measure length.	Pages 93-95
• **Identify and use appropriate operations to solve word problems involving numbers and quantities** (based on 'real life' or measures).	Pages 82-89
• Know rough equivalents of miles and kilometres.	Page 91
• Appreciate different times around the world.	Pages 99, 101

Link Objectives

Year 5

- Record estimates and readings from scales to a suitable degree of accuracy.
- Use, read and write standard metric units including their abbreviations and relationships between them.
- Convert larger to smaller units: km to m, m to cm or mm.
- Suggest suitable units and measuring equipment to estimate or measure length.
- **Use all four operations to solve simple word problems involving numbers and quantities.**
- Know imperial units (mile).
- Read the time on a 24-hour digital clock, and use 24-hour clock notation.

Year 7

- **Read and interpret scales on a range of measuring instruments.**
- Use names and abbreviations of metric and imperial units for estimation, measurement, and calculation.
- **Convert from one metric unit to another.**
- Solve problems in contexts involving length, and time.
- Choose and justify the use of an appropriate and efficient method for solving problems.
- Know rough metric equivalents of imperial measures in common use (feet, miles).

(Key objectives in bold)

This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Activity sheet 9.1
- Activity sheet 9.2
- Activity sheet 9.3
- Activity sheet 9.4
- OHT 9.1
- OHT 9.2
- Counting stick
- Whiteboards
- Rulers marked in mm
- Short and long tape measures
- Metre sticks
- Range of objects to measure
- Labels with cities and countries written on them
- Range of events written on separate cards
- Analogue teaching clocks
- Related Key Stage 2 national test questions

department for **education and skills**

Planning sheet	Day One	Unit 9 *Measures*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Use, read and write standard metric units of length, m, cm, mm, abbreviations and relationships. Convert larger to smaller units of length and vice versa: m to km; cm or mm to m. Round decimals to the nearest whole number or tenth. VOCABULARY metre centimetre millimetre decimal equivalents RESOURCES Counting stick	• Use a counting stick with 10 divisions. Say the stick is to represent 1 m. Practise counting up in 0.1 m and then in 10cm steps. Point to a division on the counting stick. **Q** What is the length in centimetres, and the length in metres? e.g. 70 cm, 0.7 m. Point half-way between 10 cm and 20 cm **Q** What measurement lies here? i.e. 15 cm Ask children to say this in metres i.e. 0.15m. Repeat by pointing to other half-way points. Point to other places on the stick and ask children to estimate the length to this point e.g. 0.67 m, 67 cm. **Q** Round this to the nearest tenth of a metre i.e. 0.7 m, 70 cm. Say that the stick now represents 10 cm, each division being 1 cm or 10 mm. Repeat the above and ask for equivalent lengths in cm and mm. Ask children to round mm measurements to the nearest cm. At certain points ask children to come and write the lengths on the board using the standard abbreviations, to check that they know how to write these measurements as well as say them.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Use, read and write standard metric units of length, km, m, cm, mm, abbreviations and relationships. Convert larger to smaller units of length and vice versa: m to km; cm or mm to m. VOCABULARY kilometre, km metre, m centimetre, cm millimetre, mm RESOURCES Counting stick Whiteboards	• Say that the counting stick now represents one kilometre. **Q** How many metres are in a kilometre? Remind children that 'kilo' means 1000 (and there are also 1000 grams in a kilogram). **Q** What does each division represent? Quickly count in 0.1 km and then 100 m steps to 1 km, 1000 m. Point to 250 m. **Q** What is this measurement in both m and km? Repeat for other half-way points asking for m and km equivalents. • Ask what 0.001 km is in metres. Ask what fraction of a km this is. Ask what the equivalent of 0.01 km is in m. Record one tenth, hundredth and thousandth of a kilometre on the board. 0.1 km = 100 m 0.01 km = 10 m 0.001 km = 1 m • Ask children to write on whiteboards the equivalent in km of 300 m, 30 m, 3 m, 330 m, and 333 m. Check they understand the place value of a three-place decimal. • Write a range of measurements in m and km and ask children to use what they have learned to convert them from km to m or m to km, recording this in their books. Check results and correct any misunderstandings. **Q** How many mm are there in a metre? (reminding children that there are 10 mm in a cm and 100 cm in a metre.)

Plenary

Teaching Activities / Focus Questions

- Use the counting stick to represent 1 m and ask children what each division represents in mm. Repeat the process as above and give them a range of measurements to convert from mm to m or m to mm in their books. Check results and correct any misunderstandings.
- Write the value 10 cm on the board. Ask the class for equivalents to this in mm, m, km. Write these in a column:
  0.0001 km
  0.1 m
  10 cm
  100 mm

  Repeat starting with 10 000 mm, 10 m, 0.1 km and form the three columns.

  Point to any value e.g. 0.1 m. Ask the class to complete sentences such as 'A hand is 0.1 m wide'. Repeat mixing the units.

  Check the children's answers are sensible and correct any misunderstandings.

By the end of the lesson children should be able to:

- **Use correctly the abbreviations km, m, cm, mm;**
- **Know the equivalent of one thousandth of 1 km;**
- **Be able to convert a larger metric unit to a smaller, for example, write 3.125 km in metres;**
- **Begin to convert a smaller unit to larger, for example write 3 cm in metres;**
- **Round a measurement to the nearest whole unit or tenth of a unit.**

(Refer to supplement of examples, section 6, pages 91 and 95.)

