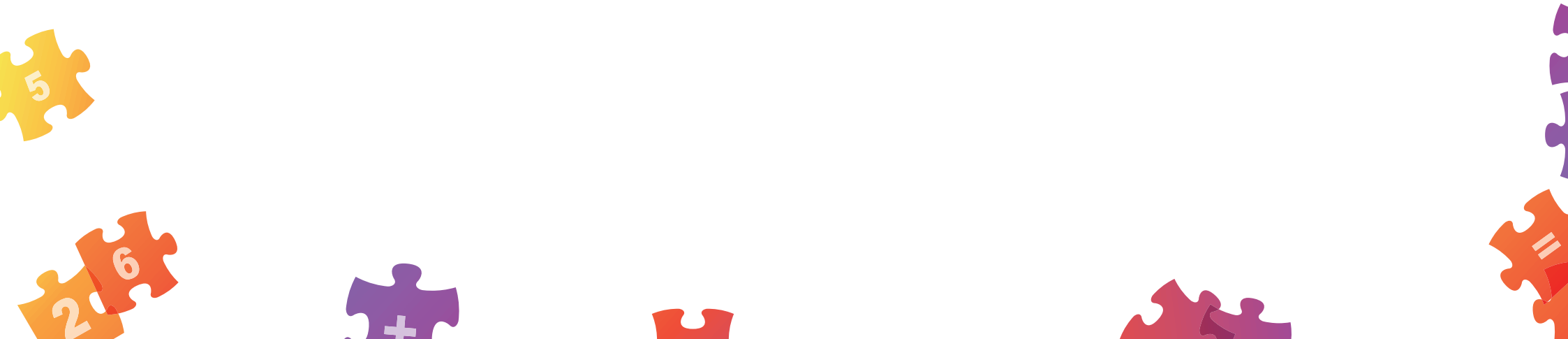

School Improvement
Liverpool
Maths Plans
Year 6


5
2
6
+
=

Contents

Introduction

The Liverpool Maths team have developed a medium term planning document to support effective implementation of the new National Curriculum.

In order to develop fluency in mathematics, children need to secure a conceptual understanding and efficiency in procedural approaches.

Our materials highlight the importance of making connections between concrete materials, models and images, mathematical language, symbolic representations and prior learning.

There is a key focus on the teaching sequence to ensure that children have opportunities to practise the key skills whilst building the understanding and knowledge to apply these skills into more complex application activities.

For each objective, there is a breakdown which explains the key components to be addressed in the teaching and alongside this there are a series of sample questions that are pitched at an appropriate level of challenge for each year group.

An additional section (see appendix 1) provides a list of key, basic skills that children must continually practise as they form the building blocks of mathematical learning.

Using the plans

This is not a scheme but it is more than a medium term plan
The programme of study has been split into four domains:

- **Number**
- **Measurement**
- **Geometry**
- **Statistics**

As a starting point, we have taken these domains and allocated them into five half terms:

Year 6	
Autumn 1	**Number** - number and place value - addition and subtraction, multiplication and division
Autumn 2	**Number** - fractions (including decimals and percentages) - ratio and proportion - algebra
Spring 1	**Measurement**
Spring 2	**Geometry** - properties of shapes - position and direction
Summer 1	**Statistics**

These allocations serve only as a guide for the organisation of the teaching. Other factors such as term length, organisation of the daily maths lesson, prior knowledge and cross-curricular links may determine the way in which mathematics is prioritised, taught and delivered in your school.

Using the plans

Within each half term, are some new objectives and some continuous objectives:

Year 6		
	New objectives	**Continuous objectives**
Autumn 1	9	4
Autumn 2	15	9
Spring 1	6	10
Spring 2	7	10
Summer 1	2	10

The new objectives vary in length but cover the new learning for that half term, they will not appear again in their entirety.

If the objective is in italics, it has been identified as an area that, once taught, should be re-visited and consolidated through basic skills sessions as these key skills form the building blocks of mathematical learning.

The continuous objectives build up as you move through each half term, these objectives cover all the application aspects in mathematics. It is crucial that they are woven into the teaching continually during the year, so that once fluent in the fundamentals of mathematics, children can apply their knowledge rapidly and accurately to problem solving.

As before, the timings allocated and the organisation and frequency of delivery of these continuous objectives is flexible and will vary from school to school.

Please note that Summer 2 has deliberately been left free for the testing period traditionally carried out at the end of summer 1. This also allows the flexibility to allocate time in Summer 2 to target specific areas identified through the assessment process as needing additional teaching time.

There are 2 appendices attached:

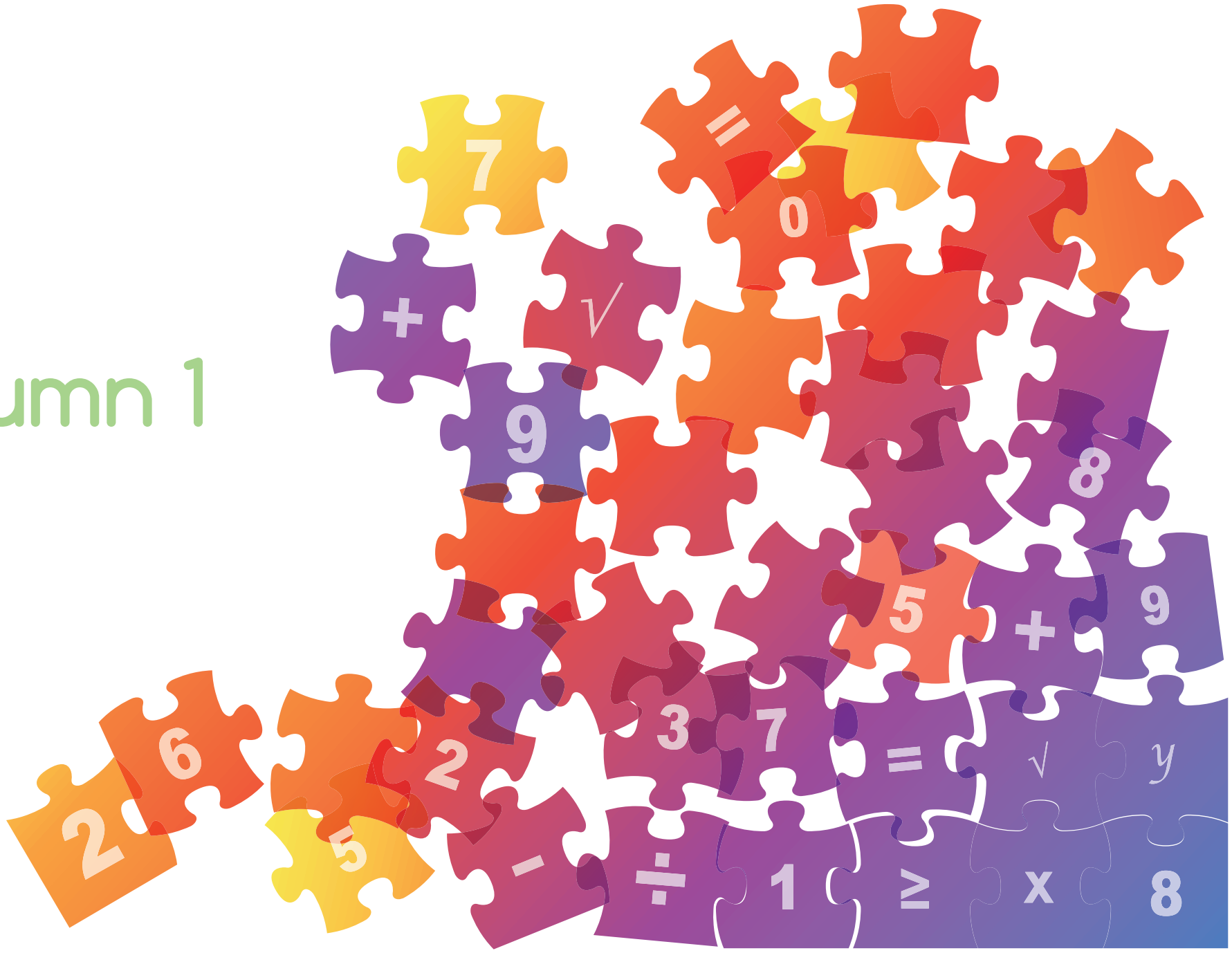
Appendix 1 - List of key basic skills with guidance notes

