North Yorkshire County Council

National Curriculum for Mathematics 2014

Exemplification of the Programmes of Study for

YEAR 2

This document brings together the exemplification materials that are available on the NCETM website. Where there were gaps on the website, we have included other examples from past SATs papers and NCETM Mastery documents. We have also included appropriate links to Nrich problems, games and investigations. Click on in each section to access the weblinks which relate to the programmes of study statements.

fluency, reasoning and problem-solving

Contents

Purpose of study

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims

The national curriculum for mathematics aims to ensure that all pupils:

become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language

can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

The School Curriculum

The programmes of study for mathematics are set out year-by-year for key stages 1 & 2. Schools are, however, only required to teach the relevant programme of study by the end of the key stage. Within each key stage, schools therefore have the flexibility to introduce content earlier or later than set out in the programme of study.

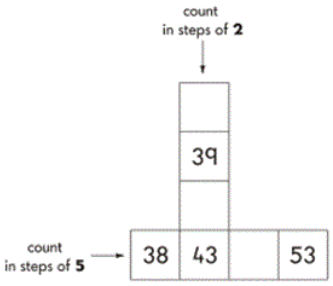
YEAR 2 – Number and Place Value

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement.

count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward

Use their knowledge of counting on from or back to zero in steps of 2, 3, 5 and 10 to answer multiplication and division questions such as 7 × 2 and 40 ÷ 5. They understand that one way to work out 40 ÷ 5, for example, is to find out how many fives make 40. They know that this can be done by counting forwards in fives from zero or backwards in fives from 40.

Write the missing numbers in each of these patterns.



recognise the place value of each digit in a two-digit number (tens, ones)

Look at these numbers.

37 12 45 60 72 27

Which of these numbers is the largest?

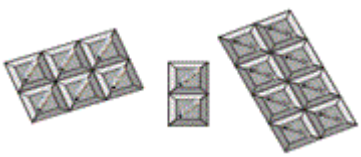
Which of these numbers is between 10 and 20?

What is the value of …? (point to digits in the list above)

identify, represent and estimate numbers using different representations, including the number line

Children should be able to represent numbers using equipment such as bundles of ten and single art-straws, 10p and 1p coins and number lines.

Look at the squares of chocolate



There are 16 squares

Tick (✓) the sum that matches the picture:

6+2+8=16 5+2+9=16

5+6+5=16 6+6+4=16

8+3+5=16

compare and order numbers from 0 up to 100; use <, > and = signs

Here are two signs

Use these signs to make these correct

52 ☐ 17

18 ☐ 91

50 ☐ 34

Children should be able to order a set of two-digit numbers, such as 52, 25, 5, 22, 2, 55 and explain their decisions. They understand and use the < and > symbols; they write a two-digit number to make the statement 56 > ☐ true.

read and write numbers to at least 100 in numerals and in words

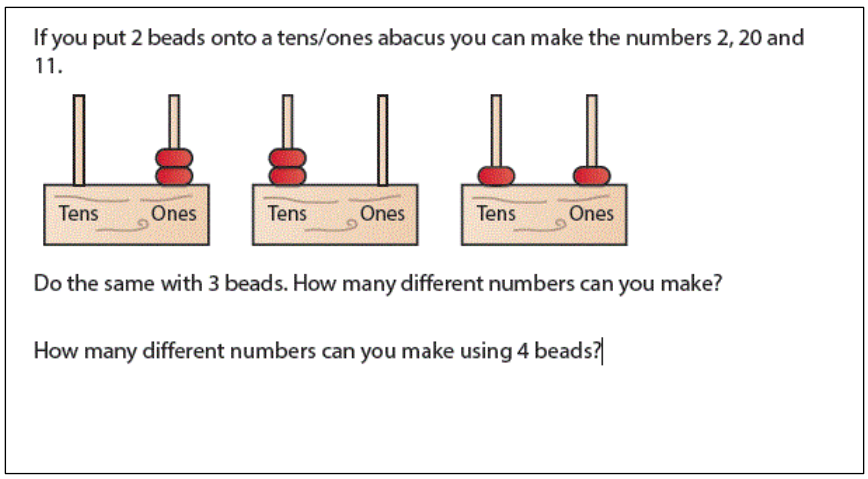
Children should be able to answer questions, such as:

- What numbers can you make using two of these digits: 3, 6, 0?
- Write down each number you make. Read those numbers to me. Can you write the largest of the numbers in words?

use place value and number facts to solve problems

Children should be able to answer questions such as:

- Can you find an even number more than 30 and less than 50, how many can you find?