Planning sheet	Day Two	Unit 9 *Measures*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Use, read and write standard metric units of length, km, m, cm, mm, abbreviations and relationships. Convert larger to smaller units of length and vice versa: m to km; cm or mm to m. VOCABULARY represent RESOURCES Counting stick	• Reinforce work from previous lesson by using the counting stick to represent 1 km – 10 divisions each representing 100 m 2 km – 10 divisions each representing 200 m **Q** If the counting stick represents 2km what does each division represent? • Point to different divisions/between divisions on the counting stick, e.g. the half-way point, quarter and three-quarter point and to specific division markers. **Q** How many metres does this represent? Ask children to record on individual whiteboards. While doing this work vary holding the counting stick horizontally and vertically.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Know mile and kilometre equivalents. VOCABULARY mile kilometre RESOURCES Whiteboards Activity sheet 9.1	• Discuss with pupils what they know about imperial units relating to length and where they have seen these used in a 'real life' context. Say that in this lesson you will focus on miles. Ask where they might see measurements in miles e.g. distances shown on road signs. In Europe road signs have distances in kilometres. Say that in this country most people also think of speed in mph as opposed to kmph. • Ask the class which is smaller, 1 mile or 1 km. Write 1 mile >1 km on the board. Ask them if they can remember the approximate equivalent. Write 5 miles is approximately equivalent to 8 km. Set this problem: Your friend uses 6 litres of petrol for every 100 km travelled. The milometer in her car showed that she travelled 570 miles last month. She pays 77.9p for every litre of petrol she buys. She wants to know what the month's travel cost her. How can the class help her? Write the problem on the board. Establish that you need to know the km equivalent to 570 miles. Work through some related equivalents to establish how this can be done e.g. 5 miles is 8 km, 10 miles is 16 km, 100 miles is 160 km. Ask what 500 miles is in km, 70 miles etc. Work out the answer for 570 km. Explain the scaling method, divide 5 into 570 and multiply by 8, and the unit method, 1 mile is ⅝ km. So 570 miles is 570 × ⅝ km. Show children how to record these in their books. Solve the rest of the problem with the class. • On graph paper draw a conversion graph for miles and km. The horizontal axis is miles and is to cover 100 miles. Choose your own scale. Give out Activity sheet 9.1. **Q** Can we convert these using our graph? **Q** Is this an easier method?

Plenary

Teaching Activities / Focus Questions

• A driver worked out that 400 km is equivalent to 640 miles. Ask the children to discuss this answer.

Q How do you know that this is wrong?

Draw out that the number of miles must be less than the number of kilometres.

Q What error has the driver made?

By the end of the lesson children should be able to:

- **State the approximate equivalence between commonly used imperial units and metric units: 8 kilometres equals 5 miles;**
- **Estimate and check, using metric or imperial units, measurements such as the distance from Leeds to Liverpool.**

(Refer to supplement of examples, section 6, pages 91 and 93.)

Planning sheet	Day Three	Unit 9 *Measures*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Convert larger to smaller units of length and vice versa: m to km; cm or mm to m. Round decimals to the nearest whole number or tenth. VOCABULARY tenth round nearest RESOURCES Counting stick	• Use the counting stick to represent the distance between 1 m and 2 m. Quickly count up in steps of 10 cm and then 0.1 m to help children become familiar with this. Now point to various points on the counting stick. **Q** What are the equivalent measurements in cm? in m? Include points half way between divisions and other points between divisions encouraging them to make estimates. • Remind children how to round to the nearest 10. After pointing to various positions ask the children to round the measurement to the nearest 10 cm. **Q** What fraction of a metre is 10 cm? • Draw out from the children that rounding to the nearest 10 cm is equivalent to rounding to the nearest tenth of a metre.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Suggest suitable units/ equipment to estimate length. VOCABULARY length width height depth perimeter RESOURCES Rulers marked in mm Short and long tape measures Metre sticks Range of objects to measure OHT 9.1	• Tell the children to look at their conversion graphs. Ask them what information they used to draw them e.g. 5 miles is 8 km so 50 miles is 80 km and 100 miles is 160 km. Discuss the scales they used and why they chose them. Emphasise the importance of choosing big enough scales and drawing them accurately. Show the graph on the OHP or as a display. Discuss the axes, the straight line, the origin and the fact that all points on the line have a meaning. Show the two points, 50 miles and 100 miles, and get children to use their graphs to convert miles to km and km to miles. Show OHT 9.1. Get volunteers to show how to convert on the OHT. • Explain to the children that they will be making estimates and measuring perimeters this lesson. You want them to record their estimates and measurements using at least two units decimal notation. Demonstrate how to estimate and measure the perimeter of the desk. If the length is 95 cm your estimate might be 1 m and you record the length as 0.95 m or even 950 mm. Do the same for the width and find the perimeter. Before the children start, ask them to make sure that they start measuring at the point marked zero on any rulers/tape measures that they may be using as this will affect the answer. Demonstrate what happens if they don't. Show the class how to record the estimates, measurements and perimeter in their books. Tell the children they can find the perimeter using either of the two units. • Divide the class into groups giving each group 6 or more objects to measure the perimeters. Ensure that there is a range of sizes from the face of dice to a wall display board, the classroom door, or the classroom carpet. • Draw the class together and collect responses. Compare estimates with actual measurements. Discuss their choice of units and their conversions. Compare the perimeters of the different shapes.