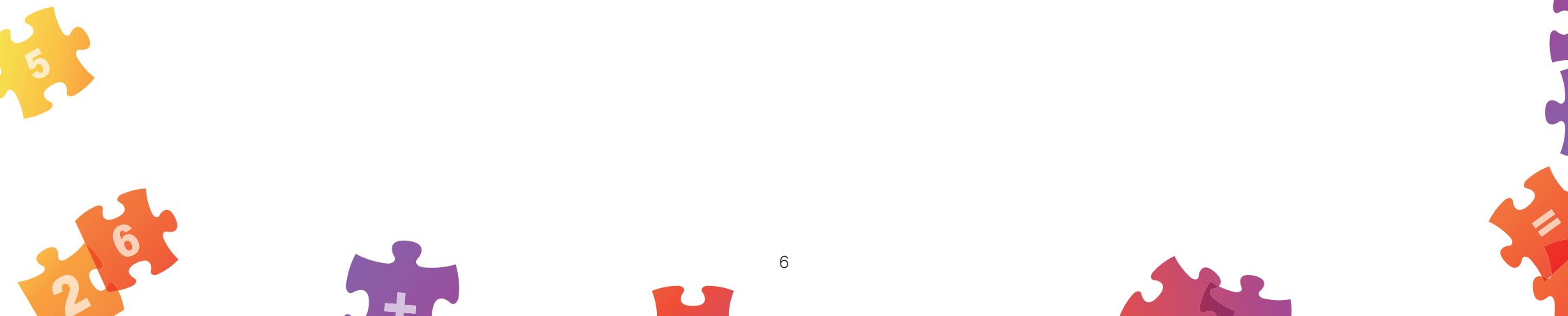
Appendix 2 - Progression through the domains across the key stages


5


6
2

Autumn 1




5
2
6
+
=

YEAR 6 PROGRAMME OF STUDY			
DOMAIN 1 – NUMBER			
NEW OBJECTIVES – AUTUMN 1			
NUMBER AND PLACE VALUE			
Objectives (statutory requirements)	What does this mean?	Example questions	**Notes and guidance (non-statutory)**
Read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit	Be able to talk about the relative size of numbers, a number bigger than, less than, in between Place random numbers between two demarcations on a number line Present number lines in different ways and in different contexts (horizontal number line, vertical scale etc.) Order consecutive and non-consecutive numbers in ascending and descending order with particular focus on crossing boundaries and the use of zero as a place holder	Place 234 680 on a number line from 200 000 to 300 000 Think of a number that lies in between 789 456 and 800 000 Order these numbers from smallest to largest and largest to smallest 89 565, 890 732, 890 056, 89 005	Pupils use the whole number system, including saying, reading and writing numbers accurately.
Round any whole number to a required degree of accuracy	Using any number up to seven digits, be able to round to one or more of the six criteria, 10, 100, 1000, 10000, 100 000, 1 000 000	Think of the number 789 456, round it to the range of criteria specified on the left Is 789 456 nearer to 700 000 or 800 000? Explain how you know	

Notes

Use negative numbers in context, and calculate intervals across zero	Building on the work in Year 5, children work with increasingly larger numbers	The temperature reached a high of 15˚C in the summer and fell to -38˚C in the winter, what is the difference between these temperatures?	

Notes

NEW OBJECTIVES – AUTUMN 1

ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the

formal written method of long multiplication

Teaching to be in line with school Calculation Policy

Methods:

- Partitioning (grid)
- Short
- Long

Progression shown through:

THTU x U

TU x TU

HTU x TU

THTU x TU

24 x 32 = 768

x	20	4	
30	600	120	720
2	40	8	48
			768

Partitioning (grid)

```
 1245
x   3
 3735
 1 1
```

Short

Short

```
 1245
x  13
 3735
 1 1
12450
16185
 1
```

Long

Pupils practise addition, subtraction, multiplication and division for larger numbers, using the formal written methods of columnar addition and subtraction, short and long multiplication, and short and long division (see Mathematics Appendix 1).

They undertake mental calculations with increasingly large numbers and more complex calculations.

Pupils continue to use all the multiplication tables to calculate mathematical statements in order to maintain their fluency.

Pupils round answers to a specified degree of accuracy, for example, to the nearest 10, 20, 50 etc., but not to a specified number of significant figures.

Pupils explore the order of operations using brackets; for example, 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9.

Notes

Divide numbers up to 4 digits by a two-digit whole number using the formal written

method of long division, and interpret remainders as whole number remainders,

fractions, or by rounding, as appropriate for the context

Divide numbers up to 4 digits by a two-digit number using the formal written method

of short division where appropriate interpreting remainders according to the context

Teaching to be in line with School Calculation Policy

Methods for ÷:

- Short
- Long

Progression shown through:

THTU ÷ U

HTU÷TU

THTU÷TU

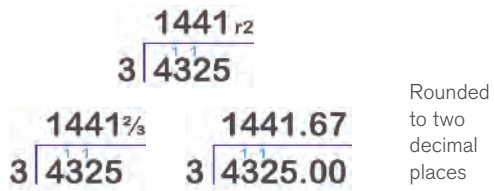
Remainders:

Expressing any remainders first using the notation 'r'.

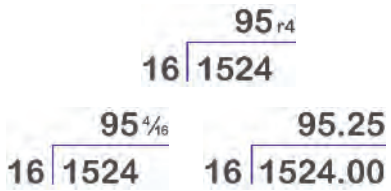
Moving onto expression of the remainder as a fraction and then as a decimal.

Developing the ability to interpret the remainder and then decide whether to round up or down depending on the context

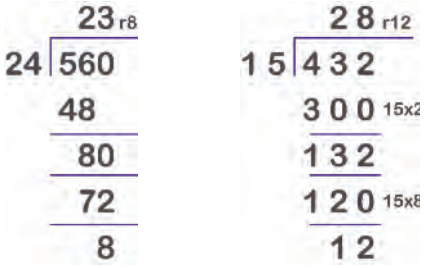
Link this with the 'Following the calculation sequence:' section

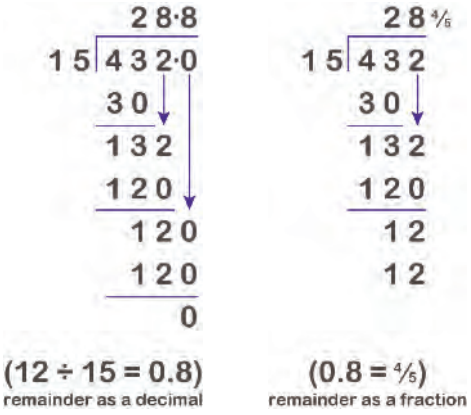


Short



Short





Common factors can be related to finding equivalent fractions.

Notes

Perform mental calculations, including with mixed operations and large numbers	Building on the skills introduced in Year 5 such as, TU ± TU and HTU ±TU, children calculate mentally, including working with decimals Progression shown by working with calculations that include more than one operation	1236 + 400, 36 + 57 1236 + 700, 136 + 57 5.3 x 4, 12.8 ÷ 4 After completing such calculations ask further questions such as: Can you double your answer, find ¼ of it, multiply by 100, divide by 1000, find 20% etc.	
Identify common factors, common multiples and prime numbers	A prime number is a number that can be divided evenly only by 1 or itself and it must be a whole number greater than one Identify all prime numbers between 1 and 100 A prime factor is a factor that is also a prime number Find the prime factors of a given number From a two-digit number, children can identify all factor pairs For all multiplication tables up to 12 x 12, children can identify multiples	List all the prime numbers between 20 and 40 From a given set of numbers, identify which are prime and which are composite (non-prime) Find the prime factors of 18 (2 x 3 x 3) List all the factor pairs of 48 Consider the numbers between 20 and 40. Are any of them multiples of both 4 and 6?	

Notes

	When given a pair of two-digit numbers, children can identify all factors that are common to both numbers	Consider the numbers 36 and 48 List all the factors that are common to both numbers	
Use their knowledge of the order of operations to carry out calculations involving the four operations	Understand that the four operations addition, subtraction, multiplication and division, and the order in which these operations are carried out, follow an agreed criteria Use the acronym of BIDMAS to define the order = brackets, indices, divide, multiply, add, subtract	Complete calculations such as: $(11 \times 5) - 21 =$ $34 + (35 \div 7) \times 2 =$ $9^2 - (13 \times 3) \div 6 =$	

Notes

CONTINUOUS OBJECTIVES – AUTUMN 1			
Solve number and practical problems that involve all of the above (number and place value)	Be able to answer word and reasoning problems linked to place value	Emma has used these digit cards to make the number 367.98  Subtract 8.39 from Emma's number If you made the number that is four hundredths more than Emma's, which new digit card(s) would you need? How many prime numbers less than 100 can you make with these digit cards? What is the number half way between 12.215 and 40.617? Fill in the missing numbers: 0.06 x ☐ = 60 ☐ ÷ 1000 = 0.16 0.603 x ☐ = 603	

Notes

		Find the numbers that could fit the following clues: • Less than 100, square and odd • A multiple of 8 that rounds to 130 as the nearest ten • A cubed number greater than 100 Continue the sequence: 11, 8.5, 6, 3.5, 1, ☐ ☐ Find the number less than 30 that has the most factors	
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why ***Solve problems involving addition, subtraction, multiplication and division*** ***Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy***	Teaching of the skill to be in line with School Calculation Policy **Method for + and -** • Column **Progression shown through:** Working with numbers up to THTU.t h th	5487.324 + 2564.142 5487.324 + 2564.142 8051.466 1 1 1 Column 5487.324 – 2564.142 4 1 2 1 5487.324 – 2564.142 2923.182 Column	

Notes

	Ensure that children have opportunities to: • Estimate the answer • Evidence the skill of addition and/or subtraction • Prove the inverse using the skill of addition and/or subtraction • Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds) • Solve missing box questions including those where missing box represents a digit or represents a number • Solve problems including those with more than one step • Solve open-ended investigations	Following the calculation sequence for addition and subtraction • Estimate 1245.854 + 1123.364 • Calculate 1245.854 + 1123.364 • Prove 2369.218 – 1123.364 = 1245.854 • Calculate 2369.21m – 1123.36m (when calculations include units of measure, a degree of accuracy to two decimal places allows sufficient challenge) • 2369.218 - □ = 1245.854 (or, when including units of measure, a degree of accuracy to two decimal places allows sufficient challenge eg 2369.21cm - □ = 1245.85cm) • I have 1245.85 litres of water in one container and 1123.36 litres in another container, how much do I have altogether? I pour out 450.5 litres, how much is now left? □□□ + □□□ = □□□□ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is odd/even etc.	