YEAR 2 – Addition and Subtraction

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement.

solve problems with addition and subtraction:

- **using concrete objects and pictorial representations, including those involving numbers, quantities and measures**
- **applying their increasing knowledge of mental and written methods**

add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

- **a two-digit number and ones**
- **a two-digit number and tens**
- **two two-digit numbers**
- **adding three one-digit numbers**

Use partitioning, counting strategies and knowledge of number bonds to add or subtract a one-digit number or a multiple of 10 to any two-digit number. To work out 86 – 50, for example, they might partition and calculate:

86 – 50 = 80 + 6 – 50 = 80 – 50 + 6 = 30 + 6 = 36

Similarly, to find the total number of people on a bus with 14 people on the top deck and 8 below, they might use:

14 + 8 = 14 + 6 + 2 = 20 + 2 = 22

Children add or subtract two-digit numbers using practical and informal methods and their knowledge of the relationships between operations. For example, they count back along a number line to find 64 – 25 or count up from 67 to find the answer to 94 – 67. They represent such calculations as number sentences. They calculate the value of an unknown in a number sentence such as ☐ ÷ 2 = 6 or 85 – ☐ = 29. They recognise, for example, that to answer 85 – ☐ = 29 they could use the related addition 29 + ☐ = 85

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Extend their knowledge and use of number facts, and use partitioning and number bonds to add and subtract numbers mentally to answer questions such as

60 – ☐ = 52 or 35 = 20 + ☐.

They make jottings where appropriate to support their thinking. Answer problems such as:

Look at this number sentence: ☐ + ☐ = 20. What could the two missing numbers be? What else? Can you tell me all the pairs of numbers that make 20?

show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot

Understand that addition can be done in any order and use this to solve an addition by rearranging the numbers to simplify the operation. They need to understand that two numbers can be taken away from each other but that the answers will not be the same.

recognise and use the inverse relationship between addition and subtraction and use this to check calculations and missing number problems

Check their addition and subtraction with a calculation that uses the inverse operation.

Answer questions, such as:

- Look at this number sentence: 74 – 13 = 61

  Write three more number sentences using these numbers. How do you know, without calculating, that they are correct?

- What addition facts can you use to help you calculate these?

  12 – 5, 19 – 8

  Explain how the addition facts helped you.

- I think of a number, I subtract 19 and the answer is 30.

  What is my number? How do you know?

YEAR 2 – Multiplication and Division

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

The children should be able to:

Recognise a multiple of 2, 5 or 10 and use their knowledge of multiplication facts to find corresponding division facts. They can say which numbers are odd and which are even.

e.g. 2 x 5 = 10, show me three more number facts using these numbers.

Is 34 an odd number? How do you know?

calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (x), division (÷) and =

Children should be able to:

Find missing numbers or symbols in a calculation:

4 x __ = 20 __ ÷ 10 = 3

Anna has 3 boxes of cakes. Each box contains 5 cakes. How many cakes does she have altogether? Show how you worked this out.

show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot

Children should be able to:

Use their knowledge of triangles of numbers to show related number facts.

e.g. If 6 x 2 = 12 then 2 x 6 = 12 and 12 ÷ 6 = 2.

solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Children should be able to:

Use various methods and apparatus to help them solve word problems such as:

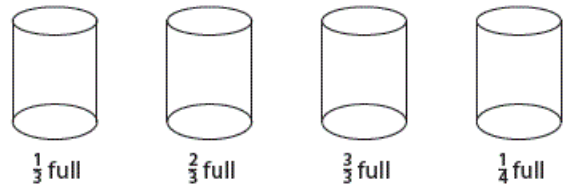
There are 10 lollies in a bag. Charlie needs 30 lollies for his party. How many bags does he need to buy? Show how you worked this out.

YEAR 2 - Fractions

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

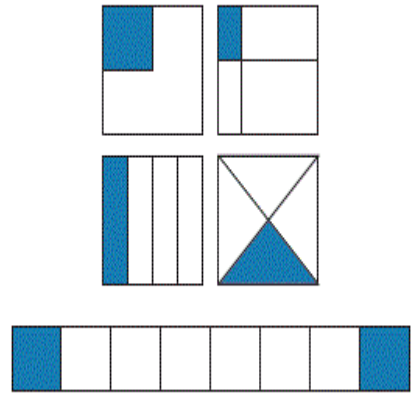
recognise, find, name and write fractions ⅓,¼ ,²⁄₄ and ¾ of a length, shape, set of objects or quantity

Shade the cylinders.



