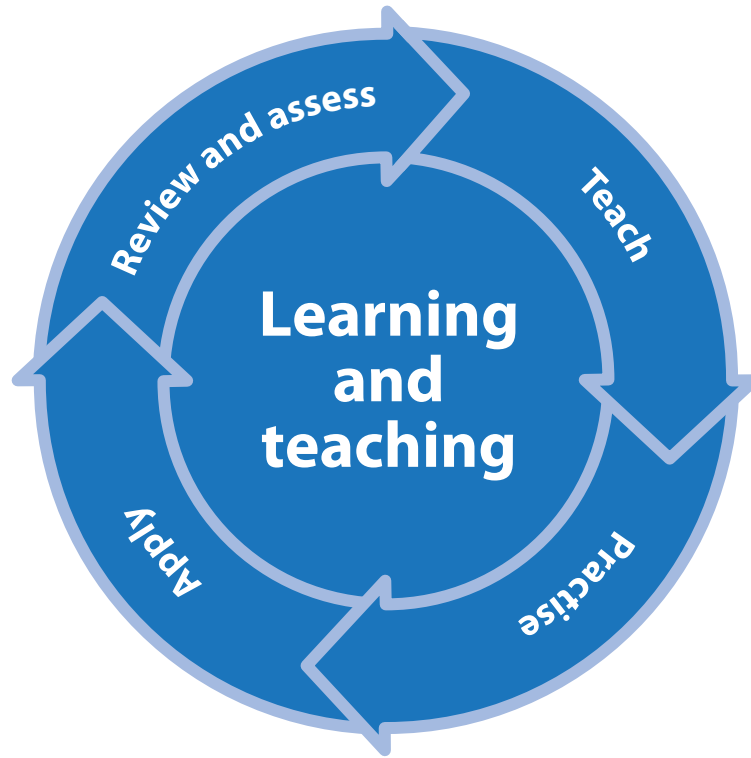


Securing Level 4 in Mathematics



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Securing Level 4 in Mathematics

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Securing Level 4 in Mathematics

These materials are intended to support you in ensuring that as many children as possible reach level 4 by the end of Key Stage 2. The guidance identifies key areas of learning that children need to secure to attain level 4 in mathematics. While you will integrate the ideas from these materials into your on-going planning, they could also be used to plan targeted support for particular groups of children. To help you there is a double page spread for each of the six areas of mathematics:

- Securing mental skills
- Understanding and using place value
- Calculating with money and time
- Reading scales
- Interpreting tables and graphs
- Naming and transforming shapes

Remember:

Every day is a mental mathematics day – ensure that children engage in 10 to 15 minutes of mental work each day to practise and reinforce knowledge and skills in mathematics. *Don't expect quick recall if the practice and repetition has not taken place.*

Hands-on learning is still important – provide appropriate practical equipment for children to use and manipulate, to help them to explore how and why things work and to learn to visualise, describe and represent what is in front of them. *Don't just talk about measuring jugs, use one. Using apparatus is better than imagining how they work.*

Seeing mathematics through models and images supports learning – help children to see how mathematics works and can be represented through a physical object, picture or diagram such as place value cards, number stick, number lines, representations of fractional parts. *Don't expect children to visualise and 'see' how something works if they have no models and images to draw on.*

Talking mathematics clarifies and refines thinking – give children the vocabulary and language of mathematics; provide activities and time for them to discuss mathematics using this language. Teach children the precision of language, for example using: 'regular', 'equals', 'factor' and how to express their reasoning using language such as 'if ... then', 'because', 'cannot be', 'never', 'sometimes', 'always'. *Don't expect children to explain or provide reasons if they have no opportunity to use, develop and refine the language to do so.*

Make mathematics interesting – share your interest in mathematics with the children. Give children mathematics that engages them in: testing out ideas such as deciding which quadrilaterals have diagonals that bisect one another; explorations such as finding numbers which can be divided by the sum of their digits e.g. 12, 45; answering intriguing questions such as how long it takes for a million heart beats. *Don't expect children to be interested in mathematics if you don't share an interest and all their mathematics is routine and dull.*

Learning from mistakes should build up children's confidence – look out for mistakes and encourage children to recognise that making mistakes is something everyone does. Show children mistakes and get them to identify and correct them. Encourage children to work with a partner and share their work. *Don't just tell children something is wrong; help them to see what went right and to identify when it went wrong.*

