National Curriculum for Mathematics 2014

Exemplification of the Programmes of Study for

YEAR 3

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.

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 3 – Number and Place Value

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

count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number

a) Count on from zero in steps of 2, 3, 4, 5, 8, 50, 100;

b) Give me the number 100 less than 756

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

For each of these numbers: 428, 205, 130, 25, 7, 909, tell me: How many hundreds? How many tens it has? How many ones?

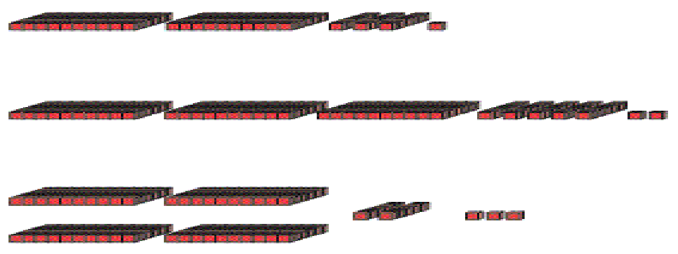
compare and order numbers up to 1000

Sort these numbers into ascending order: 95, 163, 8, 740, 25, 0, 400, 303

identify, represent and estimate numbers using different representations

Show me 642 on a number line, with Dienes apparatus, with place value cards etc.

What number is represented by each set –



What number is halfway between 65 and 95? How do you know?

read and write numbers up to 1000 in numerals and words

Read these numbers 428, 205, 130, 25, 7, 909

solve number problems and practical problems involving these ideas

a) Jack walks 645 metres to school. Suzy walks 100 metres less. How far does Suzy walk?

b) What is 1 more than 485? Than 569? Than 299?

c) What number needs to go into each triangle? Explain why?

642 = 600 + Δ + 2 967 = Δ + 60 + 7

YEAR 3 – Addition and Subtraction

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

add and subtract numbers mentally, including a three-digit number and ones, a three-digit number and tens, three-digit number and hundreds

add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction

estimate the answer to a calculation and use inverse operations to check answers

solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Examples below, addressing combinations of the requirements above, are taken from a variety of publications.

What number is 27 more than 145? What number is 19 more than 145? Explain how you worked out these two calculations.

Work out the missing digits:

3☐ + ☐2 = 85

Work out these subtraction calculations:

72 – 5	372 – 68	270 – 3
82 – 15	132 – 28	70 – 66

Did you use the same method for each calculation? If not, why not? Explain your methods to a friend and compare your methods with theirs.

Paul says 172 – 15 = 163. Write down an addition calculation that you could do to check this.

Paul's working is: 170 – 10 = 160 and 5 – 2 = 3 so 172 – 15 = 163

Can you identify where Paul has gone wrong?

Layla has 45p in her money bank and 28p in her purse. How much more money does she need to buy a comic that costs £1?

Ben and Jess are answering this problem:

Mary has collected 61 key rings, Jo has 45. How many more key rings does Mary have than Jo?

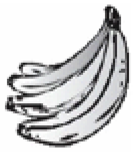
Ben does the calculation 61 + 45. Jess does the calculation 61 – 45. Who is correct? Explain how you know.

I pay for a coach trip costing £7.80 with a £10 note. How much change should I get?

A film starts at 6:30 pm and ends at 8:10 pm. How many minutes does the film last?

Josh buys one coconut and half a kilogram of bananas. What does he pay?

Coconut
78p



Bananas
£1.50 per kg

Show your working.

Explain your method to a friend.

Holly has these coins.

She wants to buy a notebook costing £1.50.

How much more money does she need?

I travel on a journey lasting 1 hour 25 minutes. The train leaves the station at 7:45 am. What time does the train arrive?

What number is 199 more than 428?

What is the difference between 1999 and 4003?

Would you use a mental, written or calculator method to solve each of these? Explain your choice.

$23.05 + \square = 176.25$

What is the total cost if I buy food costing £3.86 and £8.57?

These are the start and finish times of a film.

START 14:05 FINISH 16:25

How long was the film?

A packet of crisps costs 32p. Josh buys two packets.
How much change does he get from £1?