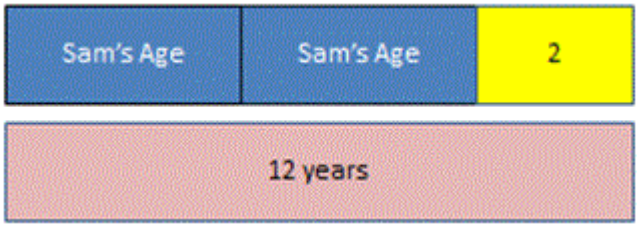
This may first be carried out as a practical activity.

Which of these diagrams have $\frac{1}{4}$ of the whole shaded?



Explain your reasoning.

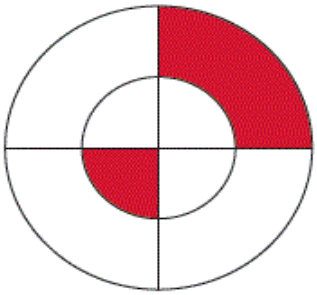
Using bar models to represent and unpick a fraction word problem



Harrison and Sam were talking and Harrison said that if he doubled Sam's age and added 2 he would get 12

What fraction is the red part of the whole circle?

Explain your reasoning.



write simple fractions for example, ½ of 6 = 3 and recognise the equivalence of ¼ and ½

Would a chocolate lover rather have ½ or ²⁄₄ of this bar of chocolate?

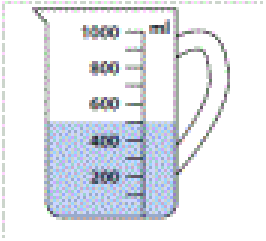
Explain your answer.

YEAR 2 - Measurement

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

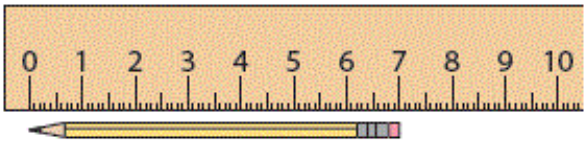
choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

- Suggest sensible units you might use to measure: the height of your table; how much water is in a cup; the weight of my reading book; how long it takes me to wash my hands.
- Choose a piece of equipment to help you measure: the weight of your shoe; how long the classroom is; how long this lesson lasts; how much water a cup holds.
- How long is this line? Now draw a line 2 cm longer than this one.



How much water is in this measuring jug?

How long is the pencil?



The pencil is _____ cm long.

- Find an object in the classroom that you think is about 10 cm long.

  About how heavy do you think your pencil case is?

- If I programme my floor turtle to go forward three metres is there enough room in the classroom? How could you measure to find out?

compare and order lengths, mass, volume/capacity and record the results using >, < , =

- Megan and Jack are growing beans. Megan's plant is 25 cm tall. Jack's is 38 cm tall. Whose plant is the taller? By how much? Can you compare them using > or < ?

recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value;

find different combinations of coins that equal the same amounts of money

Holly has these coins.

Harry has the same amount of money but has six coins.

What are they? Is there only one possible answer?

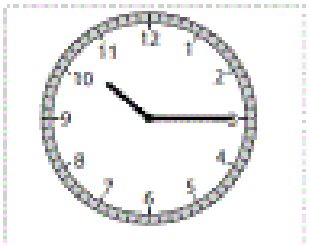
solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

Jess has saved 62p. She spends 15p. How much money does she have left?

She pays with a 50p piece. How much change does she get?

compare and sequence intervals of time

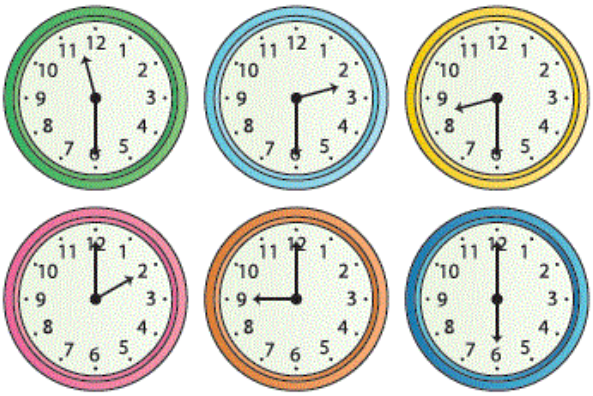
tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.



What time does this clock show?

Draw a clock showing the time five minutes later.

Show your school day on clock faces: when do you leave home, have breaks, go back home, etc.?