Notes

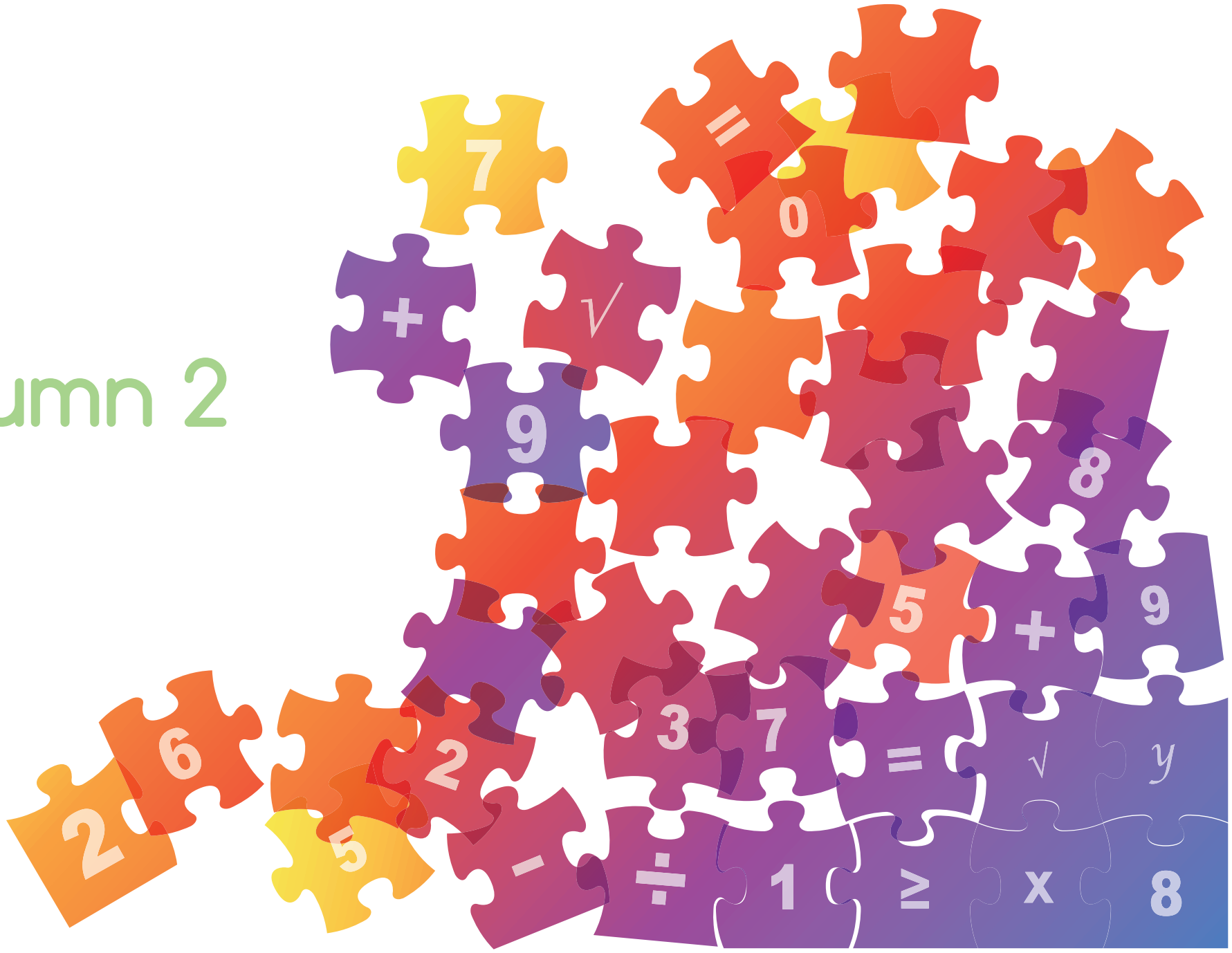
	Multiplication and division: Keeping size of calculations in line with the teaching of the skill (see Autumn 1) TU x TU, HTU x U, HTU x TU or THTU x U THTU ÷ U, HTU ÷ TU or THTU ÷ TU, ensure that children have opportunities to:		
	• Estimate the answer	• Estimate 214 x 17 =	
	• Evidence the skill of multiplication and division	• Calculate 214 x 17 =	
	• Prove the inverse using the skill of multiplication and/or division	• Prove 3638 ÷ 17 = 214	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 214 ml x 17 =	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 3638 ÷ ☐ = 214	
	• Solve problems including those with more than one step	• One full barrel holds 214 litres and there are 17 full barrels, how much do I have altogether? I sell 2 barrels, how many litres do I have left?	
	• Solve open-ended investigations	☐☐☐ + ☐☐☐ = ☐☐☐☐ • Using the digit cards 1 to 9, make the smallest /biggest answer, an answer that is a multiple of 5 etc.	

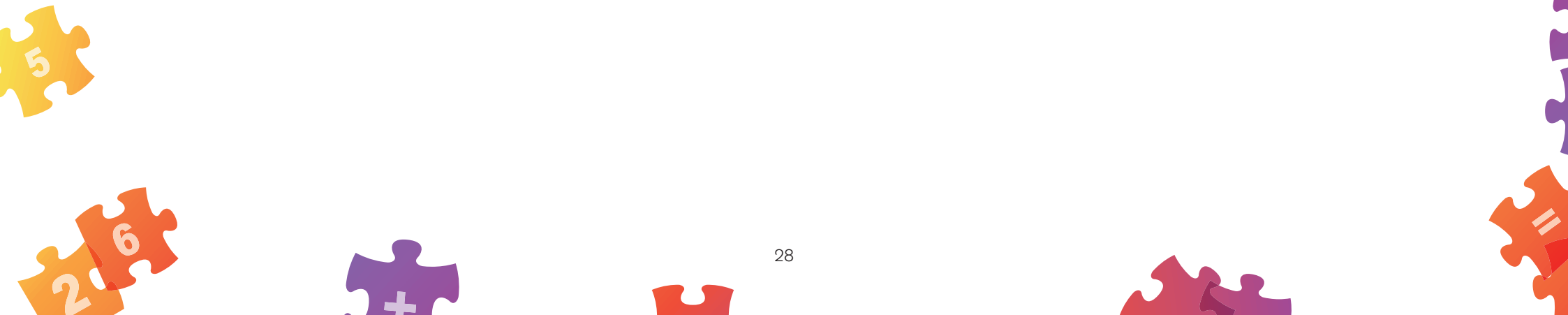

5


6
2


+

Autumn 2




5
2
6
+
=

YEAR 6 PROGRAMME OF STUDY			
DOMAIN 1 – NUMBER			
NEW OBJECTIVES – AUTUMN 2			
FRACTIONS (INCLUDING DECIMALS AND PERCENTAGES)			
Objectives (statutory requirements)	What does this mean?	Example questions	**Notes and guidance (non-statutory)**
Use common factors to simplify fractions; use common multiples to express fractions in the same denomination	Express a fraction in its simplest form by dividing both the numerator and denominator by the greatest common factor or by dividing by a common factor (you will need to do this more than once) From a set of fractions, convert them so that they have the same denominator, remembering that when multiplying or dividing both the numerator and denominator by the same number, the fraction keeps its value	Simplify $\frac{16}{24}$ Divide numerator and denominator by 8 (greatest common factor) Divide numerator and denominator by 4 (a common factor) and then by 2 (a common factor) Convert this set of fractions so that they all have the same denominator $\frac{2}{3}, \frac{5}{6}, \frac{9}{12}$	Pupils should practise, use and understand the addition and subtraction of fractions with different denominators by identifying equivalent fractions with the same denominator. They should start with fractions where the denominator of one fraction is a multiple of the other (for example, $\frac{1}{2} + \frac{1}{8} = \frac{5}{8}$) and progress to varied and increasingly complex problems. Pupils should use a variety of images to support their understanding of multiplication with fractions. This follows earlier work about fractions as operators (fractions of), as numbers, and as equal parts of objects, for example as parts of a rectangle. Pupils use their understanding of the relationship between unit fractions and division to work backwards by multiplying a quantity that represents a unit fraction to find the whole quantity (for example, if $\frac{1}{4}$ of a length is 36cm, then the whole length is $36 \times 4 = 144$cm)
Compare and order fractions, including fractions > 1	For a set of fractions where the denominator of one fraction is not a multiple of the others, use the skill of finding a common denominator in order to compare them	Convert these fractions so that they all have the same denominator $\frac{2}{3}, \frac{5}{6}, \frac{3}{4}$ and then place them in order from smallest to largest	
Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions	Using the skill of converting fractions so that they have a common denominator, add and subtract fractions Starting with proper fractions, progressing into mixed numbers, where the mixed number may need to be converted into an improper fraction first	$\frac{3}{4} + \frac{5}{6}$ $1\frac{1}{4} - \frac{3}{5}$	