Plenary

Teaching Activities / Focus Questions

• Discuss the appropriateness of units and levels of accuracy for different measurements.
Say that when fitting kitchens, measurements to the nearest mm might be required, whereas when buying material, measurements to the nearest 10 cm might be adequate as long as measurements are rounded up.

Q Did you round any of your measurements? When? Why?

Q When might a measurement of 112 cm be necessary rather than a rounded measurement of 1.1 m or even 1 m?

By the end of the lesson children should be able to:

- **Suggest an imperial or metric unit to measure various objects/distances;**
- **Choose a suitable measuring instrument to measure;**
- **Record estimated and measured lengths in decimal form.**

(Refer to supplement of examples, section 6, pages 93 and 95.)

Planning sheet	Day Four	Unit 9 *Measures*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Order mixed decimals. VOCABULARY decimal place tenths hundredths thousandths RESOURCES Whiteboards	• Write these lengths on the board and ask the children to put them in order, smallest first on their mini-whiteboards: 1.1 m, 1.25 m, 1.04 m, 1.9 m, 1.75 m Repeat with the following distances: 4.1 km, 4.01 km, 4.001 km, 4.25 km, 4.725 km, 4.9 km, 4.29 km. • Use the children's responses to clarify any misconceptions about the place value, drawing a number line to show the relative positions of these numbers if necessary. **Q** Which digit did you look at to decide? Why? **Q** Which is longer, 1.25 m or 1.9 m? How do you decide?

Main Teaching

Objectives and Vocabulary	Teaching Activities
Understand different times around the world. Use a world time chart to answer questions. VOCABULARY Greenwich Mean Time British Summer Time 24-hour clock 12-hour clock digital/analogue RESOURCES Activity sheets 9.2, 9.3, 9.4 Labels with cities and countries written on them Range of events written on separate cards Analogue teaching clocks	• Tell the children that there are different time zones around the world to fit in with when different countries are exposed to the sun. Remind the children that if it is light here then on the opposite side of the world it is dark and so the times of day are adjusted. Show the children a world time chart (found in diaries) so that they can see the zones. Explain that the sun rises in the east and so countries to the east of ours will see the sun first. When it's getting light here, it will still be dark in countries to the west. • Explain that on the world time chart times are recorded as hours before and after Greenwich Mean Time, the time in this country. Explain about British Summer Time and remind pupils what happens when the clocks change. Say that the world time charts ignore this and so this has to be taken into account in the summer. Say that some other countries also move their clocks in the summer. • Ask the children if they have relatives living in other countries. Relate some examples to these places. • Give out copies of Activity sheet 9.2 and 9.3. Demonstrate how the time chart can be used to find the time in another country when it is say 8am here. Revise conversion between 12-hour and 24-hour clocks if necessary. • Ask for seven volunteers. Hang labels around their necks with the names of cities and countries that are about three or four hours apart e.g. Auckland, Los Angeles, Buenos Aires, London, Karachi, Perth and Sydney. Give each child an analogue clock set at the times in these cities when it is midday in London. Put a range of cards on the table with events on such as sleeping, eating breakfast, going to school, eating lunch, going home, eating tea, watching TV, and going to bed. Ask the children to pick up what might be an appropriate card (explain that we'll have to make some guesses as children go to school at different times in some countries). Then say it is now one hour later, ask them to change their cards if necessary. Repeat until the children have gone through a whole day so that the rest of the class can appreciate that these different events happen at different times around the world. • Children use Activity sheet 9.3. Work in pairs. Choose cities on the map (not written in bold on the map) and say/record 'It is 1200 noon in London, in Delhi it is .....'.

Plenary

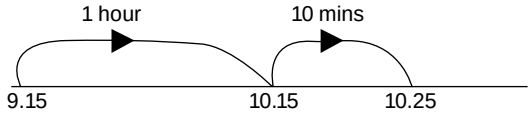
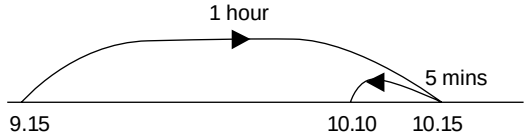
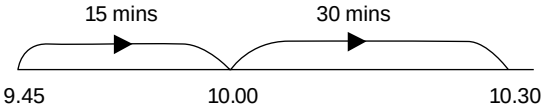
Teaching Activities / Focus Questions
• Ask the children to think about a part of the world where it is nearly midnight on the 12 November. Say that to the east it will be a little later. **Q** What will the date be to the east? **Q** What would happen if you sailed eastwards across these two time zones? Say that there is an imaginary line between these two zones called the International Date Line. Explain that a plane flies along the equator, going around the world once. It starts at and returns to Accra in Africa. There are 360° in a circle, so when the plane has travelled through 180° it is half-way round the world and the time difference to Accra will be 12 hours. **Q** What will be the time difference when the plane has travelled 90°? Explain the gain and loss in time as the plane travels. HOMEWORK – Give out Activity sheet 9.4 and explain that the circle represents the equator, and the centre the North Pole. For homework the children are to put in the times at the points on the circle if the time in Accra is 7am or 0700. **By the end of the lesson pupils should:** • **Understand different times around the world;** • **Know how to use a world time chart.** (Refer to supplement of examples, section 6, page 101.)

