Diagnostic Mathematics Tasks

Year 4 summer term to Year 5 spring term

A set of half-termly mathematics tasks supporting diagnostic assessment to find gaps in pupil learning and inform teaching and planning.

Sample Booklet

Contents

Continuing Professional Development Standard

National Centre for Excellence in the Teaching of Mathematics

Introduction

This resource has been designed to support Year 4 and Year 5 teachers in using diagnostic assessment to inform teaching that addresses significant gaps in pupil learning. The booklet contains a series of mathematical questions/activities which enable teachers to progressively explore pupils' knowledge, conceptual understanding, and skills from the end of the summer term in Year 4 to the spring term in Year 5. The tasks cover a range of mathematical domains including Number & Place Value, Calculation and Fractions.

How to use

The activities are intended to be used by class teachers or teaching assistants (under the direction of a class teacher), for short focussed one-to-one pupil conferencing with pupils whose gaps in knowledge and conceptual understanding need a more forensic approach than might be possible in a whole class lesson.
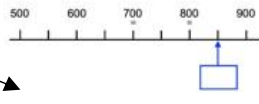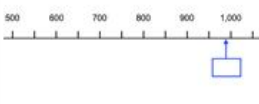
Each task has:

- some suggested questions focussed on both assessment of the pupils' subject knowledge and their reasoning to inform next steps in teaching
- the purpose for using the task with National Curriculum links
- common misconceptions (from Spring term Y5)
- suggestions for next steps in learning.

It is recommended that as one-to-one conferencing is intensive, that sessions last no more than 20 minutes. During the session, more than one task could be used to support discussion.

Understanding the layout of the Tasks

Colour coded for ease of reference for different terms

Key task/mathematical activity for the pupil

Purpose of task linked to National Curriculum including non-statutory guidance

Suggested next step

Year 4 Summer Term: Key Task 2	Year 4 Summer Term: Key Questions	Year 4 Summer Term: Purpose
Number and place value: Write the correct number in the box. 500 600 700 800 900 **Number and place value:** Write the correct number in the box. 500 600 700 800 900 1,000	• What can you tell me about this number line? • What is the smallest number shown? • What is the largest number shown? • What number would go halfway on the number line? How do you know? • What value do each of the divisions on the number line represent? (goes up in 50s) • What is the missing number in the box? How could you prove it? • What can you tell me about this number line? • What value are the jumps increasing by each time on the number line? (goes up in 50s) • What is your estimate for the missing number in the box? How could you prove it? (accept answers between 985 and 995) • Why can't the missing number be 960? How do you know? Where would 960 go on the number line?	• To compare and order numbers up to 1000 [Year 3 NC] • To count from 0 in steps of 50 [Year 3 NC] • Using a variety of representations, including those related to measure, pupils continue to count in ones, tens and hundreds, so they become fluent in the order and place value of numbers to 1000. [Year 3 NC – non-statutory guidance] • Ability to reason and explain mathematical thinking.
		Next Step • Ask pupils to order and compare a variety of 3-digit numbers and position them on a number line.

Key questions for class teacher/teaching assistant

Year 5 Spring Term: Key Task 4	Year 5 Spring Term: Key Questions	Year 5 Spring Term: Key Misconceptions
Problem solving: Multiplication and division Asim and Mike both buy 12 cans of lemonade. Asim buys 3 packs of 4 cans at £1.20 for each pack. Mike buys 2 packs of 6 cans at £1.70 for each pack. Mike says to Asim, 'You paid 50p more than me.' Is Mike correct? Circle Yes or No. Explain how you know.	• Can you read the problem to me? • What do you already know that can help you with this problem? • Can you use the bar model or a number line to picture the problem? • Can you identify the steps needed to the solve the problem? How do you know? • How could you estimate the answer? • Which would be the most appropriate method to perform this calculation – mental, jottings or a formal written method? Justify your choice. • How could you prove your answer is correct? NB: Pupils do not need to work on whole SATs papers in Year 4/5, but key questions (which are appropriately pitched) have been identified.	Pupils might: • struggle to understand and visualise the problem • find it difficult to identify the steps needed to solve the problem • multiply the cost of each pack by the number of cans rather than the number of packs • have a tendency to jump into formal methods of calculation before looking at the size of the amounts given which can result in errors due to the context of money (decimal notation) [NC Y4] • record money with both the use of the £ sign and p sign [NC Y2]
		Next Steps • Provide children with some real-life examples involving buying items from a supermarket or shop. Compare the price difference per unit when purchasing items in smaller as against larger packs.

