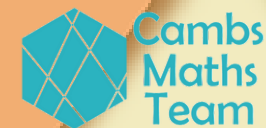


**YEAR
SIX**



Diagnostic Assessment Toolkit

Assessing Prior Learning in Mathematics

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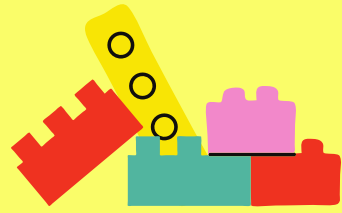
How to Carry Out a Diagnostic Assessment

The diagnostic assessment activities in this booklet have been designed with small groups in mind, however they can be used on a 1:1 basis or with a larger group with some adaptation. There is a printable notes page at the back of this document that you can use to record your observations and next steps.



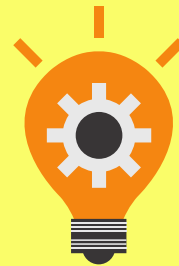
1. Primer

Begin by talking about the children's prior learning. Find out what the children remember, including any key words they know. If you can, look at examples of their previous work.



2. Build it, draw it...

Move on to a task involving models and images. Ask the children to find, make or draw an example of the key concept or word. Use practical equipment, if it's relevant to do so.



3. Reasoning and comparing

Asking children to explain their thinking can provide an insight into their conceptual understanding and use of key words. Comparison activities provide a good opportunity for this.



4. Inform planning


Use what you have found out to inform your planning. Some children may require support before the topic begins, whilst others may need to spend longer on one or more small steps.




Supporting resources

An accompanying PowerPoint presentation has been created to be used alongside this toolkit so that you can present the questions to the children on a screen, if you wish.


Features of the Diagnostic Toolkit




Prior learning and key vocabulary: At the start of each section there is a brief description of what the children will have learnt about previously and how this links to the new content that will be taught this year. It's recommended that teachers use this alongside the statutory and non-statutory guidance in the national curriculum. For each topic there is also list of key words. Although the children may not know all of these words yet, they should be aware of most of the words in this list. If not, it is recommended that you revisit or teach these words before introducing new words.



Common misconceptions: This list contains several common misconceptions and barriers to progress related to this topic. If a child has one of these misconceptions or barriers to progress, and they are not addressed, it is likely that they will have greater difficulty understanding the new concepts you are planning to teach. Therefore this section can help you to know what to look out for when carrying out the diagnostic activities. Most of the misconceptions in this toolkit link to previous learning from last year (or earlier), however some other misconceptions included in the list may arise during this topic if a child misunderstands the key concepts or procedures when they are introduced. Please be aware that this list is not exhaustive and doesn't include all of the possible misconceptions that could arise. If you think that a child demonstrates a misconception that is not on the list for your year group, it could be highlighted in the diagnostic toolkit for another year group - where it may be more commonly found.



Addressing misconceptions: This section provides advice for helping you to address some of the highlighted misconceptions and barriers to progress. This section can inform planning for whole class teaching, pre-teaching or interventions. If references have been made to methods or representations that you do not use in your school, such as bar models perhaps, please consider how you might adapt the suggested approach, representation or method that you use in your setting.



Diagnostic activities: These pages in the toolkit contain suggestions for activities and questions that you can use to find out about children's understanding of prior learning. The tasks have been designed to be used with small groups, but they could be adapted for larger groups of children or if you intend to use them on a 1:1 basis. Some of the questions require the use of diagrams or other images, examples of which have been provided in the accompanying PowerPoint presentation. In addition to the list of suggested activities, each page contains a picture of the questions and activities with annotations. The annotations are designed to support the adult leading the activity, including suggestions for things to look out for and possible adaptations. Read the section called *How to carry out a diagnostic assessment* before using these activities.

Year Six

Place Value and Number

Prior Learning

In Year 5, children further develop their understanding of numbers to at least one million, including rounding numbers; children also begin to interpret and use negative numbers in context. They are taught to apply their understanding of number and place value to a range of practical and number problems.



This Year

In Year 6, children will be taught to compare and order numbers to at least ten million and round numbers to any given degree of accuracy. They will continue to learn about negative numbers.

Key vocabulary: words for describing the value of digits, including: ones, tens, hundreds, thousands, ten thousands, hundred thousands, millions, ten millions, tenths, hundredths and thousandths. Comparison words, including: greater than ($>$), less than ($<$), equal to ($=$), most, least, fewer or fewest, first..., tenth..., last etc. Words and phrases for rounding, approximating and estimating, including: to the nearest, approximately equal to (\approx), exactly and equivalence. Words relating to the properties of numbers, including: multiple of, divisible by, factor, prime factor, positive, negative, integer, decimal, minus, prime, square number, cube number, complement.

