Assessing with Numicon
A proven approach at a time of change
Help all your pupils achieve in mathematics

Introduction
Assessment opportunities
Tracking progress
Gathering evidence
SATs practice
Your next steps

Embodies the aims of the 2014 National Curriculum
Numicon is a multi-sensory approach to understanding mathematics, built on a proven pedagogy that raises achievement across all ability levels.

With clear opportunities to assess the understanding of each child, *Numicon* enables you to confidently approach the increased demands of the 2014 National Curriculum.

Your pupils’ progress can be carefully tracked and evidenced, so you can ensure every child achieves end-of-year expectations and is ready for secondary school.

---

**You can assess with Numicon by:**

- Referring to the formative **assessment opportunities** provided in each Activity Group
- Tracking a child’s progress over time using regular **Milestones** available on *Numicon Online*, via Oxford Owl
- Using the **Explorer Progress Books** to capture each pupil’s ability to apply their knowledge and understanding
- Using **Test Practice Books** to prepare for Year 2 and Year 6 tests, identifying any areas for further practice
Using symbols and letters for variables and unknowns

Assessment opportunities
Look and listen for children who:
- Use the words and terms for use in conversation effectively
- Can identify the term-to-term rule in a linear sequence, e.g. in the sequence 38, 43, 48, 53, the term-to-term rule is ‘add 5’.
- Describe a rule for finding the general term of a linear sequence and express this with an algebraic expression, e.g. \( 5n + 33 \) in Activity 1.
- Can explain algebraically how ‘think of a number’ problems work.
- Can explain the general relationship between an ‘input’ (x) and an ‘output’ (y) for a particular function (e.g. for a function described by \( y = 3x \), y is always three times x, x is always one third of y).
- Can identify a missing input or output for a given function, represented by \( x \) and \( y \) respectively, e.g. \( y = 3x \).
- Use tests of divisibility to sort numbers.
- Describe the commutative properties of adding and multiplying in general terms, including algebraically, e.g. \( a + b = b + a \) and \( ab = ba \).
- Can explain why adding and multiplying are commutative, while subtracting and dividing are not.

**Educational context**
In this activity group, children continue to explore how to describe general situations and rules mathematically. They are supported to express patterns numerically, e.g. as sequences and functions, and to identify and describe relationships between numbers, e.g. as formulae. This links to children’s work with formulae in the Geometry, Measurement and Statistics Teaching Resource Handbook, Measurement 3. This leads into describing general rules which apply in any instance of the same type of situation, and, building on their work in Pattern and Algebra 3, to expressing these rules concisely using algebra, with letters standing for unknown values and variables. For example, in Activity 4 they work out how to describe the commutative property of adding two numbers – the property that the order in which the numbers are added doesn’t matter – more succinctly, as \( a + b = b + a \).

Connecting with the work of Pattern and Algebra 2, we see:

- The assessment opportunities outline what to look and listen for in whole class, group, and individual work.
- Activity Groups are matched to pages within Explorer Progress Books to help you assess each child individually.
With National Curriculum assessment levels no longer supported, Milestones are a robust, reliable resource for ensuring every child meets end of year expectations, giving you evidence of a child’s understanding along the way.

Milestones:

- Mark key concepts and skills to be grasped by each child at regular points throughout the year
- Give you confidence in tracking a child’s progress over time
- Are integrated into the medium-term planning materials

**Milestone 4**

- Use short and long multiplying and dividing to solve problems, including those involving decimals
- Add and subtract fractions and mixed numbers
- Multiply simple pairs of proper fractions
- Divide proper fractions by whole numbers
- Express missing number problems algebraically
- Enumerate possibilities of combinations of two unknowns
Explorer Progress Books make evidence-gathering simple and effective. They show a pupil’s depth of comprehension and give insight into their thought process, making it easy for you to assess their development over time.

**Function Machines**

Leo made a function machine that gave the following input and output:

5 → ? → 20

What are the different functions that might have been in the machine?

What if it was a two-step function? What could those functions have been?
Test Practice Questions are specifically designed to ensure children are as well-equipped as possible to succeed in the Year 2 and Year 6 National Curriculum tests.

Name _______________________________ Date ______/ ______/ ______

Number and place value 2

6 Look at this number.

765,483.102

What is the value of the 6 in this number? ________

Write the digit that is in the thousandths column. ________

7 Amy chooses a prime number. She multiplies it by 10 and rounds it to the nearest hundred.

Her answer is 200.

Write all the possible prime numbers Amy could have chosen. ________

8 Write the missing number in the sequence.

654,845 654,945 ________ 655,145 655,245 ________

Test Practice Questions:

- Provide full coverage of all curriculum areas for Key Stage 1 and Key Stage 2 SATs
- Offer distinct sections for Arithmetic and Reasoning to prepare children for the specific demands of each paper
- Are arranged by topic to easily identify areas for additional practice
Your next steps…

• Contact your local Educational Consultant to discover more about *Numicon*: +44 (0) 1536 452610

• Visit [www.oxfordprimary.co.uk](http://www.oxfordprimary.co.uk) for more information about *Numicon* and the latest developments on assessment

• Download free editable milestone grids for individuals and groups from Oxford Owl: [www.oxfordowl.co.uk/for-school](http://www.oxfordowl.co.uk/for-school)

