Year 6 Block B - Securing number facts, understanding shape
Unit 2

Learning overview

In this learning overview are suggested assessment opportunities linked to the assessment focuses within the Assessing Pupils' Progress guidelines. As you plan your teaching for this unit, draw on these suggestions and on alternative methods to help you to gather evidence of attainment, or to identify barriers to progress, that will inform your planning to meet the needs of particular groups of children. When you make a periodic assessment of children's learning, this accumulating evidence will help you to determine the level at which they are working. To gather evidence related to the three Ma1 assessment focuses (problem solving, reasoning and communicating), it is important to give children space and time to develop their own approaches and strategies throughout the mathematics curriculum, as well as through the application of skills across the curriculum.

In this unit the illustrated assessment focuses are:

- **Ma1, Reasoning**
- **Ma2, Operations, relationships between them**
- **Ma3, Properties of shapes**

Children use decimal notation in a variety of contexts, such as 3.5 ÷ 7 or ν ÷ 5 = 0.4, explaining methods and checking that answers are correct. They apply knowledge of multiplication facts to **derive related facts**; for example, they state the three other known facts when given 23.4 × 2.5 = 58.5, or work out that since 8 × 7 = 56 then 0.8 × 0.7 = 0.56.

Children multiply and divide decimal numbers to solve word problems such as: 'How many cups holding 0.2 litres can be filled from three 1.5 litre bottles of lemonade?' They approximate first to check that their answers are sensible: 'I estimated that the answer must lie between 21 and 24 so it cannot possibly be 225.' They **communicate** their **reasoning** and rectify the error. They use symbols to write a formula for the number of glasses *g* in *y* bottles, if one bottle holds 5 glasses.

Children use their calculators to solve problems involving patterns and relationships. They use rounding to find an approximate answer as a check. They record the calculations involved using symbols for unknown numbers where appropriate. They look at an answer in its original context and check that it is reasonable. For example, they use a calculator to find the missing numbers and digits in calculations such as 568.1 ÷ ν = 24.7, or 14ν × ν6 = 10 868, and explain their reasoning.

Assessment focus: *Ma2, Operations, relationships between them*

Look for evidence of children understanding that, for addition and multiplication, order does not matter (i.e. the operations are commutative). Look for evidence of children using division as the inverse of multiplication. Look out for children who use trial and improvement to find the missing number in a sentence such as 442 ÷ □ = 26, and those children who recognise that 442 ÷ 26 will provide the answer because, for example:

26 × □ = 442 and □ × 26 = 442 (multiplication is commutative)

442 ÷ □ = 26 and 442 ÷ 26 = □ (division is the inverse of multiplication)

Children find the **squares of multiples of 10** and answer questions such as:

What is 40 squared?

What number when multiplied by itself gives 900?

They find prime factors of two-digit numbers; for example, they find that the prime factors of 28 are 7 × 2 × 2. They collaborate to find the number between 0 and 50 with the greatest number of prime factors. They solve problems such as:

Find two prime numbers with a total of 30.

Which prime numbers lie between 20 and 30?

Is 96 a prime number? How do you know?

Explain why 87 is not a prime number.

Children explore patterns, sequences and relationships and explain their method and reasoning, using diagrams where helpful. For example:

What are the missing numbers in this sequence? 10, 25, n, n, 70, n

Write a formula for the nth term of the sequence 3, 6, 9, 12, 15, ...

A line of counters is set out in a pattern: 5 white, 4 blue, 5 white, 4 blue, ...

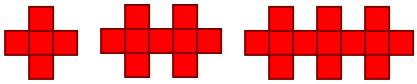
What colour is the 65th counter?

Make a pattern with blue and yellow beads so that the 57th bead is yellow.

Children **hypothesise** and **investigate systematically**. They explore the patterns made by multiples of 2, 3, 4, 5, … on a 100-square. They predict the numbers whose multiples will form vertical or diagonal lines, or checkerboard patterns. They change the layout to a nine-column grid, and hypothesise about the patterns that the multiples will make. They **predict** a number whose multiples will be in vertical lines, or what multiples will form diagonal lines. They continue and extend the investigation, asking 'What if...?' questions and making **general statements**.