Planning sheet	Day Five	Unit 9 *Measures*	Term: *Autumn*	Year Group: *6*

Oral and Mental

Objectives and Vocabulary	Teaching Activities
Count on/back in steps. VOCABULARY multiple RESOURCES Counting stick Whiteboards	• Discuss the homework. Emphasise that there are 24 hours in a day and 360° in a circle so 12 hours is equivalent to 180°, 6 hours to 90°, 3 hours to 45° and 1 hour to 15°. Every 15° means a difference of 1 hour in time. • Practise counting on in steps of 60 from 0 to 600 either using the counting stick or saying the numbers around the room. • Write a starting 10s number on the board e.g. 40 and get the children to write the next 10 numbers increasing in steps of 60 (40, 100, 160 etc.). Repeat using different starting numbers. **Q** When is it useful for us to know our multiples of 60? Draw out the reasons from the children why: 60 min in hour, 60 sec in a minute etc. • Get the children to write the 60s sequence starting with 30. Ask them to write by the side of their numbers the hours and minutes these would be equivalent to if the original numbers were in minutes.

Main Teaching

Objectives and Vocabulary	Teaching Activities
Identify and use appropriate operations to solve word problems, based on 'real life', involving the use of time. VOCABULARY 24-hour clock 12-hour clock digital, analogue RESOURCES Word problems involving time OHT 9.2	• Demonstrate to pupils how they could use a number line for time problems. For example. What is the time 1 hour and 10 minutes after 9:15?  What is 55 minutes later than 9:15?  What time is 45 minutes later than 9:45?  Demonstrate examples which include subtraction. Set the class similar questions to do in their books. • Discuss their answers and correct any misunderstandings. Demonstrate strategies for dealing with multiplication problems. For example: A chicken needs to be cooked for 50 minutes per kilogram; how long must a 2.5 kg chicken be cooked for? $50 \times 2.5 = 125$. Convert this to hours and minutes. Ask 'How many 60s are in 125?' Two with 5 minutes left over. So the chicken must be cooked for 2 hours and 5 minutes. • Demonstrate a division problem. For example: A videotape is three hours long. How many 40 minute programmes could you record? Convert 3 hours to 180 minutes, and then ask how many 40s are in 180. There are four with 20 minutes left. So you could record four programmes. • Discuss the step-by-step guide to solving problems. Give the children a range of similar word problems drawn from related Key Stage national test questions to do in their books using this approach.

Plenary

Teaching Activities / Focus Questions
• Show the children questions from the end of Key Stage 2 national test questions. Ask the children to discuss the questions in pairs and then ask them how they went about answering the questions. Gather their solutions and relate their method to the step-by-step guides, OHT 9.2. • Ask the children to teach someone at home the 'number line method' for solving time problems. **By the end of the lesson pupils should be able to:** • **Solve 'story' problems involving units of time, and explain and record how the problem was solved.** (Refer to supplement of examples, section 6, page 89.)

Convert into kilometre equivalents

30 mph limit	London 65 miles
Glasgow 215 miles	A police car travelled at 100 mph. What speed in kmph?