Securing mental skills

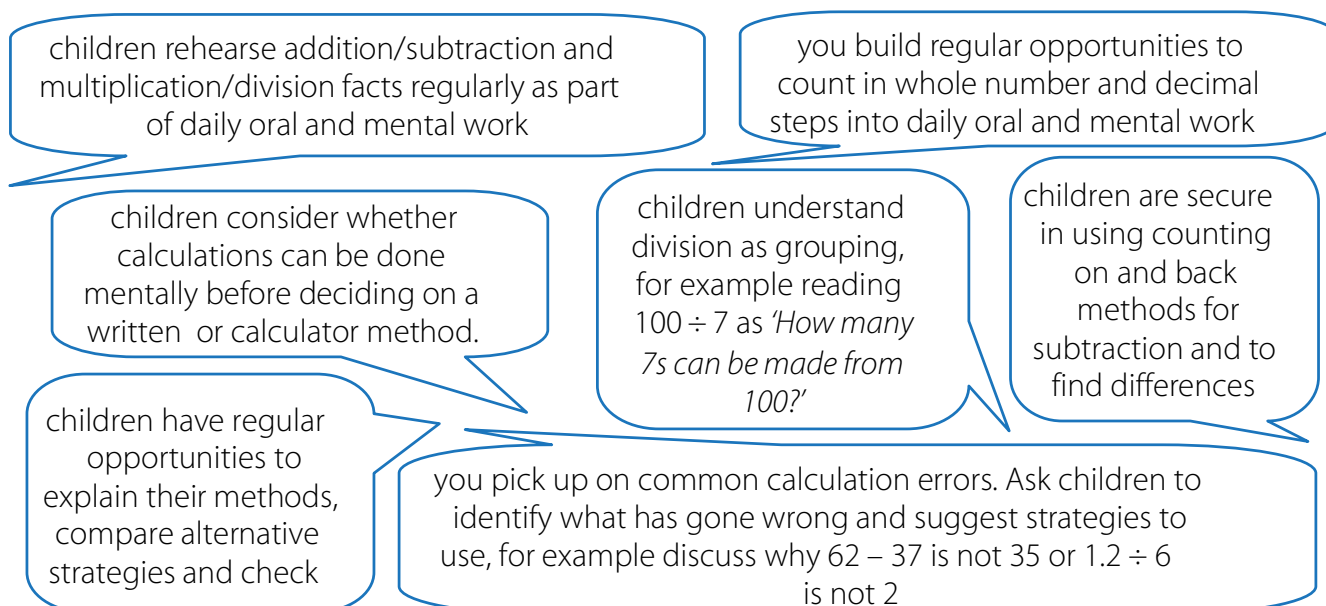
Level 4 standards to be achieved:

Use mental methods for appropriate calculations in all four operations
Use known facts and place value to answer simple calculations involving decimals
Draw number lines or make other jottings to support accurate mental calculation
Choose an efficient method for a calculation from a repertoire of mental strategies
Use mental strategies to solve problems involving numbers, shapes and measures
Make sensible choices between using mental, written or calculator methods for particular calculations or problems

For children to attain level 4, teach them how to:

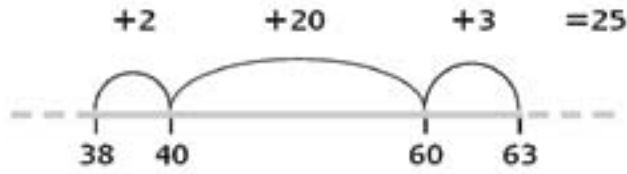
- understand and use language associated with the four operations, for example difference, sum, total, product, multiple, share equally, factor, remainder
- build on what they know e.g. as $624 \div 6 = 600 \div 6 + 24 \div 6 = 100 + 4 = 104$
- recognise cases where particular strategies will be effective, for example using rounding to work out that $\text{£}1.99 \times 3 = \text{£}6.00 - 3\text{p}$
- answer simple decimal calculations using their relationship to number facts, for example $0.7 \times 3 = 2.1$ as 7 tenths $\times 3 = 21$ tenths or 2.1; $5.4 \div 9 = 0.6$ as $9 \times 6 = 54$ and $9 \times 0.6 = 5.4$
- use number lines and other jottings to record working clearly
- build up speed with practice for calculations that can be done mentally
- answer questions mentally involving units, for example find the ml in $\frac{1}{5}$ of a litre

Make sure that:



Securing mental skills

Teaching and learning resources



Number lines



Difference ITP



Make numbers spreadsheet

Counting sticks



Intervention materials

Springboard 6

• Lesson 12

Overcoming barriers in mathematics - level 3 to 4

- Can I multiply/divide by 10 and 100 and 1000?
- Can I add and subtract two numbers in my head quickly?
- Can I use my tables to multiply and divide?

Wave 3 materials

- +/- Year 6 booklets 3, 4a and 4b
- x/÷ Year 6 booklets 1 and 3

x		0.7
5		3.5

Multiplication/division facts spreadsheet

Assessment checklist

I can statements	Assessment examples
<i>I can use mental calculation strategies for addition, subtraction, multiplication and division</i>	What number is 199 more than 428? What is the difference between 1999 and 4003? One orange costs 15p. How much would five oranges cost? 4 pineapples cost £3.40. Calculate the cost of 1 pineapple.
<i>I can use mental methods for calculations that involve decimals</i>	Multiply nought point seven by nine. Subtract one point nine from two point seven. Find the total of 0.2, 0.4 and 0.6. What is half of three point six?
<i>I can record my working for mental methods that involve several steps</i>	A bottle holds 1 litre of lemonade. Rachel fills 5 glasses with lemonade. She puts 150 millilitres in each glass. How much lemonade is left in the bottle?
<i>I can choose when to use mental methods, when to use written methods and when to use a calculator</i>	Would you use a mental, written or calculator method to solve each of these? Explain your choice. $23.5 \times ? = 176.25$ How many cartons of juice costing 30p each can I buy with £2? What is the total cost if I buy food costing £3.86 and £8.57?