YEAR 3 – 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 3, 4 and 8 multiplication tables

- multiply seven by three; what is four multiplied by nine? Etc.
- Circle three numbers that add to make a multiple of 4

  11 12 13 14 15 16 17 18 19

- Leila puts 4 seeds in each of her pots. She uses 6 pots and has 1 seed left over. How many seeds did she start with?
- At Christmas, there are 49 chocolates in a tin and Tim shares them between himself and 7 other members of the family. How many chocolates will each person get?

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

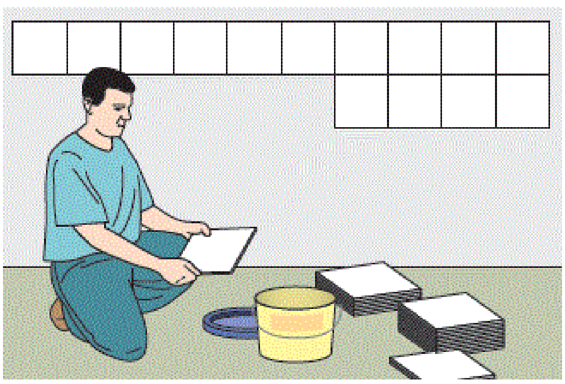
- One orange costs nineteen pence. How much will three oranges cost?
- Mark drives 19 miles to work every day and 19 miles back. He does this on Mondays, Tuesdays, Wednesdays, Thursdays and Fridays. How many miles does he travel to work and back in one week?

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Miss West needs 28 paper cups. She has to buy them in packs of 6

How many packs does she have to buy?

Tom is laying tiles. He has 84 tiles; how many complete rows and columns could he make?



Fill in the missing digits in these calculations –

$$\begin{array}{r} 2\,\boxed{} \\ \times\quad 8 \\ \hline 1\;7\;6 \\ \hline \end{array} \qquad \begin{array}{r} 2\,\boxed{} \\ \times\quad \boxed{} \\ \hline 1\;1\;2 \\ \hline \end{array} \qquad \begin{array}{r} 1\,\boxed{}\,4 \\ \times\quad \boxed{} \\ \hline 7\;3\;6 \\ \hline \end{array}$$

YEAR 3 – Fractions

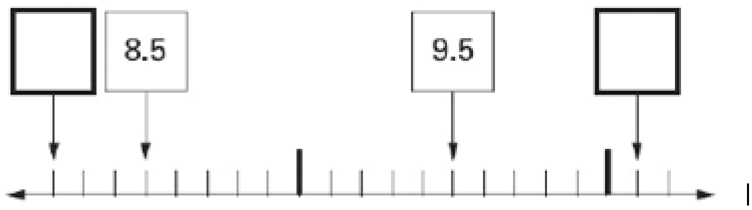
Examples of what children should be able to do, in relation to each (boxed) Programme of Study statement

count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10

Children should be able to:

- Use decimal notation for tenths
- Divide single digits or whole numbers by 10
- Explain how finding 1/10 is the same as dividing by 10

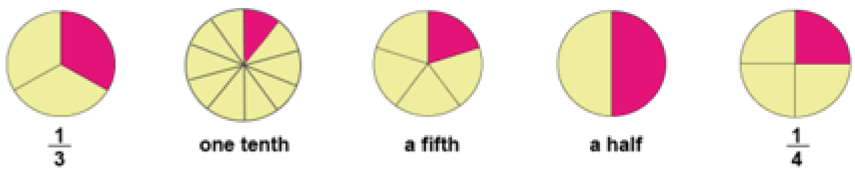
Here is part of a number line. Write in the numbers missing from the two empty boxes.



recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators

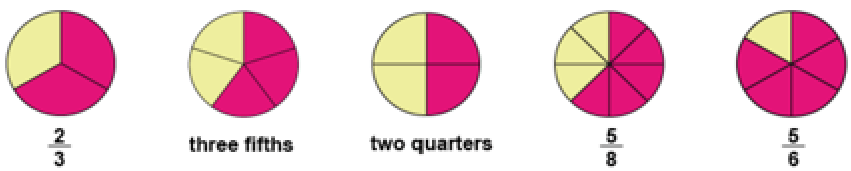
Children should be able to recognise and write unit and non-unit fractions of shapes.

Unit Fractions. Unit means one. Here are some examples of unit fractions.



Can you spot the pattern? A unit fraction is one part of a whole that is divided into equal parts.