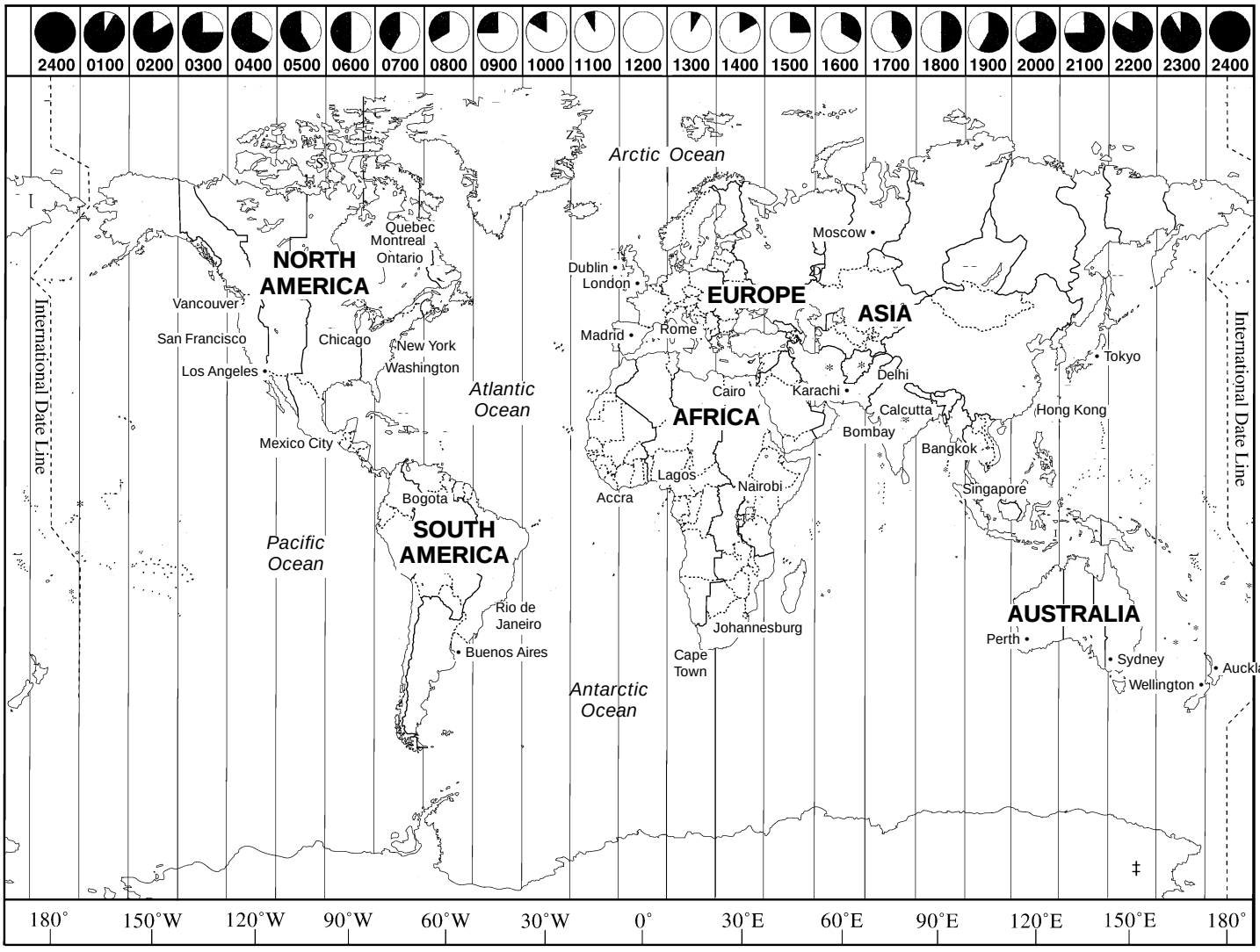
Convert into mile equivalents

90 kmph limit	Paris 146 km
Berlin 128 km	The French train travels at 150 kmph. What speed in mph?

World time differences

Hours plus or minus GMT in London

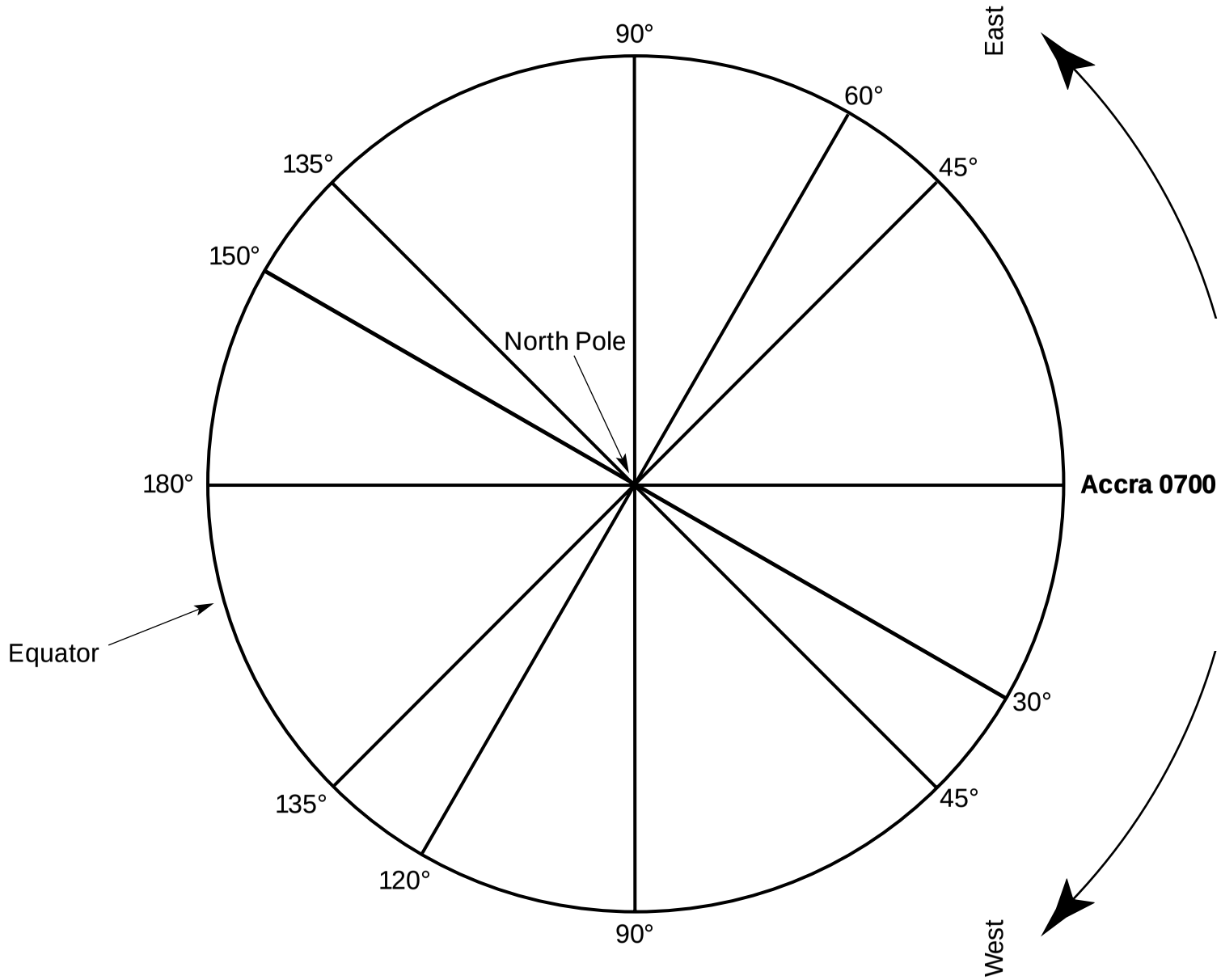
Accra	GMT
Adelaide	2130 (–9½)
Amsterdam	1300 (+1)
Athens	1400 (–2)
Auckland	2400 (–12)
Baghdad	1500 (+3)
Bangkok	1900 (+7)
Beijing	2000 (+8)
Belgrade	1300 (+1)
Berlin	1300 (+1)
Bogota	0700 (–5)
Bombay	1730 (+5½)
Brasilia	0900 (–3)
Brussels	1300 (+1)
Bucharest	1400 (+2)
Buenos Aires	0900 (–3)
Cairo	1400 (+2)
Calcutta	1730 (+5½)
Calgary	0500 (–7)
Cape Town	1400 (+2)
Chicago	0600 (–6)
Copenhagen	1300 (+1)
Darwin	2130 (+9½)
Delhi	1730 (+5½)
Dublin	GMT
Helsinki	1400 (+2)