Understanding and using place value

Level 4 standards to be achieved:

Read, write, order and round large numbers and numbers with up to 3 decimal places

Understand the effect of multiplying and dividing numbers by 10, 100 and 1000

Use understanding of place value to calculate accurately and solve problems

For children to attain level 4, teach them how to:

- find the value of each digit in large numbers and decimals
- order a set of numbers by identifying significant digits
- position numbers on a number line
- round whole numbers to the nearest ten, hundred or thousand
- round decimal numbers to the nearest whole number
- use rounding to find an approximate answer before tackling tricky calculations
- multiply and divide whole numbers by 10, 100 and 1000
- use a known fact to answer linked decimal facts
- create and continue number sequences involving decimal numbers
- interpret decimal numbers in the context of measures such as money and length
- add and subtract numbers with up to two places of decimals
- use the value of digits to explain the steps in calculation methods or problems

Make sure that:

children regularly use partially-numbered and blank number lines as part of daily oral and mental work

you reinforce decimal place value using visual models such as bead strings or base 10 apparatus and using contexts such as length and money

children have regular opportunities to describe their methods of solving calculations and problems involving decimals to each other and you. Encourage them to use accurate place value language to describe each step

children describe the value of decimal digits using the language of both decimals and fractions, for example, 'nought point nought two' and 'two hundredths'

children do not describe the effect of multiplying by 10 as 'adding a nought'

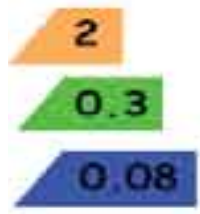
you regularly include decimal number facts and counting in daily oral and mental work

you use models such as place value charts or grids to teach children about place value. Watch for children who believe that the column to the left of thousands represents millions. Stress that the value of each column gets ten times bigger as you move to the left

Understanding and using place value

Teaching and learning resources

Place value cards




Place value chart spreadsheet


1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009

Place value chart spreadsheet

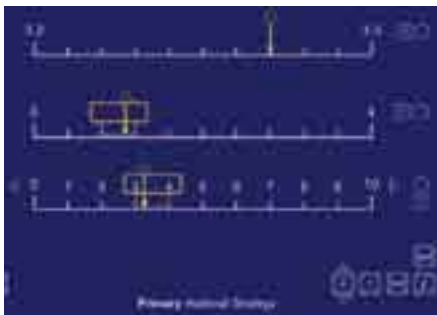
Bead strings



Moving digits ITP



Decimal number line ITP



Intervention materials

Springboard 6

•Lesson 1

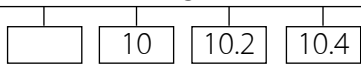
Overcoming barriers in mathematics - level 3 to 4

- Can I read, write, partition and order decimal numbers?
- Can I use my tables to work out \times/ \div facts with decimals?
- Can I multiply and divide by 10 and 100 and 1000?

Wave 3

- +/- Year 6 booklets 1, 2 and 3
- \times/\div Year 6 booklet 2

Assessment checklist

I can statements	Assessment examples
I understand what each digit in a large/decimal number is worth and can explain how I know	What is the value of the 3 in the number 235 107? Suggest a number between 3.4 and 3.5 How many tenths could be made altogether from 8.4?
I can find a missing number in a decimal sequence	Find the missing number on this number line: 
I can explain how I order a set of decimal numbers	Put the correct symbol, < or >, in each box: 3.03 <input type="text"/> 3.3 0.37 <input type="text"/> 0.327 Order these numbers: 0.27 0.207 0.027 2.07 2.7
I can round the numbers in a calculation to find an approximate answer	What is 3 528 rounded to the nearest ten/hundred/thousand? I buy 6 books that cost £4.99 each. How much will I pay to the nearest pound? How do you know?
I can describe each step I do to complete a decimal calculation or problem	Explain how you know which two numbers total 0.12: 0.1 0.5 0.05 0.7 0.07 0.2 Explain how you find the missing number: $11.07 + \square = 18.45$
I can multiply/divide a number by 10/100/1000 and explain how I know the answer	How many hundreds are there in two thousand four hundred? Write what the four missing digits could be: $\square\square\square \div 10 = 3\square$
I can use number facts to give some linked decimal facts	$7 \times 8 = 56$ What is 0.07×8 ? Give some other decimal facts that are linked to this multiplication fact. What number multiplied by 8 equals 4.8?