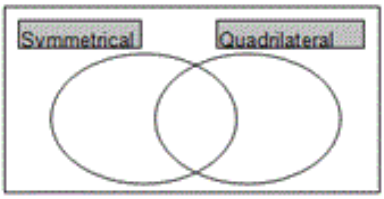
- Which of these clocks shows a time between 5 and 7 o'clock?

Know the number of minutes in an hour and the number of hours in a day

YEAR 2 – Geometry: Properties of Shapes

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

identify and describe the properties of 2-D shapes, including the number of sides and symmetry in a vertical line

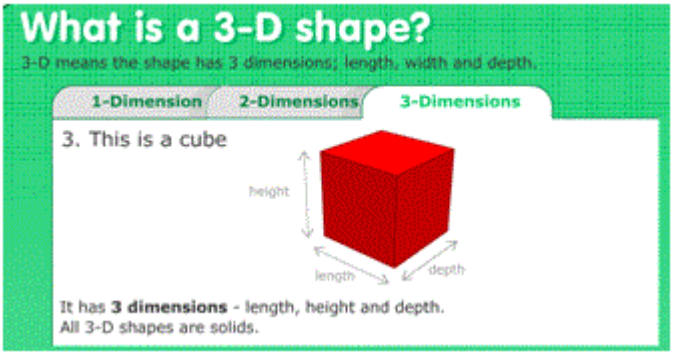
I can sort shapes describing how I have classified them	Place the shapes below in the correct place in the Venn diagram. 	
I can identify whether shapes are symmetrical	Make one shape of your own to add to each section of the diagram.	

identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces

Write the missing numbers in the 2 empty boxes.

	number of square faces	number of triangular faces	number of circular faces
cylinder	0	0	
cube		0	0
pyramid	1	4	0

identify 2-D shapes on the surface of 3-D shapes, for example a circle on a cylinder and a triangle on a pyramid



compare and sort common 2-D and 3-D shapes and everyday objects.

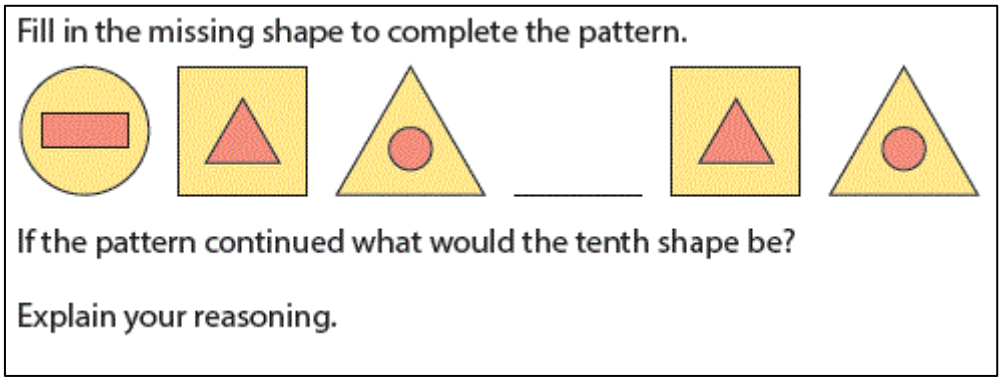
Children can sort two sets of 2D and 3D shapes in 2 or more different ways using different criteria each time. For example, they might choose ‘dimensions’ or ‘right angled’

YEAR 2 – Geometry: Position and Direction

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

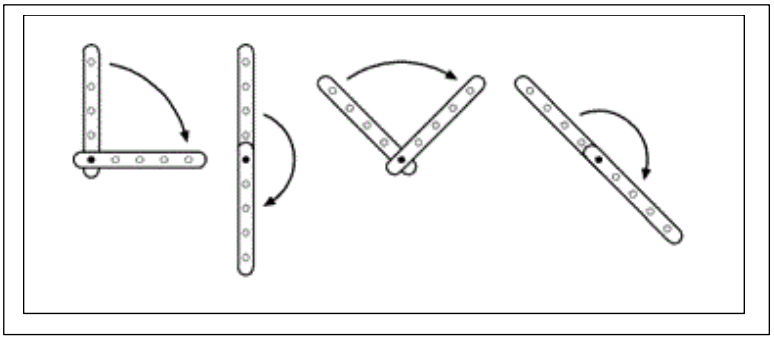
order and arrange combinations of mathematical objects in patterns

Describe the patterns in sequences and predict what comes next in the sequence and continue the pattern.



use mathematical vocabulary to describe position, direction and movement including distinguishing between rotation as a turn and in terms of right angles for quarter, half and three- quarter turns (clockwise and anti-clockwise), and movement in a straight line

Recognise whole, half and quarter turns. They describe turns and give and follow instructions to turn. For example, they give instructions to a friend to follow a route around the playground. They make and draw half and quarter turns from the same starting point using, for example, two geostrips.