Hong Kong	2000 (+8)
Honolulu	0200 (–10)
Jerusalem	1400 (+2)
Johannesburg	1400 (+2)
Karachi	1700 (+5)
Kuala Lumpur	2000 (+8)
Kuwait	1500 (+3)
Lagos	1300 (+1)
Lisbon	GMT
London	GMT
Los Angeles	0400 (–8)
Madrid	1300 (+1)
Malta	1300 (+1)
Mexico City	0600 (–6)
Montreal	0700 (–5)
Montevideo	0900 (–3)
Moscow	1500 (+3)
Nairobi	1500 (+3)
New York	0700 (–5)
Oslo	1300 (+1)
Ottawa	0700 (–5)
Panama	0600 (–6)
Perth W.A.	2000 (+8)
Pretoria	1400 (+2)
Quebec	0700 (–5)
Rio de Janeiro	0900 (–3)
Rome	1300 (+1)
San Francisco	0400 (–8)
Seoul	2100 (+9)
Singapore	2000 (+8)
Stockholm	1300 (+1)
St. Petersburg	1300 (+3)
Sydney	2200 (+10)
Tokyo	2100 (+9)
Vancouver	0400 (–8)
Vienna	1300 (+1)
Warsaw	1300 (+1)
Washington	0700 (–5)
Wellington	2400 (+12)