---

**How to get in touch:**

**Web:** [www.oxfordprimary.co.uk](http://www.oxfordprimary.co.uk)

**Email:** primary.enquiries@oup.com

**Tel:** +44 (0) 1536 452610

**Fax:** +44 (0) 1865 313472
Using symbols and letters for variables and unknowns

**Educational context**

In this activity group, children continue to explore how to describe general situations and rules mathematically. They are supported to express patterns numerically, e.g. as sequences and functions, and to identify and describe relationships between numbers, e.g. as formulae. This links to children’s work with formulae in the Geometry, Measurement and Statistics 6 Teaching Resource Handbook, Measurement 3. This leads into describing general rules which apply in any instance of the same type of situation, and, building on their work in Pattern and Algebra 3, to expressing these rules concisely using algebra, with letters standing for unknown values and variables. For example, in Activity 6 they work out how to describe the commutative property of adding two numbers – the property that the order in which the numbers are added doesn’t matter – more succinctly, as \( a + b = b + a \). Connecting with the work of Pattern and Algebra 2, we explore general rules of divisibility for help in finding factors.

**Learning opportunities**

- To describe a numerical pattern or general relationship in words and algebraically, as a formula.
- To recall and use tests of divisibility by 2, 3, 5, 9 and 10.
- To describe and explain the commutative property of adding and multiplying.

**Words and terms for use in conversation**

algebra, algebraic notation, symbol, generalize, reasoning, logic, systematic, show, prove, pattern, sequence, constant difference, term, first term, term-to-term rule, predict, relationship, general rule, general term, \( n \)th term, unknown, variable, value, expression, equation, equivalent, inverse, function, function machine, input, output, divisibility, test of divisibility, factor, multiple, prime, composite, commutative property, associative property, number trio, part–whole relationship

**Assessment opportunities**

Look and listen for children who:

- Use the words and terms for use in conversation effectively.
- Can identify the term-to-term rule in a linear sequence, e.g. in the sequence 38, 43, 48, 53, … the term-to-term rule is ‘add 5’.
- Describe a rule for finding the general term of a linear sequence and express this with an algebraic expression, e.g. \( 5n + 33 \) in Activity 1.
- Can explain algebraically how ‘think of a number’ problems work.
- Can explain the general relationship between an ‘input’ \((x)\) and an ‘output’ \((y)\) for a particular function e.g. for a function described by \( y = 3x \), \( y \) is always three times \( x \), \( x \) is always one third of \( y \).
- Can identify a missing input or output for a given function machine, and a missing instruction, e.g. ‘\( \times 3 \)’ for a given set of inputs and outputs.
- Can write an equation to show the general relationship between input and output for a given function, represented as \( x \) and \( y \) respectively, e.g. \( y = 3x \).
- Use tests of divisibility to sort numbers.
- Describe the commutative properties of adding and of multiplying in general terms, including algebraically, e.g. \( a + b = b + a \), \( ab = ba \).
- Can explain why adding and multiplying are commutative, while subtracting and dividing are not.

**Explorer Progress Book 6b, pp. 20–23**

After completing work on this activity group, give small focus groups of children their Explorer Progress Books and ask them to work through the challenges on the pages. As children complete the pages, assess what progress they are making with the central ideas from the activity group. Refer to the assessment opportunities for assistance. Children will also have the opportunity to complete their Learning Log (pp. 22-23) where they can reflect on the mathematics they have done so far.

**Explore More Copymaster 4: Secret Function Machine**

After completing work on Activity 4, give children Explore More Copymaster 4: Secret Function Machine to take home.
Function Machines

Leo made a function machine that gave the following input and output:

\[5 \rightarrow ? \rightarrow 20\]

What are the different functions that might have been in the machine?

What if it was a two-step function? What could those functions have been?

What if Leo’s machine also did:

\[6 \rightarrow ? \rightarrow 22\]

\[7 \rightarrow ? \rightarrow 24\]

What do you think the function was? Was it a one-step or a two-step function?

Mini-Marathon

Freya is training for a mini-marathon. She wants to calculate how many calories to eat to replace all the energy she will use as she runs. She knows that someone her age uses 10 calories per hour for every kilogram of their weight, running at a steady pace.

Freya weighs 36 kg and she runs for half an hour every day after school. How many calories will she use in a week?

Freya’s friends would like to do the run too, and want to know how to make this calculation for each of their weights. How could Freya write her calculation for them, if \(A = \) calories burned per hour and \(B = \) weight in kg?
Number and place value 2

6 Look at this number.

765,483.102

What is the value of the 6 in this number?

Write the digit that is in the thousandths column.

7 Amy chooses a prime number. She multiplies it by 10 and rounds it to the nearest hundred.

Her answer is 200.

Write all the possible prime numbers Amy could have chosen.

8 Write the missing number in the sequence.

654,845 654,945 655,145 655,245

9 Here is a sorting diagram.

Place the numbers below in the correct box on the diagram.
9 12 36 4 13

<table>
<thead>
<tr>
<th>Factor of 48</th>
<th>Not a factor of 48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square number</td>
<td>9</td>
</tr>
<tr>
<td>Not a square number</td>
<td></td>
</tr>
</tbody>
</table>

10 Here are some digit cards. Use each card once to complete the statements below.

6 2 0 8 7 3

956,384 > 6,384
56,843 < 56,5
2,635,2 > 2,635,296