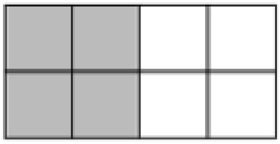
Non-unit fractions. Unit means one, so non-unit is any number apart from one. Here are some examples of non-unit fractions.



Many (or, rather, more than one of the) parts, of an equally divided whole, is a non-unit fraction.

Understand that the number on the bottom of a fraction tells me how many pieces the whole is divided into

What fraction of this shape is shaded? How do you know? Is there another way that you can describe the fraction?



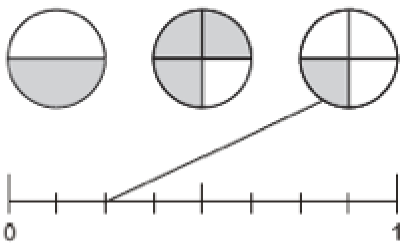
Here are 21 apples. Put a ring around one third of them.

recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators

Children should be able to:

- Position fractions on a number line; eg. mark fractions such as ½, 3 ½ and 2 3/10 on a number line marked from zero to 5.

A fraction of each shape is shaded. Match each fraction to the correct place on the number line. One has been done for you.



recognise and show, using diagrams, equivalent fractions with small denominators

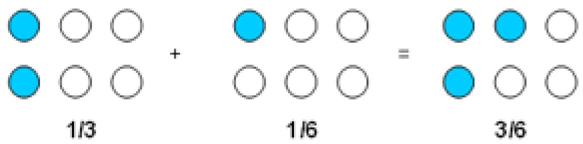
Children should be able to:

- Identify pairs of fractions that total 1.
- Circle two fractions that have the same value.

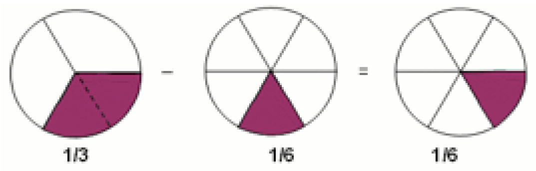
Add/subtract fractions with the same denominator within one whole (e.g. 5/7 + 1/7 = 6/7)

This could also be done by using drawings and in the array form:

For addition:



and for subtraction:



compare and order unit fractions, and fractions with the same denominators

Children should be able to answer questions like:

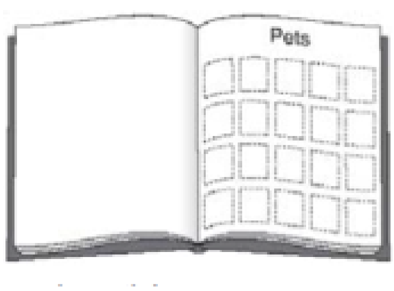
- Would you rather have 1/3 of 30 sweets or 1/5 of 40 sweets? Why?

solve problems that involve all of the above

Children should be able to answer questions like:

- 15 grapes are shared equally onto five plates. What fraction of the grapes is on each plate?

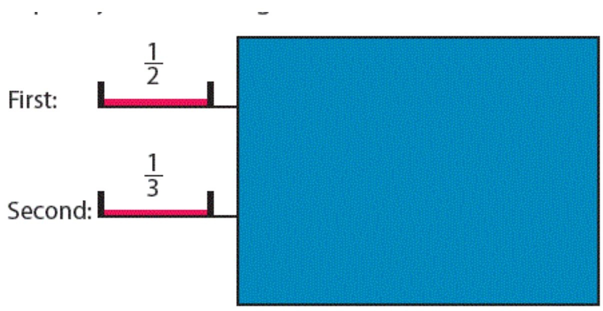
Megan has 20 animal stickers to go on this page –



1/4 of them are dog stickers
1/2 of them are cat stickers
The rest are rabbit stickers

How many rabbit stickers does she have?

Only a fraction of each ribbon is shown. The rest is hidden behind the sheet of paper –



Which ribbon is longer?

Explain your reasoning.