Common misconceptions from Spring term linked to National Curriculum

Suggested next steps to help address misconceptions

What to look for

In addition to the key tasks, pupils should also have access to a range of concrete resources. For example, place value counters, place value charts, Dienes rods, Numicon, Cuisenaire, tens frames, hundred squares and digit cards. For some tasks squared paper may also be useful.

Teachers and teaching assistants should take this opportunity to observe how well individual pupils:

- explain their reasoning using appropriate vocabulary
- model the mathematics using a combination of the available concrete resources and informal jottings (pictures, number lines and part -part whole diagrams such as bar models)
- use formal notation, for example equations to show the operation(s) needed
- make and explain decisions about when to solve calculations mentally or with formal methods
- can identify the steps needed to solve the problem in the most straightforward way.

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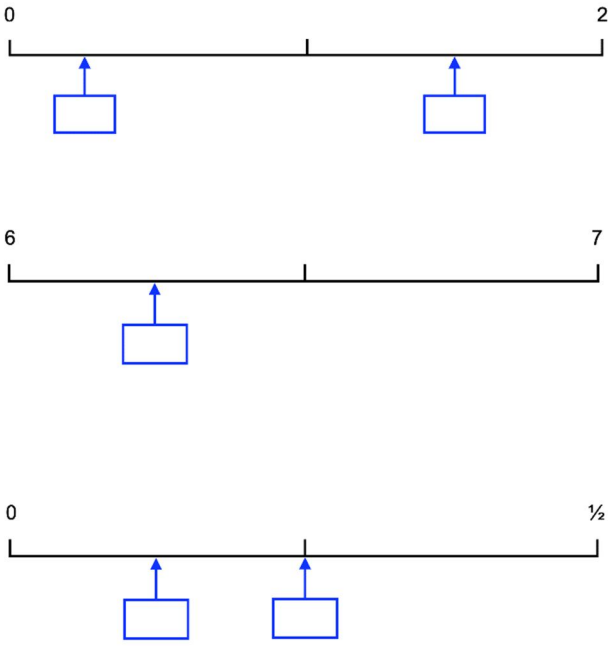| Year 4 Summer Term: Key Task 4	Year 4 Summer Term: Key Questions	Year 4 Summer Term: Purpose
Addition and subtraction Find the missing numbers in this table.	• What do you have to do? • What strategies will you use to calculate what number is 100 more than each of the given numbers? • What strategies will you use to calculate what number is 1000 more than each of the given numbers? • How could you work out the missing numbers in the last two rows of the table when you have not been given the first numbers? • Which was the easiest to find? Which was the hardest to find?	• To recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, ones). *[Year 4 NC]* • To order and compare numbers beyond 1000. *[Year 4 NC]* • Using a variety of representations, including measures, pupils become fluent in the order and place value of numbers beyond 1000. *[Year 4 NC – non statutory guidance]* • Ability to reason and explain mathematical thinking.

Number	100 more	1,000 more
542	642	1,542
106		
986		
	451	
		4000

$$\boxed{} + 100 = 673$$

$$205 - \boxed{} = 195$$

$$729 = 700 + \boxed{} + 9$$

	Next Step	
	Can pupils use their knowledge of number and place value to solve these three missing number equations?	

Year 5 Autumn Term 1: Key Task 2	Year 5 Autumn Term 1: Key Questions	Year 5 Autumn Term 1: Purpose
Fractions 	For each number line • What number range does this number show? • Could the missing number be a whole number? How do you know? • Say something about the fraction you think goes in the empty box using this sentence "The fraction in the empty box is greater than ___ but less than ___." Explain your thinking. • What could you record on the number line to help you? (*the half-way position and then possibly the quarter and three-quarter positions*) • You have told me the fraction you think goes in the box. Are you sure? • Can you say how you decided on that fraction? • How could you convince someone that your answer is a reasonable one?	• To recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators. *[Year 3 NC]* • Pupils begin to understand unit and non-unit fractions as numbers on the number line, and deduce relations between them, such as size and equivalence. They should go beyond the [0, 1] interval including relating this to measures. *[Year 3 NC – non statutory guidance]* • Recognise and write decimal equivalents to $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}$. *[Year 4 NC]*
		Next Step
		Can pupils suggest equivalent fractions and decimals for their choices, eg $1\frac{1}{2} = \frac{3}{2} = 1.5$?