Assessment focus: *Ma1, Reasoning*

As children work with sequences of numbers, including those that arise as they grow shapes, look for the way in which children express a general rule. Look for children who record in words how to work out numbers that will occur later in the sequence. Look out for those children who begin to use algebra to express the general rule for a sequence.



'It goes up in fours.'

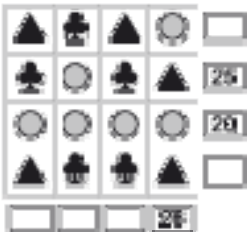
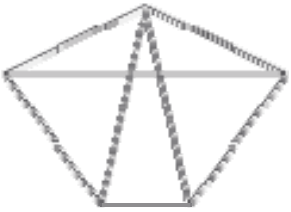
'The 20th shape will have 5 + 19 × 4 squares in it.'

'The pattern in the number of squares goes:
4 + 1, 2 × 4 + 1, 3 × 4 + 1
so the *n*th shape will have *n* × 4 + 1 squares.'

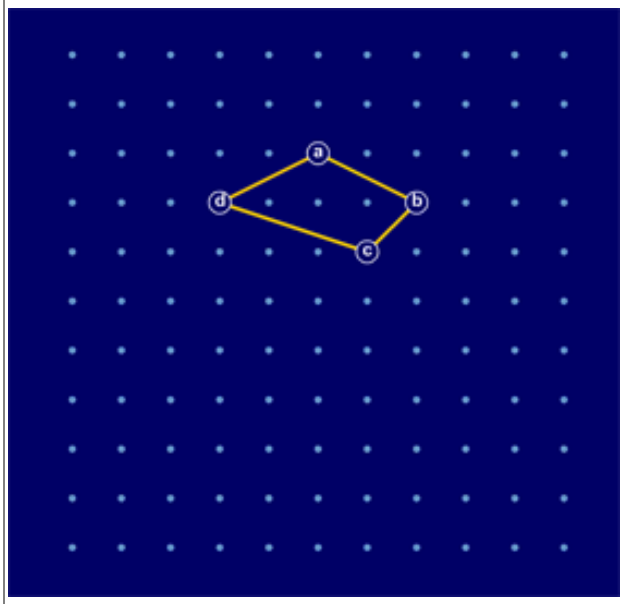
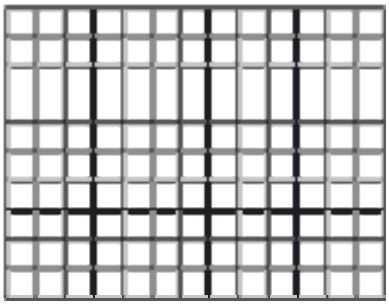
Children investigate the line symmetry of polygons. They find assorted shapes with two lines of symmetry. They **measure** the angle between the lines of symmetry of shapes with 2, 3, 4, 5, … lines of symmetry. They describe what they have found out, commenting on patterns and relationships. They investigate the properties of quadrilaterals, measuring the angles or using paper-folding to establish which angles in a quadrilateral are equal. They investigate the diagonals of quadrilaterals to discover which of them are perpendicular and which intersect at their mid-points.

Assessment focus: *Ma3, Properties of shapes*

Look for evidence of children's knowledge of the properties of 2-D and 3-D shapes. Look for the range of criteria that children use to sort shapes, for example numbers of pairs of parallel sides. Look for children's increasing knowledge of the diagonals of quadrilaterals, for example, which quadrilaterals have diagonals that intersect at their mid-points, that meet at right angles (i.e. are perpendicular to each other) or that are equal. Look for children who know a complete turn is 360° and begin to use the sum of angles at a point, for example to reason about how shapes might fit together at a point.