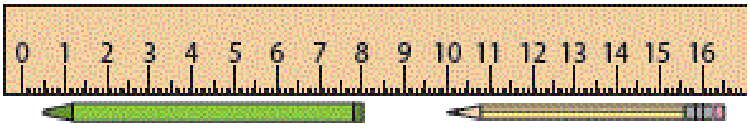
YEAR 3 – Measurement

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

measure, compare, add and subtract:
lengths (m/cm/mm); mass (kg/g); volume/capacity (l/m)

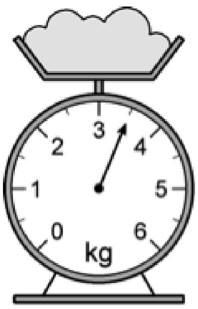
Length: children should be able to something that they think is just shorter/longer than a metre/centimetre/millimetre. They should be able to check whether they are right.

What is the difference in length between the pen and the pencil?

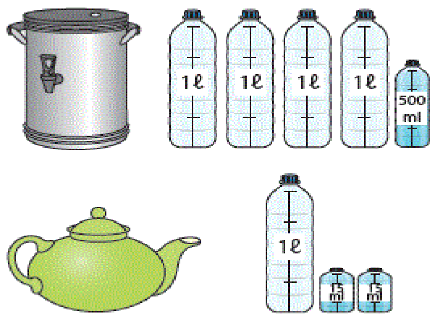


Mass: Say which object in the classroom is heavier than 100 g/kilogram/half-kilograms and know how to check if they are correct.

What is the weight of the flour shown by this scale?



Here is a tea urn and a teapot. The bottles show how much water each can hold.



How much more does the tea urn hold?

Capacity: Find a container that they think would hold one litre and check to find out if they were correct.

General: Say what each division on this scale is worth and explain how they worked this out.

measure the perimeter of simple 2-D shapes

Measure the sides of regular polygons in centimetres and millimetres and find their perimeters in centimetres and millimetres

add and subtract amounts of money to give change, using both £ and p in practical contexts

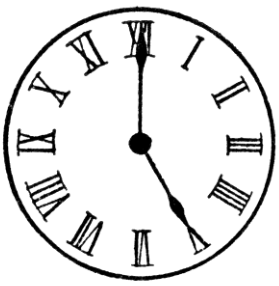
Jake wants to buy a comic that costs £1. He saves 25p one week and 40p the next. How much more money does he need to buy the comic?

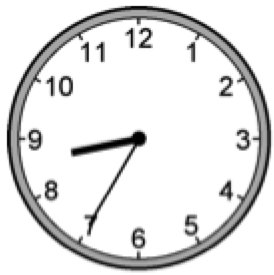
Add these prices: £6.73, £9.10 and £7.00 to find the total. Find out how much more do you need to add to get £23?

tell and write the time from an analogue clock, including Roman numerals from I to XII, and 12-hour and 24-hour clocks

Read times like this in analogue and digital formats, including those with Roman numerals.

What time does each clock show?



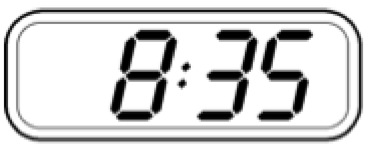



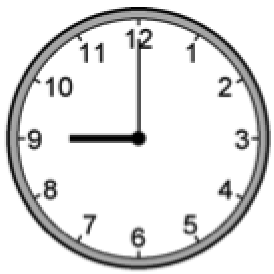
Ben’s clock says 7:50 when he gets up. Show this time on a clock face.

estimate and read time with increasing accuracy to the nearest minute, record and compare time in terms of seconds, minutes, hours and o’clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight

Kevin leaves home at quarter past 8 and arrives in school at 20 to 9. How long is his journey? How did you work this out?

How long is it between the times shown on these two clocks? How did you work it out?





know the number of seconds in a minute and the number of days in each month, year and leap year

How many minutes is 140 seconds?

What is the date of the day after 30th November?
How many days are they in January?

compare durations of events, for example to calculate the time taken by particular events or tasks

Estimate how long your favourite TV programme lasts. Use a television guide to work out how close your estimation was.

It takes 35 minutes to walk from home to school. I need to be there by 8.55 am. What time do I need to leave home?

How much does it cost to hire a rowing boat for three hours?

Boat Hire	
Motor boats £1.50 for 15 minutes	Rowing boats £2.50 for 1 hour

Sasha pays £3.00 to hire a motor boat. She goes out at 3:20 pm. By what time must she return? Explain how you solved this problem. Could you have done it in a different way?