Notes

Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$	There are three simple steps to multiplying fractions: • Multiply the numerators • Multiply the denominators • Simplify the fraction To simplify a fraction divide the numerator and the denominator by the greatest common factor or divide by any common factor (you may need to do this more than once)	Calculate $\frac{2}{3} \times \frac{3}{4}$ expressing the answer in its simplest form	They practise calculations with simple fractions and decimal fraction equivalents to aid fluency, including listing equivalent fractions to identify fractions with common denominators. Pupils can explore and make conjectures about converting a simple fraction to a decimal fraction (for example, $3 \div 8 = 0.375$). For simple fractions with recurring decimal equivalents, pupils learn about rounding the decimal to three decimal places, or other appropriate approximations depending on the context. Pupils multiply and divide numbers with up to two decimal places by one-digit and two-digit whole numbers. Pupils multiply decimals by whole numbers, starting with the simplest cases, such as $0.4 \times 2 = 0.8$, and in practical contexts, such as measures and money. Pupils are introduced to the division of decimal numbers by one-digit whole number, initially, in practical contexts involving measures and money. They recognise division calculations as the inverse of multiplication.
Divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$]	There are two simple steps to dividing proper fractions by whole numbers: • Multiply the denominator by the whole number • Simplify the fraction	Calculate $\frac{2}{3} \div 4$ expressing the answer in its simplest form	
Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$]	Understand the link between a fraction and division, that is, to find the decimal equivalent of a fraction, divide the numerator by the denominator Use the skills of division to convert a fraction to a decimal, where the decimal is recurring, they can round the answer to three decimal places When given a fraction and its associated value, use the link with division to establish the number that represents the whole quantity	Express $\frac{5}{8}$ as a decimal (use short division where remainder is expressed as a decimal, that is $5.000 \div 8 =$) Express $\frac{5}{6}$ as a decimal rounded to three decimal places Mark ate $\frac{1}{4}$ of the cherries from the plate. There are 33 cherries remaining on the plate, how many were there on the plate before Mark started eating?	

Notes

Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places	Understand the value of each digit in a number up to 10 000 000 including numbers with up to three decimal places Understand that when multiplying a number by ten, we are making that number ten times bigger, so we move each digit one place to the left, two places to the left when multiplying by one hundred (10 x 10) and three places to the left when multiplying by one thousand (10 x 10 x 10) and the same is true for division but moving the digits to the right	54.673, 504.76, 123 654.07, 647 543.1, 56.03, 54.006 What is the value of the 6 digit in each of these numbers? 456.3 x 1000 456.3 ÷ 100	Pupils also develop their skills of rounding and estimating as a means of predicting and checking the order of magnitude of their answers to decimal calculations. This includes rounding answers to a specified degree of accuracy and checking the reasonableness of their answers.

Notes

Multiply one-digit numbers with up to two decimal places by whole numbers	Teaching to be in line with School Calculation Policy **Methods:** • Expanded (grid) • Short **Progression shown through:** U.t x U U.th x U U.t x TU U.th x TU	5.6 x 9 x | 5 | 0.6 | 9 | 45 | 5.4 | 50.4 Expanded (Grid) 5.6 x 9 50.4 Short 5.6 x 12 x | 5 | 0.6 | 10 | 50 | 6 | 2 | 10 | 1.2 | 67.2 Expanded (Grid)	
Use written division methods in cases where the answer has up to two decimal places	Building on the skill of division, ensure that children work with examples where the answer has up to two decimal places Make connections with: • Division objective in Autumn 1 where remainders are expressed as decimals • Fraction and decimal objective in Autumn 2 expressing a fraction as a decimal using the skill of division	Express $\frac{3}{8}$ as a decimal	

Notes

	Include examples where context is given by including units of money and measure	1m ÷ 8 = £5 ÷ 4 =	
Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts	Per cent means per 100 Children understand the relationship between percentages, fractions and decimals Working with fractions where the denominator is 2, 4, 5, 8 and 10, practice converting to decimals and percentages and vice versa Include examples where context is given by including units of money and measure	Express $\frac{3}{8}$ as both a decimal and a percentage Express 0.75 as both a percentage and a fraction Express 45% as both a decimal and a fraction	

Notes

NEW OBJECTIVES – AUTUMN 2			
RATIO AND PROPORTION			
Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	The four objectives for this section all involve solving problems so the details and example questions are to be found in the continuous section, see Autumn 2	The four objectives for this section all involve solving problems so the details and example questions are to be found in the continuous section, see Autumn 2	Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes and recipes). Pupils link percentages or 360° to calculating angles of pie charts. Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation a:b to record their work. Pupils solve problems involving unequal quantities, for example, 'for every egg you need three spoonfuls of flour', $\frac{5}{6}$ of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion
Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison			
Solve problems involving similar shapes where the scale factor is known or can be found			
Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples			

Notes

NEW OBJECTIVES – AUTUMN 2			
ALGEBRA			
Use simple formulae	A formula is a special type of equation that shows the relationship between different variables A variable is a symbol that represents a number that we don't yet know Children can use a simple formula to carry out a calculation Introduce the concept that a variable represents a number by making connections with: • the use of x and y when reading coordinates • the formula for the area of a rectangle area = (a x b) units^2	If the y co-ordinate is three times that of the coordinate, this can be expressed as $y = 3x$ Find the value of y when $x = 7$ Use this formula area = (a x b) units^2 to calculate the area of a rectangle measuring 25cm x 5cm	Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as: • missing numbers, lengths, coordinates and angles • formulae in mathematics and science • equivalent expressions (for example, a + b = b + a) • generalisations of number patterns • number puzzles (for example, what two numbers can add up to).
Generate and describe linear number sequences	A linear sequence is a number pattern which increases or decreases by the same amount each time Children should be able to find the common difference or rule	What are the next three terms in the sequence 43, 61, 79 … What is the rule of this sequence? Look at this sequence and describe how the next number will be generated 40 80 120 160 200 …	

Notes

		This sequence continues: Will the number 340 be in the sequence? Explain how you know A sequence starts at 500 and 80 is subtracted each time 500 420 340 ... The sequence continues in the same way. Write the first two numbers in the sequence that are less than 200	
Express missing number problems algebraically	In algebra, missing values are represented by a letter rather than a missing box, the is often called the unknown or variable Generate algebraic number sentences from a set of information	Make the connection with the use of the missing box in the **'Following the calculation sequence:'** section The area of a rectangle with length of 8cm is 48cm Express this algebraically if a represents the width in cm	
Find pairs of numbers that satisfy an equation with two unknowns	In a balancing equation with two missing values, children can work out the unknowns represented by letters	Find whole number values for a and b that makes the following statement true $6 \times a = 100 - b$	
Enumerate possibilities of combinations of two variables	In an equation with two unknowns, children can find all possible solutions When given a further constraint, children can apply this knowledge to solve the equation	If a is a whole number between 10 and 15 find possible values for b $a + b = 15$ Find all possible pairs of whole number values for and that satisfy the following equation $a + 24 = 33 - b$	

Notes






CONTINUOUS OBJECTIVES – AUTUMN 2			
Solve number and practical problems that involve all of the above (number and place value)	Be able to answer word and reasoning problems linked to place value	Emma has used these digit cards to make the number 367.98  Subtract 8.39 from Emma's number If you made the number that is four hundredths more than Emma's, which new digit card(s) would you need? How many prime numbers less than 100 can you make with these digit cards? What is the number half way between 12.215 and 40.617? Fill in the missing numbers: 0.06 x ☐ = 60 ☐ ÷ 1000 = 0.16 0.603 x ☐ = 603 Find the numbers that could fit the following clues: Less than 100, square and odd	

Notes







		• A multiple of 8 that rounds to 130 as the nearest ten • A cubed number greater than 100 Continue the sequence: 11, 8.5, 6, 3.5, 1, ☐ ☐ Find the number less than 30 that has the most factors	
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	Teaching of the skill to be in line with School Calculation Policy **Method for + and - :** • Column **Progression shown through:** Working with numbers up to THTU.t h th	5487.324 + 2564.142 5487.324 + 2564.142 8051.466 1 1 1 Column 5487.324 – 2564.142 4 1 2 1 5487.324 – 2564.142 2923.182 Column	
Solve problems involving addition, subtraction, multiplication and division			
Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	Ensure that children have opportunities to:	**Following the calculation sequence for addition and subtraction**	