Objectives *Children's learning outcomes are emphasised*	**Assessment for learning**
• Represent and interpret sequences, patterns and relationships involving numbers and shapes; suggest and test hypotheses; construct and use simple expressions and formulae in words then symbols (e.g. the cost of c pens at 15 pence each is 15c pence) *I can describe and explain sequences, patterns and relationships* *I can suggest hypotheses and test them* *I can write and use simple expressions in words and formulae*	▽ and ○ each stand for a different number. ▽ = 34 ▽ + ▽ = ○ + ○ + ▽ What is the value of ○? Now make up another problem like this. How could you use symbols to help you to solve this problem? Each shape stands for a number. The numbers shown are the totals of the line of four numbers in the row or column. Find the remaining totals. 
• Tabulate systematically the information in a problem or puzzle; identify and record the steps or calculations needed to solve it, using symbols where appropriate; interpret solutions in the original context and check their accuracy *I can use a table to help me solve a problem* *I can identify and record what I need to do to solve the problem, checking my answer makes sense and is accurate*	How could you organise the information to help you? How many triangles can you see in this diagram?  How can you make sure that you have counted them all?
• Use knowledge of multiplication facts to derive quickly squares of numbers to 12 × 12 and the corresponding squares of multiples of 10 *I can say the squares of numbers to 12 × 12 and work out the squares of multiples of 10*	Estimate the area of a field 38 m wide by 42 m long. How could you use 12 × 12 = 144 to work out 12 × 13? What number when multiplied by itself gives the answer 400? 17 multiplied by itself gives a three-digit answer: 17 × 17 = 289. What is the smallest two-digit number that can be multiplied by itself to give a four-digit answer?

• Use knowledge of place value and multiplication facts to 10 × 10 to derive related multiplication and division facts involving decimals (e.g. 0.8 × 7, 4.8 ÷ 6) *I can use tables facts to work out related facts with decimal numbers*	You know that 72 ÷ 8 = 9. What other division and multiplication facts can you derive from this? Multiply 9 by 0.7. What number multiplied by 6 equals 4.2?
• Recognise that prime numbers have only two factors and identify prime numbers less than 100; find the prime factors of two-digit numbers *I can work out which numbers less than 100 are prime*	How many distinct prime factors has 16? What about 17? Can you give me a number with prime factors 3 and 5? What about 2 and 3? How could you use prime factors to help you to multiply by 18? Which numbers between 20 and 30 have the greatest number of factors? Which have the least? Which have an odd/even number of factors?
• Use approximations, inverse operations and tests of divisibility to estimate and check results *I can estimate and check the result of a calculation*	How do you know that 234 is divisible by 3? Should the answer be a multiple of 4? How could you check? I think that my answer to 3768 × 3 is wrong. How can I tell? What would be the best approximation for 9.8 × 31.8?
• Use a calculator to solve problems involving multi-step calculations *I can use a calculator to solve problems with more than one step*	Which three prime numbers multiply to make 231? What is the missing number in these calculations? 21.8 × □ = 294.3 (14.7 + □) × 4.8 = 164.64

• Describe, identify and visualise parallel and perpendicular edges or faces; use these properties to classify 2-D shapes and 3-D solids *I can use the properties of parallel and perpendicular to describe and classify 2-D shapes and 3-D solids*	What is the same about a rhombus and a kite? What is different? Name a shape that has one pair of parallel sides, but no pairs of perpendicular sides. What do you notice about the opposite sides of this parallelogram? Is it true for all parallelograms? What about this trapezium? By moving just one point, can you change this shape into a kite? A rhombus? A non-isosceles trapezium?  Which quadrilaterals have diagonals that intersect at right angles?
• Make and draw shapes with increasing accuracy and apply knowledge of their properties *I can make and draw shapes accurately*	Give me instructions to get me to draw a rhombus using my ruler and a protractor. On the grid below, use a ruler to draw a pentagon that has three right angles. 
• Use a variety of ways to criticise constructively and respond to criticism *I can respond to the suggestions of others, explaining how they have or haven't changed my opinion*	Does your rule for the relationship between edges, faces and vertices work for cylinders and cones? Are you certain that multiplying 6 by a number makes 6 larger? Have you tried multiplying 6 by 0.5?