Sally and Maria both went to the gym on Saturday. Sally was there from 2 pm until 3.30pm. Maria was there from 12.30 pm until 3.15 pm. Who spent the longer time at the gym? How much longer was she there than her friend?

YEAR 3 – Geometry: Properties of Shape

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

draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

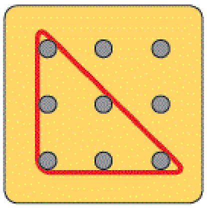
Children should be able to

use appropriate mathematical vocabulary to describe the features of common 2-D and 3-D shapes including semicircles, hemispheres and prisms

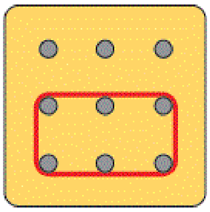
sort and classify collections of 2-D shapes in different ways using a range of properties including: ‘all sides are of equal length,’ ‘has at least one right angle’ or ‘has at least one line of symmetry’

record their classifications on Venn and Carroll diagrams, including diagrams involving more than one criterion.

How many triangles can you draw on a 3x3 pin board?



How many quadrilaterals can you draw on a 3x3 pin board?



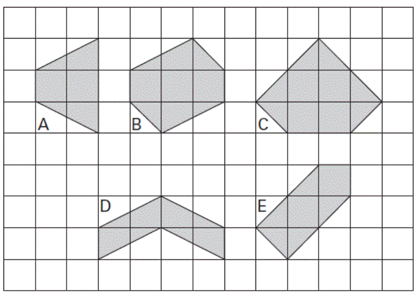
In each case, how do you decide if the shapes are the same or different?

Could you find different right angled triangles, or is there only one?

Can you name the different quadrilaterals?

Recognise angles as a property of a shape or description of a turn

Identify right angles, recognise that two right angles make a half turn, three make three quarters of a turn and four make a full turn; identify whether angles are greater or less than a right angle.



Which of these shapes have right angles?

If I face West and make a quarter turn anticlockwise, in which direction will I now face? What about half turn?

Identify horizontal and vertical lines and pairs of perpendicular and parallel lines

YEAR 3 - Statistics

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

interpret and present data using bar charts, pictograms and tables

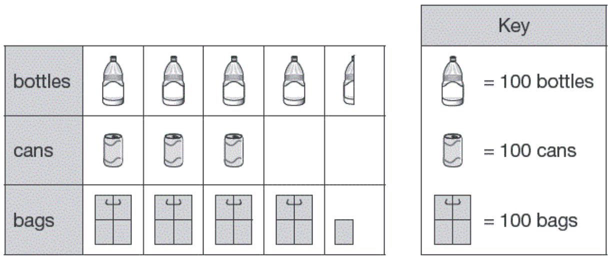
Process, present and interpret data to pose and answer questions. They use all representations such as Venn and Carroll diagrams, bar charts, pictograms. They collect data quickly onto a class tally chart. Children recognise that a tally involves grouping in fives and that this helps them to count the frequencies quickly and accurately. They produce a simple pictogram and/or bar chart, where a symbol represents 2 units. Children sort and classify objects, numbers or shapes according to two criteria, and display this work on Venn and Carroll diagrams

Can you put the all numbers in the correct places?

25 247 7002 49 990

	odd	not odd
a 3-digit number		
not a 3-digit number		

Class 3 collected litter in the park –



How many of each item did they collect?

How many more bags did they get than cans?

solve one-step and two-step questions such as ‘How many more?’ and ‘How many fewer?’ using information presented in scaled bar charts and pictograms and tables

Collect, represent and interpret data in order to answer a question that is relevant to them, for example:

- What new addition to the school play equipment would you like?
- Which class race shall we choose for sports day?

They decide on the information they need to collect and collect it efficiently. They collate the information on a tally chart or frequency table, then use this to make simple frequency diagrams such as bar charts, using ICT where appropriate. They discuss the outcomes, responding to questions such as:

- Which items had fewer than five votes?
- Would the table be the same if we asked Year 6?
- How might the table change if everyone had two votes?

Children present their conclusions to others, identifying key points that should be included. They make suggestions as to how this data could be used; for example, they may decide that they need to investigate the price of different equipment or discuss what they need to do to prepare for their chosen race.

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.

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

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

SATs Papers -

http://www.sats-papers.co.uk/

http://satspapers.org/mathsKS2SATS.htm

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/