Calculating with money and time

Level 4 standards to be achieved:

Interpret and use times written in analogue and digital notation, 12 and 24 hour clock

Read and interpret timetables and calendars to solve problems

Understand the relationships between units of time and use this to solve problems

Solve time problems that involve calculation, for example find the difference between two times

Solve multi-step problems that involve money, using a calculator where appropriate

For children to attain level 4, teach them how to:

- read and write the same time using alternative notations, for example 12/24 hour clock, digital
- locate required information in a time-table or a calendar
- convert between units of time, for example recognise that 140 secs = 2 mins 20 secs
- add times and find time differences, converting between units of time as necessary
- draw 'time lines' to support accurate calculation involving time
- break money problems into steps and identify each calculation required
- record working for each stage of multi-step problems involving money
- use calculators to solve money problems, recording each calculation that is done
- interpret calculator displays in the context of money recognising, for example, that 4.2 in pounds represents £4.20 or that 10.6666667 represents 10 and two thirds

Make sure that:

you include counting up in time intervals in your mental and oral work

children appreciate that the units of time are not decimal, so they need to take care with time calculations

you exploit opportunities to solve real problems, for example getting the children to calculate the pricing and schedule for a school visit

children use real data. Collect price lists and timetables such as from the local sports centre

children consider whether calculations can be done mentally before deciding on a written method. Counting on, for example, is often an effective method for working out change

children have regular opportunities to describe their methods for solving problems involving time/money to each other and you

children link money notation to decimal place value, understanding, for example, that the 2 in £4.27 has value of 2 tenths of a pound or 20p

children are familiar with common shopping terminology including: *Best buy*, *3 for the price of 2* and *price per 100g*

Calculating with money and time

Teaching and learning resources

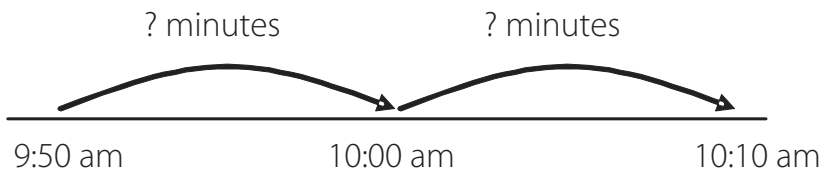
24 hours What time is it one hour after midday?	1:00 pm What is quarter past 3 in digital time?	3:15 What time is it 10 minutes before quarter past 4?
5 past 4 What is half past 1 in digital time?	1:30 What is 2:45 in analogue time?	Quarter to 3 How many hours are there in a day?

Follow-me cards

Geared demonstration clocks

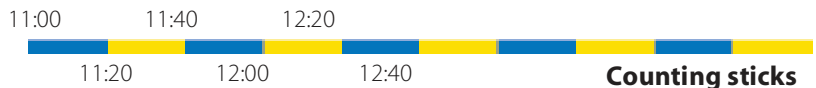


Tell the time ITP



Time lines

Calculators



Counting sticks

PIZZAS		
	Small	Medium
Ham	£4.20	£5.50
Salami	£4.40	£5.75
Mushroom	£4.50	£6.00
Cheese	£3.80	£4.95
Tuna	£4.25	£5.40
	Extra tomato	50p
	Extra cheese	60p

Price lists and catalogues

Intervention materials

Springboard 6

•Lessons 5, 6, 12, 13, 23, 24, 25

Overcoming barriers in mathematics - level 3 to 4

- Can I interpret the numbers on a calculator display?
- Can I use a calculator to solve problems with more than one step?

Assessment checklist

I can statements	Assessment examples
<i>I can solve problems that involve time, recording my calculation methods clearly</i>	These are the start and finish times on a video cassette recorder. START 14:45 FINISH 17:25 For how long was the video recording?
<i>I can read a timetable/calendar in order to solve a problem</i>	Simon's birthday is on August 20th. In 1998 he had a party on the Sunday after his birthday. What was the date of his party? Tina's birthday is on September 9th. On what day of the week was her birthday in 1998?
<i>I can solve problems that involve money, recording my working for each step</i>	A packet of crisps costs 32p. Josh buys 3 packets. How much change does he get from £1? Ryan buys sunglasses for £4.69 and a sun hat. How much change does he get from £10?
<i>I can use a calculator effectively to solve money problems</i>	How much change will I get from £10 if I buy groceries costing £2.29, £1.42, 76p and £3.83? A pencil costs 48p. Jake works out the cost of five pencils by entering 48 x 5 into a calculator. The calculator display says 2.4 What answer should Jake give?