Notes

	• Estimate the answer	• Estimate 1245.854 + 1123.364	
	• Evidence the skill of addition and/or subtraction	• Calculate 1245.854 + 1123.364	
	• Prove the inverse using the skill of addition and/or subtraction	• Prove 2369.218 – 1123.364 = 1245.854	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 2369.21m – 1123.36m (when calculations include units of measure, a degree of accuracy to two decimal places allows sufficient challenge)	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 2369.218 - ☐ = 1245.854 (or, when including units of measure, a degree of accuracy to two decimal places allows sufficient challenge e.g. 2369.21cm - ☐ = 1245.85cm)	
	• Solve problems including those with more than one step	• I have 1245.85 litres of water in one container and 1123.36 litres in another container, how much do I have altogether? I pour out 450.5 litres, how much is now left?	
	• Solve open-ended investigations	☐☐☐ + ☐☐☐ = ☐☐☐☐ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is odd/even etc	

Notes

	Multiplication and division: Keeping size of calculations in line with the teaching of the skill (see Autumn 1) TU x TU, HTU x U, HTU x TU or THTU x U THTU ÷ U, HTU ÷ TU or THTU ÷ TU, ensure that children have opportunities to:	**Following the calculation sequence for multiplication and division:**	
	• Estimate the answer	• Estimate 214 x 17 =	
	• Evidence the skill of multiplication and division	• Calculate 214 x 17 =	
	• Prove the inverse using the skill of multiplication and/or division	• Prove 3638 ÷ 17 = 214	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 214 ml x 17 =	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 3638 ÷ ☐ = 214	
	• Solve problems including those with more than one step	• One full barrel holds 214 litres and there are 17 full barrels, how much do I have altogether? I sell 2 barrels, how many litres do I have left?	

Notes

	• Solve open-ended investigations	 • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is a multiple of 5 etc.	
Solve problems which require answers to be rounded to specified degrees of accuracy	For addition and subtraction, answers to be rounded to the nearest whole number, to one decimal place, two decimal places or three decimal places For multiplication and division, answers to be rounded to the nearest whole number, to one decimal place or two decimal places For division, rounding to the nearest whole number may be rounding up or down depending on the context (eg how many egg boxes are needed would be rounded up, but how many egg boxes are full would be rounded down)	Refer to **'Following the calculation sequence:'** section, including questions where rounding to specified degree is required	

Notes

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	When given one fact, children can use their skills of multiplication or division to derive associated facts Build on the work in year 5 on scaling up and down, making connections with all measures Progression shown by using the skill of conversion in terms of weight, volume/ capacity and length	100g of bird seed costs £3.76 What does 50g cost, 200g, 1kg? Here is recipe in that feeds 3 people, what quantities would I need to feed 12 people? Answers to be expressed in kg Each person in a relay runs 150m. If there are 17 runners, what is the total distance covered in km? A square has an area of $25m^2$. Double the length of the sides and calculate the new area	
Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	Children apply their understanding of the relationship between percentages, fractions and decimals When making these connections, children work with fractions with a denominator of 100, 50, 25, 20, 10, 5 and 2, and convert these to decimals with up two decimal places	Which of the following discounts is the greatest and which is the least: $\frac{5}{25}$, 0.28, $\frac{2}{5}$, 0.3, 35%? Show your workings by converting each one into decimals and ordering them from smallest to largest There is 200ml of milk in the glass, Peter drinks $\frac{3}{5}$, what is the volume of milk remaining in millilitres?	

Notes

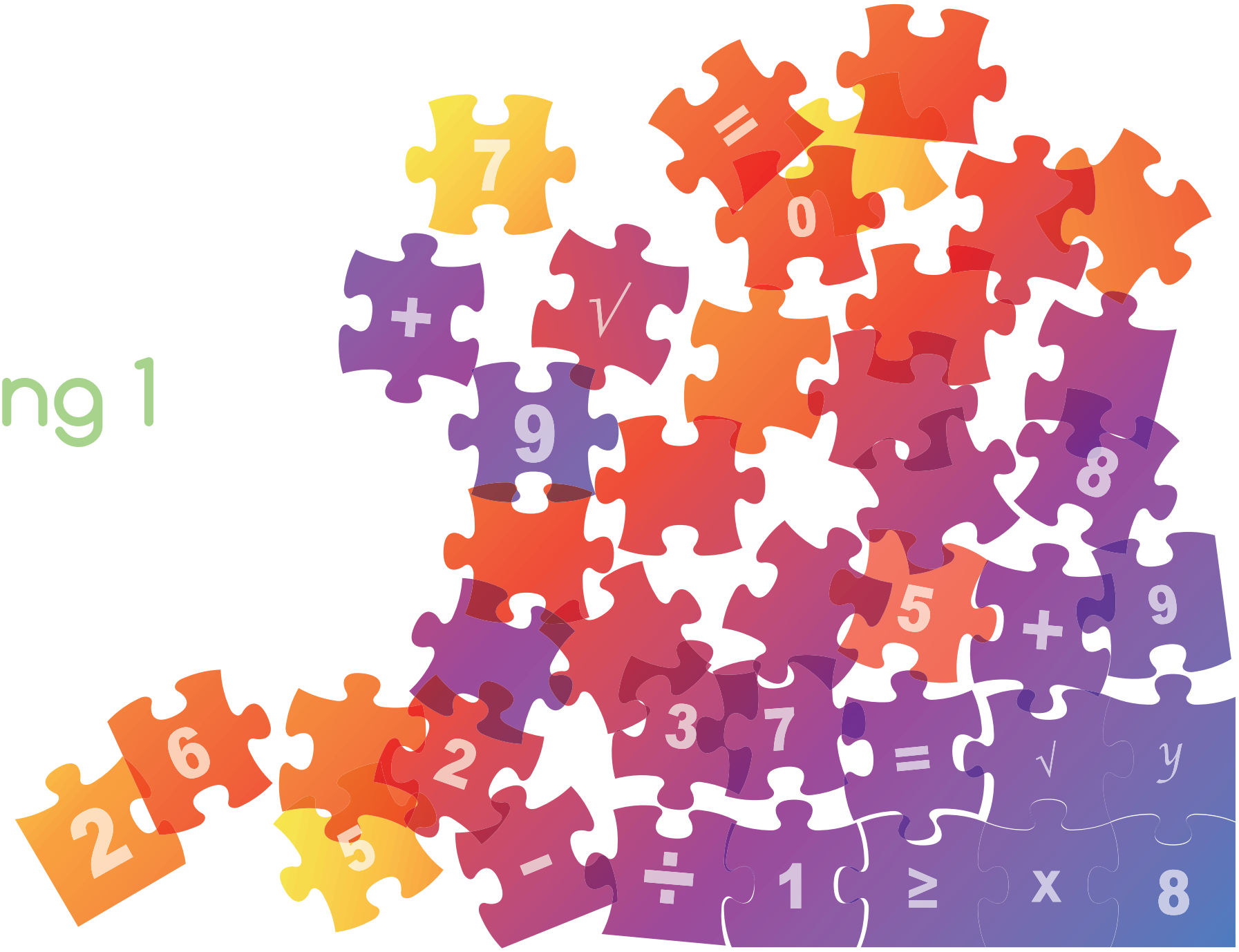
	Using knowledge of $\frac{1}{2} = 50\%$ and $\frac{1}{4} = 25\%$ and $\frac{1}{10} = 10\%$ to calculate percentages of quantities Find 10% and use this knowledge to then calculate 5% and other multiples of 5%	Find 75% of 900m Find 25% of £15 Here is a set of prices. All prices are to increase by 15% What is the increase in price? What is the new price? If a television cost £300 and is reduced by 35%, what is the new price?	
Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres	Scale factor is the ratio of the length of a scale drawing to the corresponding length of the actual object Ratios can be used to scale drawings up or down Scale factor notation is the same as ratio so a scale factor of 50 is represented by 1:50 Given or missing information may be actual measurements and /or scale measurements, and / or scale factors and / or ratios Solve problems by finding the missing information	a b  This is a scale drawing where $a = 7$cm and $b = 3$cm and the scale factor is 3. Use this information to draw the original shape The school is hall is 8m long and is represented on a scale drawing by 8cm What is the scale factor?	