Place Value and Number



Show me Show me where you would position these numbers on a number line: a) 2055 b) 72,480 and c) 271,210.  Can you round each number to the nearest 100 and to the nearest 1000?	Compare Order these positive and negative numbers from smallest to largest.  Find the difference between two numbers in this list.
What do you notice? Continue each sequence with the next three numbers. A) 950, 960, 970, 980, ... B) 4510, 4610, 4710, 4810, ... C) 65,005, 66,005, 67,005, 68,005, ... D) 903,000, 893,000, 793,000, 693,000, ... What do you notice about the digits as the numbers increase/decrease?	Multiple Choice What could the missing numbers be in this sequence: 20, __, 80, __ a) 50 and 110 b) 40 and 160 c) 40 and 60 or, d) something else?

Common Misconceptions

Some pupils may:

- Misunderstand what rounding is and how to round numbers accurately
- Not understand the value of 1 million and assume that millions come after thousands in a place value grid
- Have difficulty understanding and using negative numbers
- Assume that all number sequences increase or decrease by the same amount each time



Addressing Misconceptions

- Help children to understand rounding by explaining that rounding means making a number simpler whilst keeping it close to its original value. Demonstrate this with simple examples before moving on to examples with larger numbers.
- To better understand the size of 1 million, first children need to understand the size of 1000, 10,000 and 100,000. Children can then better comprehend that 1 million is ten times greater than 100,000, one hundred greater than 10,000 and one thousand times greater than 1000. Using base 10 equipment can help with this if the pupils are ready to comprehend that the one small cube represents the number 1000.
- Using a vertical number line can help pupils to better understand negative numbers in relation to the number zero, or 'below zero' – a term sometimes associated with very cold temperatures.
- Ensure children have experience of a variety of sequences, including sequences involving multiplication and division.

Diagnostic Activities

- **Show me** - Ask children to position numbers on a number line and round them to the nearest 100 or 1000.
- **Compare** - Look at a selection of positive and negative numbers, then ask children to order them from smallest to largest and talk about the difference between them.
- **What do you notice?** - Ask the children what they notice when they try counting on or back in 10s, 100s and 1000s. Which digits stay the same and which ones change?
- **Multiple Choice** - What could the missing numbers be in this sequence: 2, ____, 8, ____?
a) 5 and 11; b) 4 and 16; c) 4 and 6; d) something else.

Listen to children's explanations and justifications when rounding and comparing numbers. Do they understand the value of each digit?

Place Value and Number	
<p>Show me</p> <p>Show me where you would position these numbers on a number line: a) 2055 b) 72,480 and c) 271,210.</p>  <p>Can you round each number to the nearest 100 and to the nearest 1000?</p>	<p>Compare</p> <p>Order these positive and negative numbers from smallest to largest.</p>  <p>Find the difference between two numbers in this list.</p>
<p>What do you notice?</p> <p>Continue each sequence with the next three numbers.</p> <p>A) 950, 960, 970, 980, ...</p> <p>B) 4510, 4410, 4710, 4810, ...</p> <p>C) 65,005, 66,005, 67,005, 68,005, ...</p> <p>D) 903,000, 803,000, 703,000, 603,000, ...</p> <p>What do you notice about the digits as the numbers increase/decrease?</p>	<p>Multiple Choice</p> <p>What could the missing numbers be in this sequence:</p> <p>20, ____, 80, ____</p> <p>a) 50 and 110 b) 40 and 160 c) 40 and 60 or, d) something else?</p>

Ask children to talk about the properties of each number and any similarities and differences they notice.

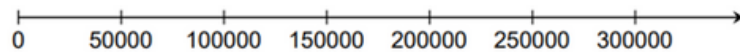
Where possible, use representations or practical materials to support discussions around numbers. These can help to highlight the properties of numbers and aid comparison. For larger numbers, it may be helpful to use place value counters.

Place Value and Number



Show me

Show me where you would position these numbers on a number line: a) 2055 b) 72,480 and c) 271,210.



Can you round each number to the nearest 100 and to the nearest 1000?

Compare

Order these positive and negative numbers from smallest to largest.



Find the difference between two numbers in this list.

What do you notice?

Continue each sequence with the next three numbers.

- A) 950, 960, 970, 980, ... , ... , ...
- B) 4510, 4610, 4710, 4810, ... , ... , ...
- C) 65,005, 66,005, 67,005, 68,005, ... , ... , ...
- D) 903,000, 803,000, 703,000, 603,000, ... , ... , ...

What do you notice about the digits as the numbers increase/decrease?

Multiple Choice

What could the missing numbers be in this sequence:

20, __, 80, __

- a) 50 and 110 b) 40 and 160 c) 40 and 60
- or, d) something else?



Acknowledgements

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Credit: Some images of manipulative resources were created using mathsbot.com - created by Jonathan Hall (@studymaths).

To find out more about the Cambridgeshire Maths Team and to keep up to date with new resources, like our page on Facebook - www.facebook.com/cambsmathsteam