Reading scales

Level 4 standards to be achieved:

Read and interpret scales presented in different contexts and orientations. Scales cover various ranges, not always starting at 0, and may or may not include units

Read values from scales that have numbered and unnumbered intervals

Use scales to measure length, width and capacity accurately to answer questions and solve problems

Interpret scales on graphs and charts and use readings to answer questions and solve problems

For children to attain level 4, teach them how to:

- work out the size of each interval, count along the scale to check and label marks
- recognise how the value of each interval changes when the start/end labels change
- identify points between two marks and estimate their value
- read values from scales that are horizontal, vertical or circular as on a clock face
- interpret scales on graphs and charts, annotating the scale to support accuracy
- use measuring equipment accurately in the context of length, weight and capacity
- use their readings to calculate differences and solve problems involving scales
- use the relationship between units of measure to convert units where appropriate

Make sure that:

scales are displayed and accessible so that children can handle and use them regularly

you regularly use scales as part of your daily oral and mental work

children are taught to identify where a scale starts and ends and how to use division to find what the interval size represents

children are expected to annotate scales and write in missing values on unnumbered marks

children understand the link between number lines and scales. Count up and down scales, including using alternative units, for example:
0g, 100g, 200g...
0kg, 0.1 kg, 0.2 kg...

children have a strategy to check estimated values by counting up and down the intervals

children use scales in different orientations. Show them how scales can be rotated if this is helpful

children have regular opportunities to solve problems that involve reading scales. Encourage them to explain their methods orally and in writing

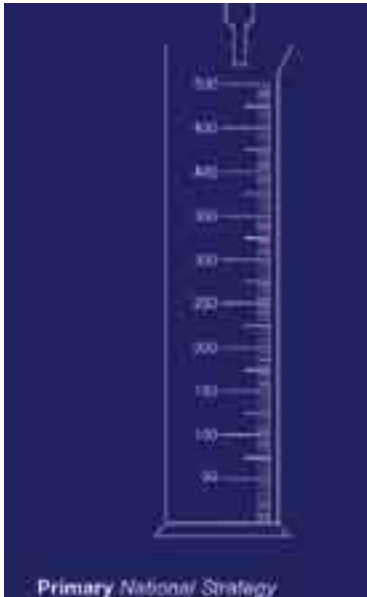
Reading scales

Teaching and learning resources

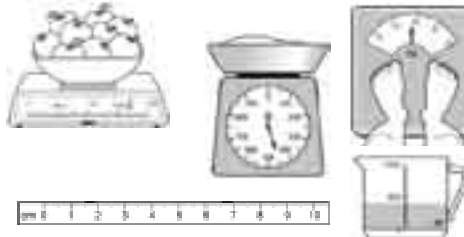
Number lines



Counting stick with further options spreadsheet



Measuring cylinder ITP



Measuring equipment

Measuring scales ITP



Intervention materials

Springboard 6

- Lessons 15 & 16

Overcoming barriers in mathematics - level 3 to 4

- Can I read and use a scale on a thermometer, protractor, ruler, weighing scale and measuring cylinder?
- Can I convert between units?

Assessment checklist

I can statements	Assessment examples
<i>I can work out the size of each interval on a scale and check using counting</i>	<p>What is one interval worth on this scale? How do you know? This scale shows the weight of Fred's cat. How much does Fred's cat weigh?</p>
<i>I can work out the value of any marked point on a scale</i>	<p>Which jug contains more water, A or B? How much more does it contain? Explain how you worked it out.</p>
<i>I can estimate the value of a point that falls between two marks on a scale</i>	<p>Sophie poured some water out of a litre jug. Look how much is left in the jug. Estimate how many millilitres of water are left.</p>
<i>I can read a scale to solve problems involving length, weight and capacity</i>	<p>Use this one apple to work out approximately how many apples you would get in a 1kg bag.</p>