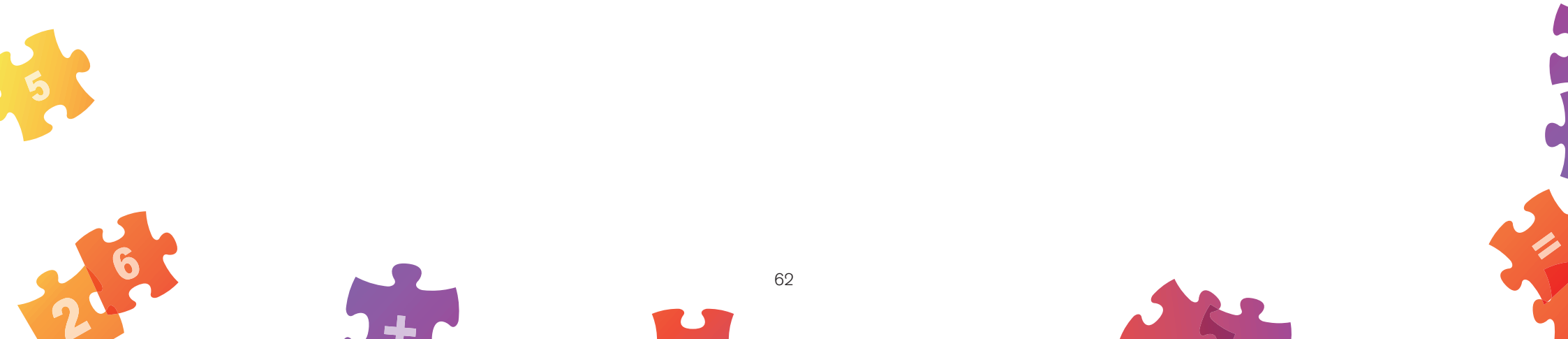
Notes

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	This is the basic introduction to ratio and proportion Ratio is used to keep things in proportion A ratio compares values, that is, how much of one thing there is compared to another, that is, part with part. They can be scaled up and down (see link to scale factors). We usually separate the two numbers in a ratio with a colon (:) The link with multiples should be explored here as children will be using this when scaling up or down to solve ratio problems Proportion is how many parts out of the whole thing and is often specified as 1 in every…, or 1 out of…, that is, part with whole. The link with fractions can be reinforced here in order that that children can use the skills of division and multiples to solve proportion problems	To dilute orange squash you use the ratio of 2 parts orange to 5 parts water. If I use 120ml of orange, how much water will I need? In a tray of 210 eggs, 1 in every 6 eggs is cracked. How many eggs are cracked and how many are not cracked? There are 250 pupils in the school and 3 in every 5 are boys. This can also be expressed as $\frac{3}{5}$ of the pupils are boys. How many of the pupils are girls? (This can be solved by using the skills of scaling up, or by using ÷ and x to find $\frac{3}{5}$ of 250)	


5
2
6
+

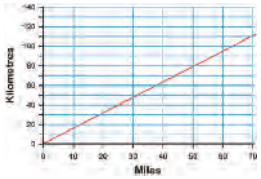
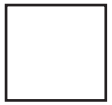
Spring 1



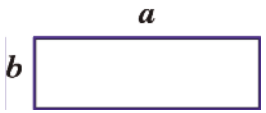
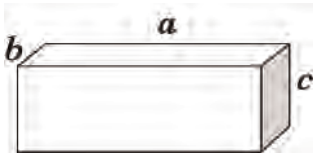

5
2
6
+
=

YEAR 6 PROGRAMME OF STUDY			
DOMAIN 2 – MEASUREMENT			
NEW OBJECTIVES – SPRING 1			
Objectives (statutory requirements)	What does this mean?	Example questions	**Notes and guidance (non-statutory)**
Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places	Building on the work covered in year 5, children should be familiar with the following units and be able to convert between these measures with confidence Units: Length km, m, cm, mm Mass kg, g Volume/capacity l, cl, ml Time hr, min, s Progression shown through a focus on decimal notation to 3 decimal places Make connections with the skill of x and ÷ by 10, 100 and 1000 Understand how negative numbers can be used for measures of temperature and be able add and subtract such measures	1549 mm = ☐ cm = ☐ km 1.703 kg = ☐ g 3.5 hrs = ☐ mins = ☐ s If the temperature at midday was 12° and by late afternoon was -5°, by how much has the temperature dropped? If the temperature increased by 28° from -15°, what is the temperature now?	Pupils connect conversion (for example, from kilometres to miles) to a graphical representation as preparation for understanding linear/proportional graphs. They know approximate conversions and are able to tell if an answer is sensible. Using the number line, pupils use, add and subtract positive and negative integers for measures such as temperature. They relate the area of rectangles to parallelograms and triangles, for example, by dissection, and calculate their areas, understanding and using the formulae (in words or symbols) to do this. Pupils could be introduced to compound units for speed, such as miles per hour, and apply their knowledge in science or other subjects as appropriate.

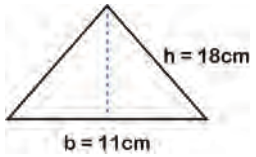
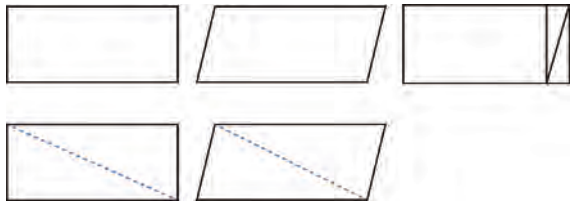
Notes

Convert between miles and kilometres	The sign ≈ means approximately equal to Can convert miles into kilometres and vice versa using examples of approximate conversions such as: 3 miles ≈ 5 km, 1km ≈ $\frac{3}{5}$ mile 1 km ≈ 0.621 miles Make the links with scaling in Autumn 2 Children can explore this relationship further by reading and interpreting an example of a line graph	Use given approximations to complete the following 9 miles ≈ ☐ km 15 km ≈ ☐ miles  	
Recognise that shapes with the same areas can have different perimeters and vice versa	Be able to find areas and perimeters of rectangles quickly using appropriate formula Solve problems involving area and perimeter Problems should include real life examples (e.g. turf for a garden, tiles for a floor)	 If the perimeter = 20cm, what could the area be?  If the area = 24cm², what could the perimeter be? A rectangular garden has an area of 32m². Working with whole numbers, what could the possible perimeters be? What is the largest perimeter for a kitchen floor with an area of 18m²? You may want to use squared paper to help	

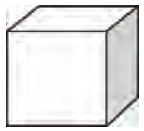
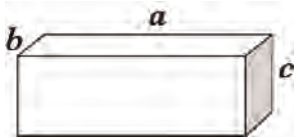
Notes

Recognise when it is possible to use formulae for area and volume of shapes	Use the formula for area of a rectangle (a x b) units^2 to calculate areas of given rectangles	 If $a = 27$m and $b = 18$m, what is the area?	
	Use the formula for volume of a cuboid (a x b x c) units^3 to calculate the volume of given shapes Make connections with Algebra Autumn 2, where the variable is represented by a letter	 If $a = 32$cm, $b = 12$cm and $c = 9$ cm, what is the volume?	

Notes

Calculate the area of parallelograms and triangles	Area of a parallelogram = base (b) x vertical height (h) units^2 = (b x h) units^2 Make the link with using simple formulae, see Algebra, Autumn 2 Solve problems when given the area and need to find either the base or the height Area of a triangle = $\frac{1}{2}$ base (b) x vertical height (h) units^2 = $\frac{1}{2}$ (b x h) units^2 Make the link with using simple formulae, see Algebra, Autumn 2 Solve problems when given the area and need to find either the base or the height Using the knowledge of the area of a rectangle, children have an understand how these formulae are derived The area of a parallelogram has same formula as rectangle The area of a triangle is half that of a parallelogram or rectangle	 Calculate the area of this parallelogram A parallelogram has an area of 98cm^2 and a vertical height of 14cm Calculate the length of the base  Calculate the area of this triangle A triangle has an area of 40cm^2 and a base length measuring 10cm. Calculate the vertical height Use images such as these below, to support understanding 	

Notes

Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3].	Calculate the volume of cubes and cuboids using the formula Volume = (a x b x c) $units^3$ Understand that the unit of measurement can be any metric length cubed (mm^3, cm^3, m^3, km^3)	 This is a cube with each edge measuring 8cm. What is the volume of the cube?  If a = 32cm, b = 12cm and c = 9 cm, what is the volume of the cuboid? If this was a scale drawing of a freight container and the measurements were a = 15m, b = 11m and c = 8m, what would the volume of the container be?	

Notes

CONTINUOUS OBJECTIVES – SPRING 1			
Solve number and practical problems that involve all of the above (number and place value)	Be able to answer word and reasoning problems linked to place value	Emma has used these digit cards to make the number 367.98  Subtract 8.39 from Emma's number If you made the number that is four hundredths more than Emma's, which new digit card(s) would you need? How many prime numbers less than 100 can you make with these digit cards? What is the number half way between 12.215 and 40.617 Fill in the missing numbers: 0.06 x ☐ = 60 ☐ ÷ 1000 = 0.16 0.603 x ☐ = 603	Pupils recognise proportionality in contexts when the relations between quantities are in the same ratio (for example, similar shapes and recipes). Pupils link percentages or 360° to calculating angles of pie charts. Pupils should consolidate their understanding of ratio when comparing quantities, sizes and scale drawings by solving a variety of problems. They might use the notation a:b to record their work. Pupils solve problems involving unequal quantities, for example, 'for every egg you need three spoonfuls of flour', $\frac{3}{5}$ of the class are boys'. These problems are the foundation for later formal approaches to ratio and proportion.