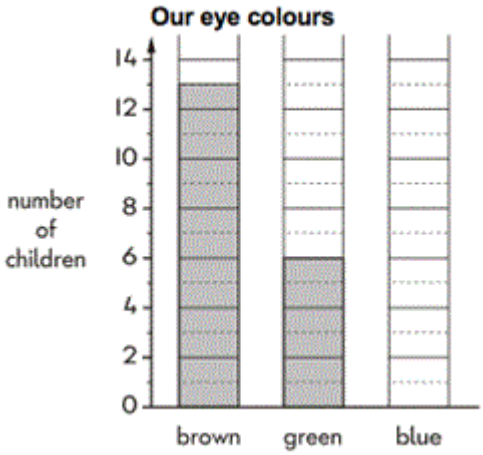


YEAR 2 - Statistics

Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

interpret and construct simple pictograms, tally charts, block diagrams and simple tables

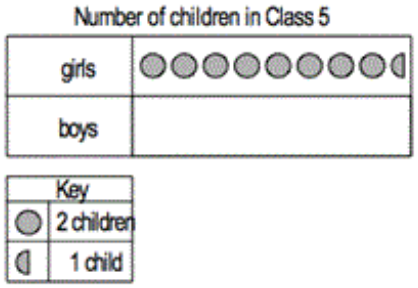
- Class 2 make a graph



5 children have blue eyes. Show this on a graph. More children have brown eyes than green eyes. How many more?

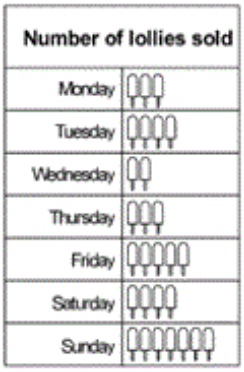
ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity

Look at this pictogram



There are 12 boys in class 5.
Show this on the pictogram

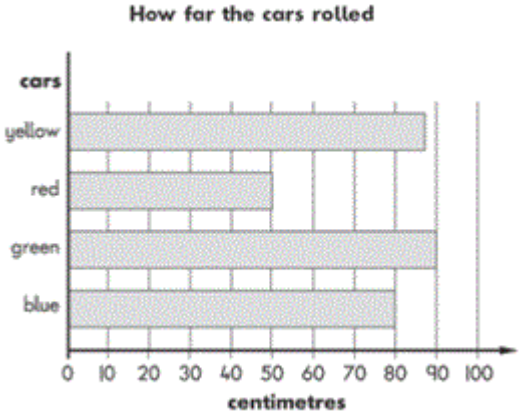
A shop sold 10 ice lollies on Wednesday



How many lollies were sold on Monday?
How many **more** lollies were sold on Tuesday than on Wednesday

ask and answer questions about totalling and comparing categorical data

- Some children rolled toy cars down a slope



How far did the blue car roll?

How much further did the green car roll than the red car?

additional questions:

  - Which car rolled the furthest?
  - Make up a question about the red car and the yellow car.

- Some children were asked to choose their favourite animal in the zoo. This table shows the results.

	Girls	Boys
zebra	9	3
lion	4	9
giraffe	7	4
monkey	8	7
elephant	6	5

How many more girls than boys chose the giraffes?

How many more boys chose lions than elephants?

Which animal was chosen by the greatest number of children

Acknowledgements –

This resource has been collated by the North Yorkshire Mathematics Team using the exemplification of the 2014 National Curriculum which is freely available from NCETM website. The resource has been adapted and revised where there were gaps; errors or further clarification seemed appropriate. We have also included weblinks to appropriate Nrich activities.

Here is a list of other resources you may find useful –

Archimedes Maths Hub/NYCC Mixed age planning:
http://carmelarchimedesmathshub.org.uk/mixed-age-planning/

NCETM Resource Tool:
https://www.ncetm.org.uk/resources/41211

NCETM Teaching for Mastery:
https://www.ncetm.org.uk/resources/46689

Nrich Curriculum Maps for KS1 and KS2:
http://nrich.maths.org/8935

STEM centre resources:
https://www.stem.org.uk/audience/primary#section--resources

Testbase:
http://www.testbase.co.uk/sec/index.php

White Rose Maths Hub Resources:
https://www.tes.com/teaching-resource/reasoning-and-problem-solving-questions-collection-ks1-and-ks2-11249968

http://www.trinitytsa.co.uk/maths-hub/free-learning-schemes/