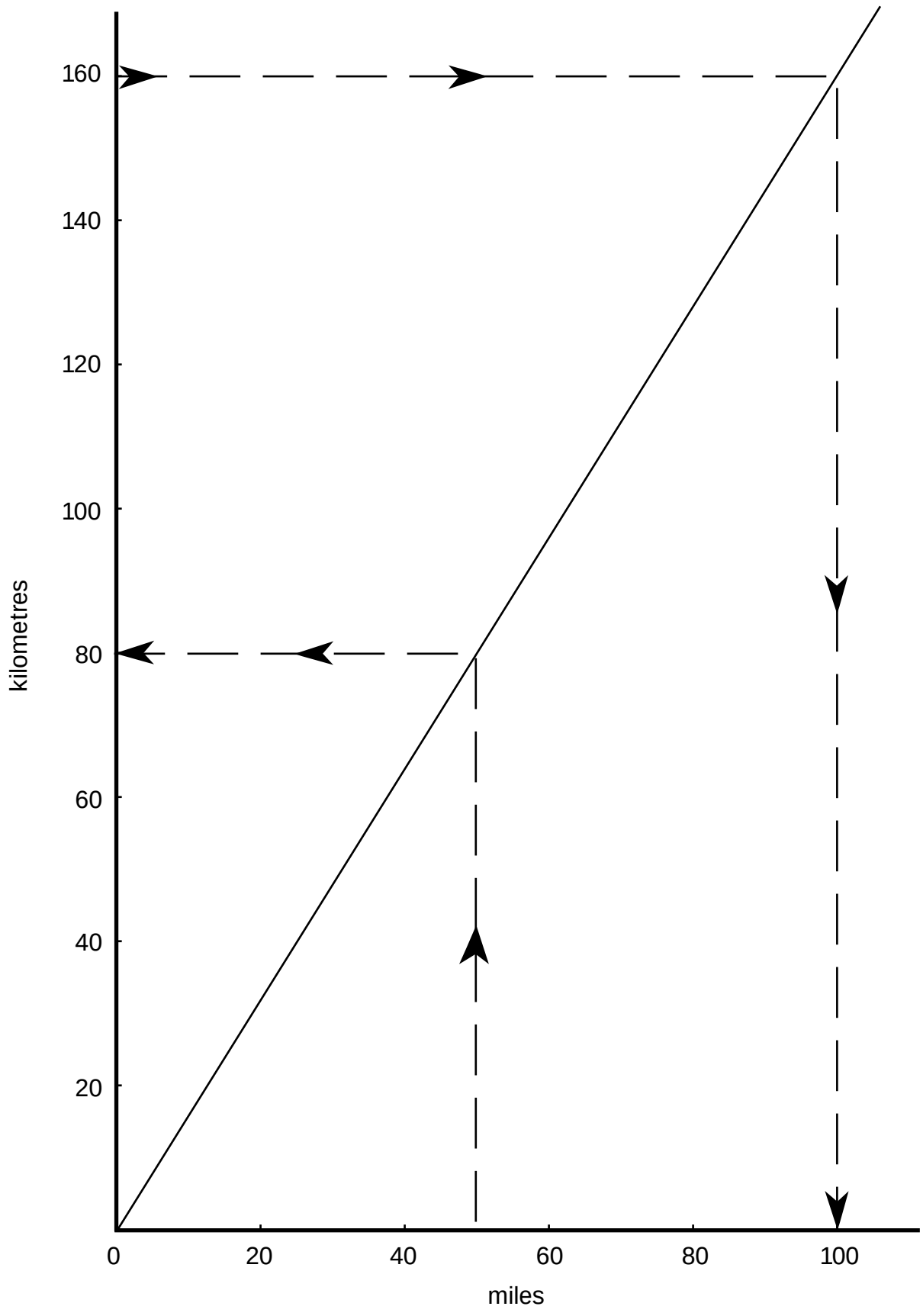
World time differences

PLACE	TIME	DIFFERENCE
London	1200 noon	(0 hours)
Auckland	2400 midnight	(+12 hours)
Los Angeles	0400 early morning	(–8 hours)
Buenos Aires	0900 morning	(–3 hours)
Dublin	1200 noon	(0 hours)
Madrid	1300 early afternoon	(+1 hour)
Moscow	1500 mid-afternoon	(+3 hours)
Karachi	1700 early evening	(+5 hours)
Perth	2000 mid-evening	(+8 hours)
Tokyo	2100 late evening	(+9 hours)
Sydney	2200 night	(+10 hours)
Wellington	2400 midnight	(+12 hours)

Times around the world



Conversion graph miles to kilometres



Step-by-step guide to solving problems

1. Read the question. Underline key words that help you solve the problem.
2. Decide what operation(s) to use.
3. Write down the calculation(s) you are going to do. Use brackets if you need to.
4. Work out the approximate answer.
5. Decide how you will work out the calculation.
6. Do the calculation and interpret the answer. Include any units (e.g. km).

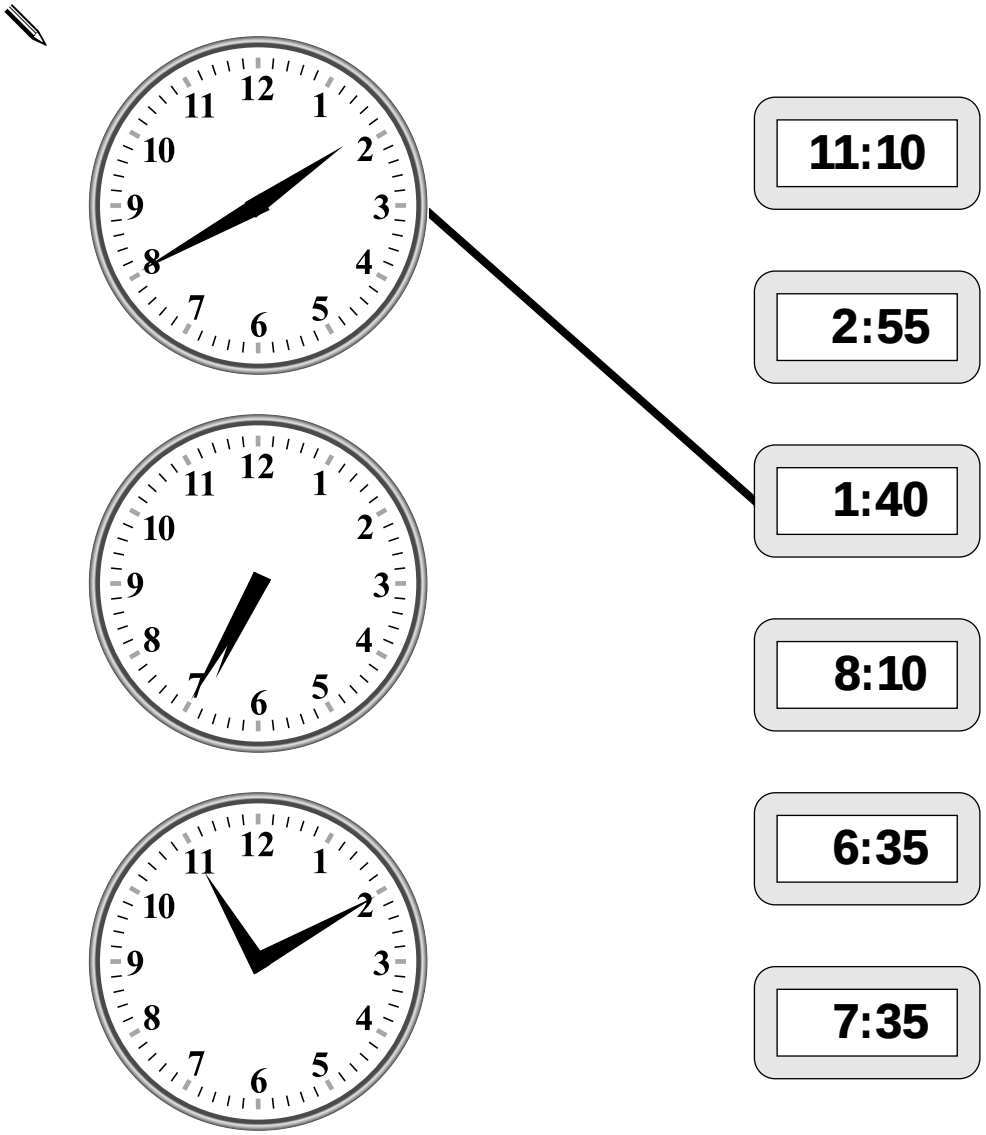
Ask: does the answer make sense?