Notes

		Find the numbers that could fit the following clues: • Less than 100, square and odd • A multiple of 8 that rounds to 130 as the nearest ten • A cubed number greater than 100 Continue the sequence: 11, 8.5, 6, 3.5, 1, ☐ ☐ Find the number less than 30 that has the most factors	
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why **Solve problems involving addition, subtraction, multiplication and division** **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy**	Teaching of the skill to be in line with School Calculation Policy **Method for + and - :** • Column **Progression shown through:** Working with numbers up to THTU.t h th Ensure that children have opportunities to: • Estimate the answer	5487.324 + 2564.142 5487.324 + 2564.142 8051.466 Column 5487.324 – 2564.142 5487.324 – 2564.142 2923.182 Column **Following the calculation sequence for addition and subtraction** • Estimate 1245.854 + 1123.364	

Notes

	• Evidence the skill of addition and/or subtraction	• Calculate 1245.854 + 1123.364	
	• Prove the inverse using the skill of addition and/or subtraction	• Prove 2369.218 – 1123.364 = 1245.854	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 2369.21m – 1123.36m (when calculations include units of measure, a degree of accuracy to two decimal places allows sufficient challenge)	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 2369.218 - ☐ = 1245.854 (or, when including units of measure, a degree of accuracy to two decimal places allows sufficient challenge e.g. 2369.21cm - ☐ = 1245.85cm)	
	• Solve problems including those with more than one step	• I have 1245.85 litres of water in one container and 1123.36 litres in another container, how much do I have altogether? I pour out 450.5 litres, how much is now left?	
	• Solve open-ended investigations	☐☐☐ + ☐☐☐ = ☐☐☐☐ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is odd/even etc	

Notes

	Multiplication and division: Keeping size of calculations in line with the teaching of the skill (see Autumn 1) TU x TU, HTU x U, HTU x TU or THTU x U THTU ÷ U, HTU ÷ TU or THTU ÷ TU, ensure that children have opportunities to:	**Following the calculation sequence for multiplication and division:**	
	• Estimate the answer	• Estimate 214 x 17 =	
	• Evidence the skill of multiplication and division	• Calculate 214 x 17 =	
	• Prove the inverse using the skill of multiplication and/or division	• Prove 3638 ÷ 17 = 214	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 214 ml x 17 =	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 3638 ÷ ☐ = 214	
	• Solve problems including those with more than one step	• One full barrel holds 214 litres and there are 17 full barrels, how much do I have altogether? I sell 2 barrels, how many litres do I have left?	

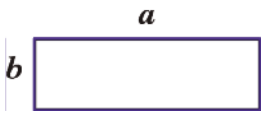
Notes

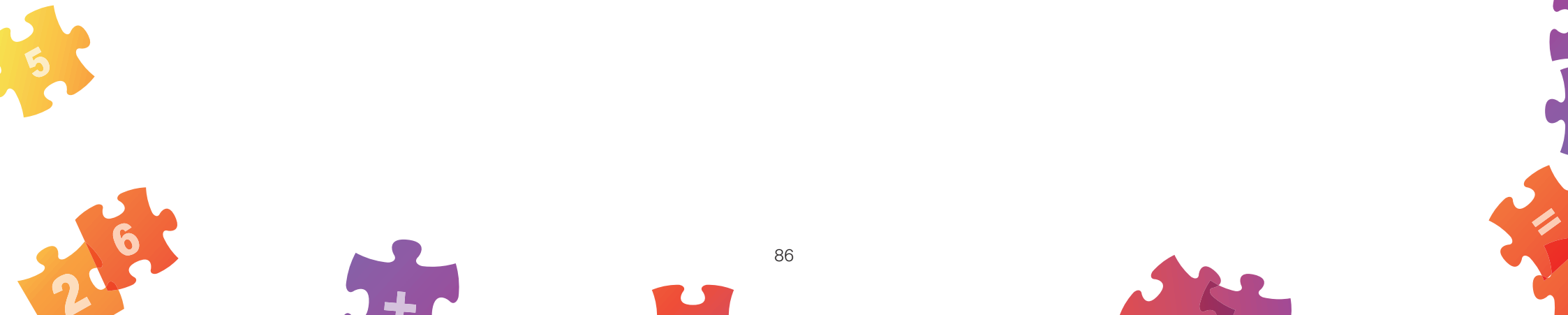
	• Solve open-ended investigations	 • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is a multiple of 5 etc.	
Solve problems which require answers to be rounded to specified degrees of accuracy	For addition and subtraction, answers to be rounded to the nearest whole number, to one decimal place, two decimal places or three decimal places For multiplication and division, answers to be rounded to the nearest whole number, to one decimal place or two decimal places For division, rounding to the nearest whole number may be rounding up or down depending on the context (eg how many egg boxes are needed would be rounded up, but how many egg boxes are full would be rounded down)	Refer to **'Following the calculation sequence:'** section, including questions where rounding to specified degree is required	

Notes

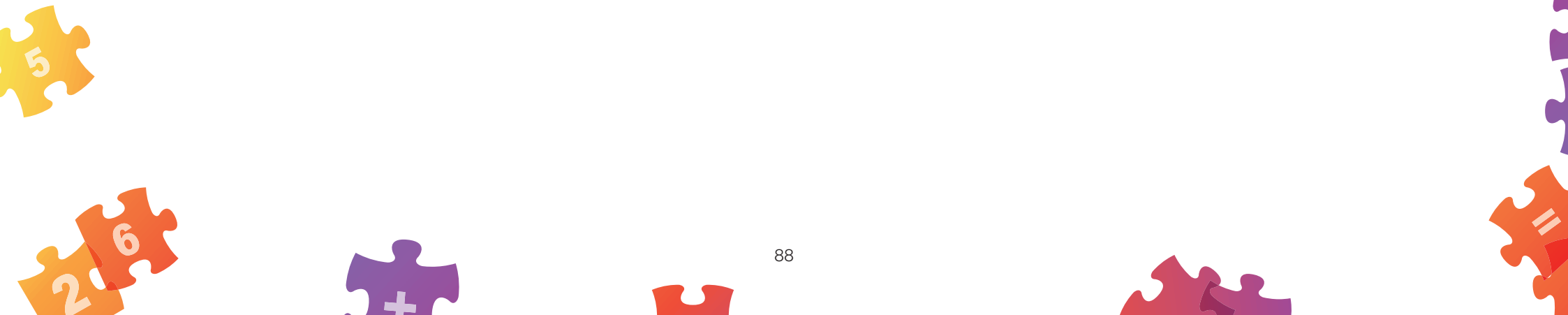
Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	When given one fact, children can use their skills of multiplication or division to derive associated facts Build on the work in year 5 on scaling up and down, making connections with all measures Progression shown by using the skill of conversion in terms of weight, volume/ capacity and length	100g of bird seed costs £3.76 What does 50g cost, 200g, 1kg? Here is recipe in that feeds 3 people, what quantities would I need to feed 12 people? Answers to be expressed in kg Each person in a relay runs 150m. If there are 17 runners, what is the total distance covered in km? A square has an area of $25m^2$. Double the length of the sides and calculate the new area	
Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	Children apply their understanding of the relationship between percentages, fractions and decimals When making these connections, children work with fractions with a denominator of 100, 50, 25, 20, 10, 5 and 2, and convert these to decimals with up two decimal places	Which of the following discounts is the greatest and which is the least: $\frac{5}{25}$, 0.28, $\frac{2}{5}$, 0.3, 35%? Show your workings by converting each one into decimals and ordering them from smallest to largest There is 200ml of milk in the glass, Peter drinks $\frac{3}{5}$, what is the volume of milk remaining in millilitres?	

Notes

	Using knowledge of $\frac{1}{2} = 50\%$ and $\frac{1}{4} = 25\%$ and $\frac{1}{10} = 10\%$ to calculate percentages of quantities Find 10% and use this knowledge to then calculate 5% and other multiples of 5%	Find 75% of 900m Find 25% of £15 Here is a set of prices. All prices are to increase by 15% What is the increase in price? What is the new price? If a television cost £300 and is reduced by 35%, what is the new price?	
Solve problems involving similar shapes where the scale factor is known or can be found	Scale factor is the ratio of the length of a scale drawing to the corresponding length of the actual object Ratios can be used to scale drawings up or down Scale factor notation is the same as ratio so a scale factor of 50 is represented by 1:50 Given or missing information may be actual measurements and /or scale measurements, and / or scale factors and / or ratios Solve problems by finding the missing information	 This is a scale drawing where $a = 7$cm and $b = 3$cm and the scale factor is 3. Use this information to draw the original shape The school is hall is 8m long and is represented on a scale drawing by 8cm What is the scale factor?	