Interpreting tables and graphs

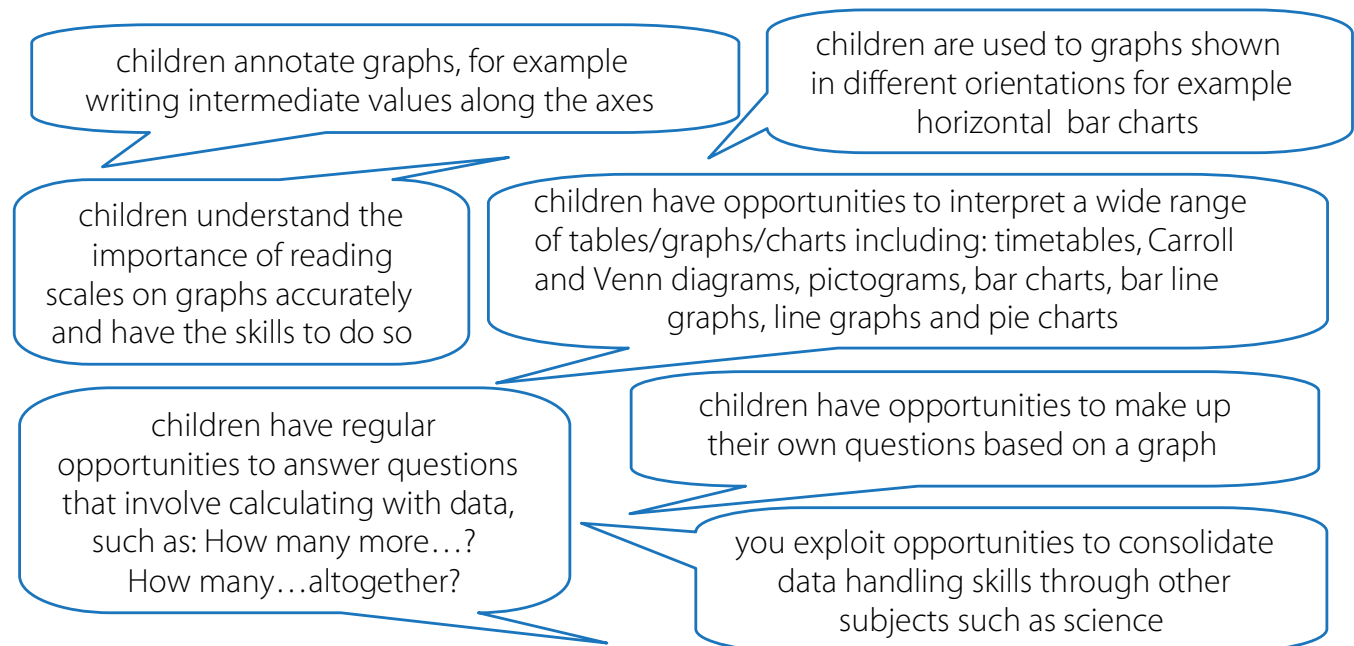
Level 4 standards to be achieved:

Read and interpret a wide range of graphs and charts, including line graphs
Identify and find relevant information in a table/graph
Work out what each interval on a scaled axis is worth and read data accurately
Decide what calculations need to be done in order to use data to answer a question or solve a problem
Explain orally and in writing how data was used to solve a problem

For children to attain level 4, teach them how to:

- recognise different types of graphs/charts and understand their key features
- use all of the relevant information, including titles, headings and labels, in order to understand what information a graph is presenting
- work out the value of each interval on the scale, annotating the axis for accuracy
- estimate the value of points between two marks on the scale of an axis
- locate the required information to answer a question
- draw lines onto line graphs to read required information accurately
- identify the calculation(s) that need to be carried out using the data collected in order to answer questions/problems
- describe and record the steps involved in solving a problem using data

Make sure that:



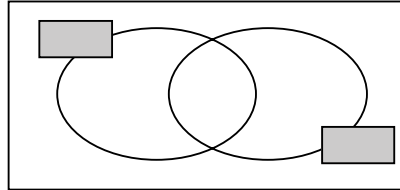
Interpreting tables and graphs

Teaching and learning resources



Carroll diagram spreadsheet

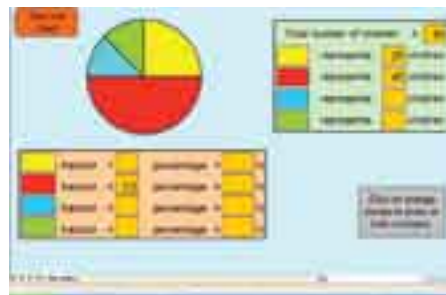
Carroll and Venn diagrams



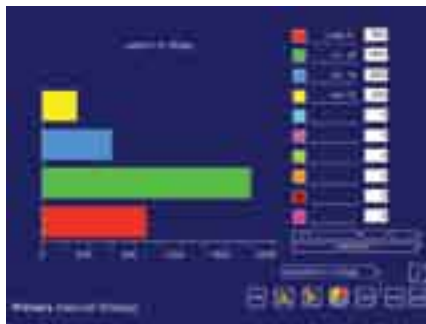
Line graph ITP



Number lines to practise reading scales



Pie chart spreadsheet



Data handling ITP

Intervention materials

Springboard 6

•Lessons 18 & 30

Overcoming barriers in mathematics - level 3 to 4

- Can I sort and interpret data in Venn/Carroll diagrams?
- Can I explain what information a graph or chart is showing?
- Can I draw a conclusion from a graph or chart?
- Can I interpret what the sectors in a pie chart represent?