Related Key Stage 2 national test questions:

2000 Test B

3 Here are three clock faces.

Match each clock face to the same time on a digital clock.



3a

1 mark

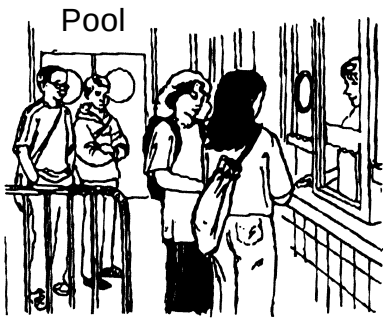
3b

1 mark

Total

2000 Test B

8



These are the opening times at a swimming pool.

	opening times am		pm
Monday	Pool closed		
Tuesday			
Wednesday	10:30	to	5:30
Thursday	10:30	to	8:30
Friday	10:30	to	9:00
Saturday	8:00	to	6:00
Sunday	7:00	to	4:00

How many **hours** is the pool open on a **Sunday?**

hours

8a

1 mark

Which **day** has the **latest** closing time?

.....

8b

1 mark

Harib arrives at the pool at **5:20pm** on **Saturday.**

How many **minutes** is it before the pool closes?

minutes

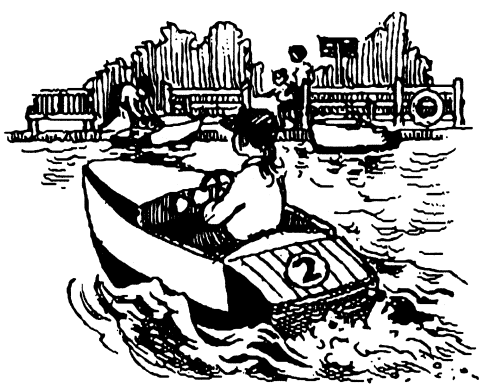
8c

1 mark

Total

2001 Test B

9



Boat Hire	
Motor boats	**Rowing boats**
£1.50 for 15 minutes	£2.50 for 1 hour

How much does it cost to hire a **rowing boat** for three hours?

£ 9a

1 mark

Sasha pays **£3.00** to hire a **motor boat.**

She goes out at **3:20 pm.**

By what time must she **return?**

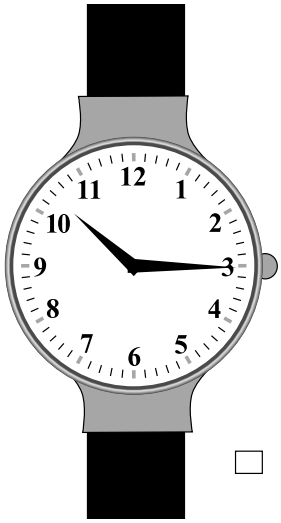
pm 9b

1 mark

Total

2001 Test A

10 This was the time on Selin's watch when she **set off** for a walk.



What time did the watch show 20 minutes **before** this?

10a

1 mark

What time did it show an hour and a half **after she set off** for the walk?

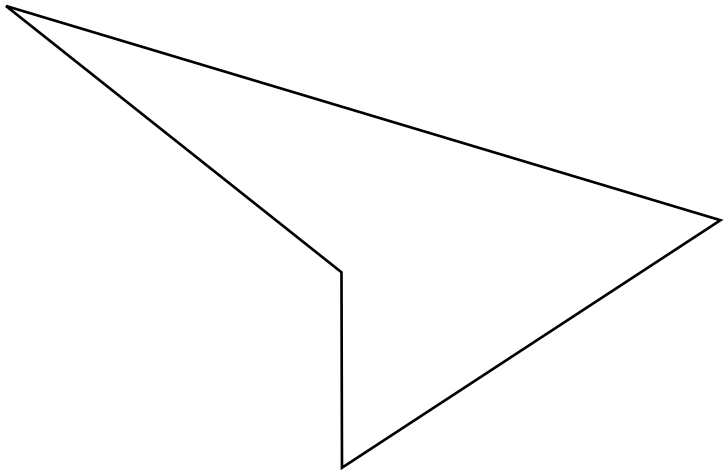
10b

1 mark

Total

2001 Test A

17



Measure accurately the **longest side** of this shape.

Give your answer in millimetres.

mm

17a

1 mark

Measure accurately the **smallest angle** in this shape.

Use a protractor (angle measurer).

°

17b

1 mark

Total