Assessment checklist

I can statements	Assessment examples																							
<i>I can find the information in a table/graph to answer a question</i>	<p>The table shows the cost of coach tickets to different cities. What is the total cost for a return journey to York for one adult and two children?</p> <table border="1"> <thead> <tr> <th></th> <th></th> <th>Hull</th> <th>York</th> <th>Leeds</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Adult</td> <td>single</td> <td>£12.50</td> <td>£15.60</td> <td>£10.25</td> </tr> <tr> <td>return</td> <td>£23.75</td> <td>£28.50</td> <td>£19.30</td> </tr> <tr> <td rowspan="2">Child</td> <td>single</td> <td>£8.50</td> <td>£10.80</td> <td>£8.25</td> </tr> <tr> <td>return</td> <td>£14.90</td> <td>£17.90</td> <td>£14.75</td> </tr> </tbody> </table>			Hull	York	Leeds	Adult	single	£12.50	£15.60	£10.25	return	£23.75	£28.50	£19.30	Child	single	£8.50	£10.80	£8.25	return	£14.90	£17.90	£14.75
		Hull	York	Leeds																				
Adult	single	£12.50	£15.60	£10.25																				
	return	£23.75	£28.50	£19.30																				
Child	single	£8.50	£10.80	£8.25																				
	return	£14.90	£17.90	£14.75																				
<i>I can read data accurately from a graph</i>	<p>Here are some children's long jump results. Sue jumped 212 cm. Draw Sue's long jump result on the graph. Use the graph to estimate how much further Sam jumped than Jan.</p>																							
<i>I can work out what calculations I need to do to answer questions using data</i>																								

Naming and transforming shapes

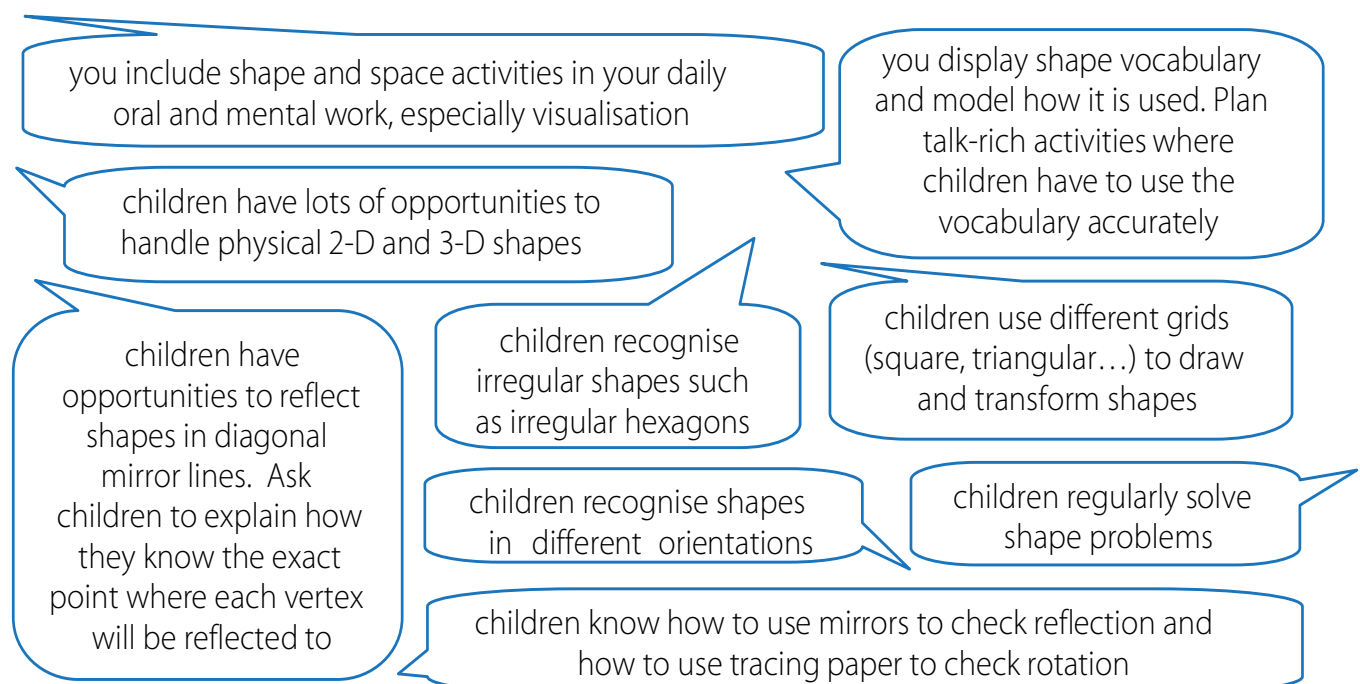
Level 4 standards to be achieved:

Name, describe and classify 2-D and 3-D shapes using knowledge of their properties
Draw and construct 2-D and 3-D shapes accurately using knowledge of their properties
Reflect 2-D shapes accurately in any mirror line
Rotate a 2-D shape through 90° or 180° about a vertex or its centre
Translate 2-D shapes in a given direction

For children to attain level 4, teach them how to:

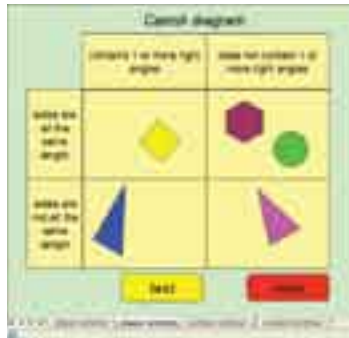
- describe 2-D shapes using a wide range of properties including number of sides, equal sides, number of right angles, equal angles and number of lines of symmetry
- describe 3-D shapes using number and shape of faces, number of edges and vertices, equal edges
- recognise *parallel* and *perpendicular* lines, including in 2-D shapes
- classify a set of shapes using various criteria and record using diagrams including Venn diagrams, Carroll diagrams and tree diagrams
- draw 2-D shapes accurately using different grids or using rulers and protractors
- build 3-D shapes using construction kits or by drawing nets
- visualise the result of reflecting, rotating or translating a 2-D shape and test their ideas
- recognise that the length of each side and the size of each angle do not change when a shape is reflected, rotated or translated

Make sure that:



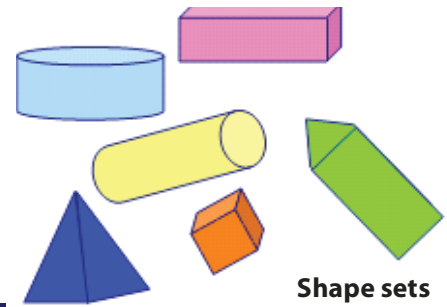
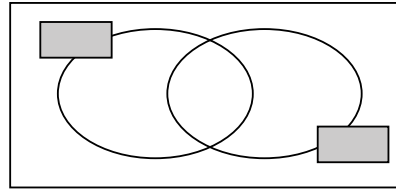
Naming and transforming shapes

Teaching and learning resources



Carroll diagram spreadsheet

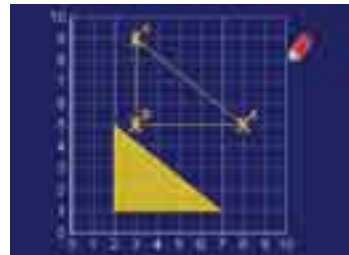
Carroll and Venn diagrams



Shape sets



Polygon ITP



Co-ordinates ITP



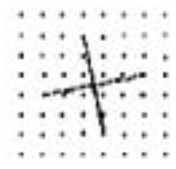
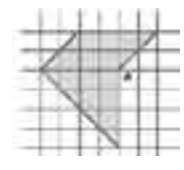
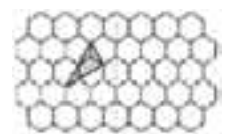


Isometric grid ITP

Intervention materials

Springboard 6

•Lesson 11

Assessment checklist

I can statements	Assessment examples
<i>I can name shapes and describe their properties using mathematical language</i>	Imagine a triangular prism. How many faces does it have? This diagram shows the diagonals of a quadrilateral. What is its name? 
<i>I can draw or make shapes accurately</i>	On squared paper, draw a pentagon that has three right angles. Draw two straight lines from point A to divide the shaded shape into a square and two triangles. 
<i>I can explain how I have sorted a set of shapes</i>	Select two 'sorting' cards, such as: <i>has exactly two equal sides</i> and <i>has exactly two parallel sides</i> . Can you show me a polygon that fits both of these criteria? What do you look for?
<i>I can reflect a shape accurately in a given mirror line</i>	This grid is made of hexagons. Draw the reflection of the shaded shape on the grid. 
<i>I can rotate a shape about a vertex or its centre</i>	This pattern is made by turning a shape clockwise through 90° each time. Draw the two missing triangles on the last shape. 
<i>I can describe where a shape will be after translation</i>	This triangle is translated two squares to the left and one square down. Give the co-ordinates of its vertices in the new position. 

Where can I find the resources?

ICT resources

ITPs (Interactive Teaching Programs)

These programs can be downloaded from the primary framework website: <http://www.standards.dfes.gov.uk/primaryframework/library/Mathematics/ICTResources/itps>

Guidance on how to use the programs can be downloaded at the top of this webpage.

Spreadsheets

These programs can be downloaded from the primary framework website: <http://www.standards.dfes.gov.uk/primaryframework/library/Mathematics/ICTResources/spreadsheets>

Many of the spreadsheets have accompanying guidance documents.

Intervention materials

Springboard 6

These materials provide lessons to support intervention for those children who are working just below level 4 in Year 6. They can be downloaded from the primary framework website:

<http://www.standards.dfes.gov.uk/primaryframework/library/Mathematics/intervention/spring6>

Overcoming barriers in mathematics – helping children move from level 3 to level 4

This is a booklet with a CD-based set of materials designed to help teachers move children from level 3 into level 4 by the end of Key Stage 2. The materials can be ordered online on the teachernet publications website:

<http://publications.teachernet.gov.uk/default.aspx?PageFunction=productdetails&PageMode=publications&ProductId=DCSF-00695-2007&>

Supporting children with gaps in their mathematical understanding – Wave 3

The Wave 3 mathematics pack aims to help teachers identify and address gaps in learning for children who are working significantly below age-appropriate levels. It can be downloaded from the primary framework website:

<http://www.standards.dfes.gov.uk/primaryframework/library/Mathematics/inclusion>



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