5
2
6
+
=

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	This is the basic introduction to ratio and proportion Ratio is used to keep things in proportion A ratio compares values, that is, how much of one thing there is compared to another, that is, part with part. They can be scaled up and down (see link to scale factors). We usually separate the two numbers in a ratio with a colon (:) The link with multiples should be explored here as children will be using this when scaling up or down to solve ratio problems Proportion is how many parts out of the whole thing and is often specified as 1 in every…, or 1 out of…, that is, part with whole. The link with fractions can be reinforced here in order that that children can use the skills of division and multiples to solve proportion problems	To dilute orange squash you use the ratio of 2 parts orange to 5 parts water. If I use 120ml of orange, how much water will I need? In a tray of 210 eggs, 1 in every 6 eggs is cracked. How many eggs are cracked and how many are not cracked? There are 250 pupils in the school and 3 in every 5 are boys. This can also be expressed as $\frac{3}{5}$ of the pupils are boys. How many of the pupils are girls? (This can be solved by using the skills of scaling up, or by using ÷ and x to find $\frac{3}{5}$ of 250)	


5
2
6
+
=

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	Building on the objective above (converting units of measure) children can use the skills of converting between standards units of measurement and now apply this in problem solving contexts Progression shown through a focus on decimal notation to 3 decimal places Units: Length km, m, cm, mm Mass kg, g Volume/capacity l, cl, ml Time hrs, min, s	Refer to **'Following the calculation sequence:'** section, and showing progression by now including questions where conversions of measure are also required	


5


6
2

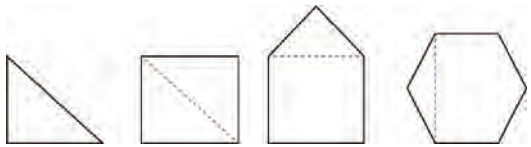
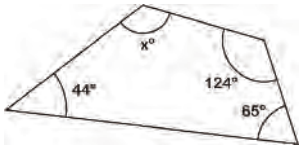
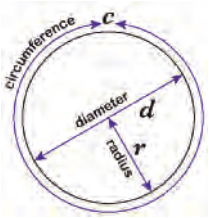

+

Spring 2

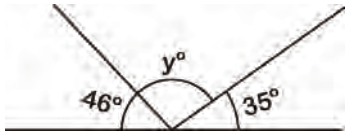
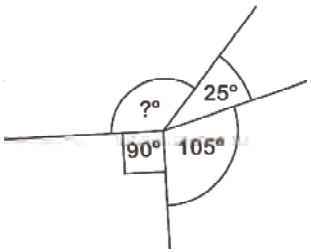
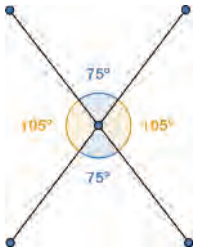
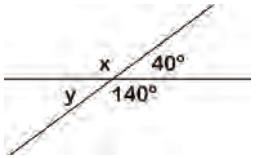
Notes

YEAR 6 PROGRAMME OF STUDY			
DOMAIN 3 – GEOMETRY			
NEW OBJECTIVES – SPRING 2			
PROPERTIES OF SHAPES			
Objectives (statutory requirements)	What does this mean?	Example questions	**Notes and guidance (non-statutory)**
Draw 2-D shapes using given dimensions and angles	Draw polygons such as triangles and quadrilaterals to a set of given criteria with a reasonable degree of accuracy in terms of lengths of sides and/or sizes of angles Use the notation of // for parallel lines and ⌐ for right angles	Using a ruler and a protractor, draw a right angled triangle with sides measuring 10cm, 6cm and 8cm Draw a parallelogram with a base of 6cm and a vertical height of 5cm Label all sides and angles, indicating parallel lines and right angles	Pupils draw shapes and nets accurately, using measuring tools and conventional markings and labels for lines and angles. Pupils describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements. These relationships might be expressed algebraically for example, $d = 2 \times r$; $a = 180 - (b + c)$.
Recognise, describe and build simple 3-D shapes, including making nets	Recognise, describe (including vocabulary of faces, edges and vertices) and then construct shapes such as cubes, cuboids, pyramids and prisms Using given properties of such shapes be able to draw and make an accurate net	Draw the net of a cuboid where the base is a square with sides measuring 5cm and longer edges measuring 7cm	
Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons	Geometric shapes can have straight sides (polygons) or curved sides (circles and ellipses) Children can sort a set of shapes according to criteria that relates to properties such as sides and angles Sum of interior angles of polygons: triangle = 180° quadrilateral = 360° pentagon = 540°		

Notes

	hexagon = 720° heptagon = 900° octagon = 1080° As the number of sides on a polygon increases, it is the same as adding a triangle, therefore adding 180° to the interior angles In a triangle, quadrilateral or regular polygon, children can find an unknown angle by using knowledge of the sum of the interior angles Make links with Algebra, Autumn 2, for unknown variables	Use models such as these to support understanding  I have an isosceles triangle where two of the angles measure 70° each. What is the size of the remaining angle? If I draw a regular hexagon, what size will each of the internal angles be?  Find the value of x $x = 360° - 65° - 124° - 44°$	
Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius	Be able to label the radius, diameter and circumference on a circle Understand the relationship between the radius (r) and the diameter (d) that is $d = 2 \times r$ or $d = 2r$ Link with Algebra, Autumn 2		

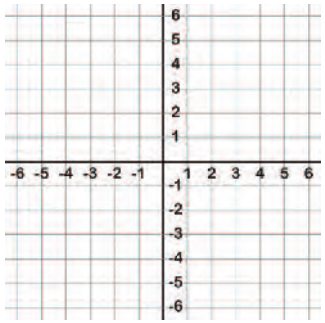
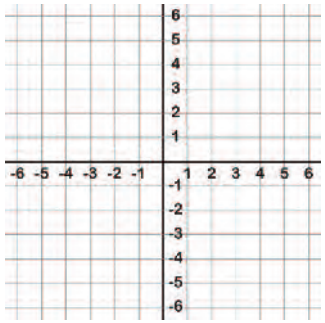
Notes

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.	Understand how angles are formed and the relationships between them when they meet: • Angles on a straight line add to 180° Make the link with Algebra, Autumn 2 • Angles around a point add to 360 Make the link with Algebra, Autumn 2 • Vertically opposite angles are always equal Make the link with Algebra, Autumn 2	 $180^\circ = 46^\circ + 35^\circ + y$  $360^\circ = 105^\circ + 90^\circ + 25^\circ + x$  	

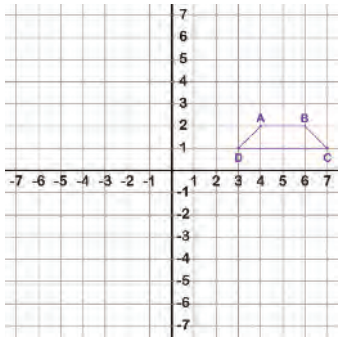
Notes

NEW OBJECTIVES – SPRING 2

POSITION AND DIRECTION

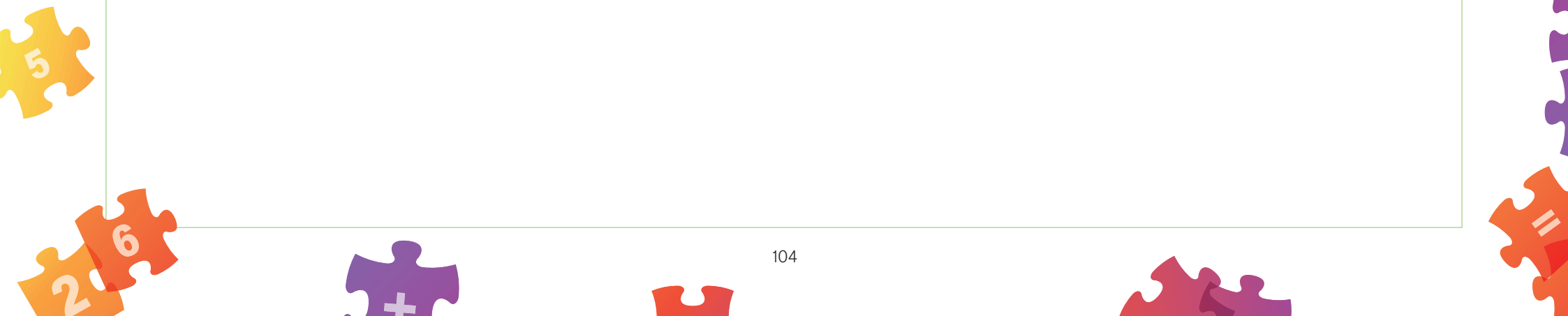
Describe positions on the full coordinate grid (all four quadrants)	Children can draw and label a pair of axes to show all 4 quadrants Children can accurately label given points in all 4 axes		Pupils draw and label a pair of axes in all four quadrants with equal scaling. This extends their knowledge of one quadrant to all four quadrants, including the use of negative numbers. Pupils draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for example, translating vertex (a, b) to $(a - 2, b + 3)$; (a, b) and $(a + d, b + d)$ being opposite vertices of a square of side d.
Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.	Using all 4 quadrants: • Plot given points to construct a shape • Find the missing coordinate of a given shape	 Plot the following points in order to construct a polygon (0, -3), (2, -1), (-2, 3), (-4, 0) The coordinates for a square are (-4, 0), (0, 4), (4, 0). What is the missing coordinate?	

Notes

	• Translate a given or drawn shape using the vocabulary of left, right, up and down (translation is a 'slide' movement)	 Translate this shape by moving it 6 down and 3 to the left	
	• Reflect a given or drawn shape when either the x axis or the y axis acts as the mirror line (reflection is a 'flip' movement)	Reflect this shape in the x axis and then in the y axis	

Notes

CONTINUOUS OBJECTIVES – SPRING 2			
Solve number and practical problems that involve all of the above (number and place value)	Be able to answer word and reasoning problems linked to place value	Emma has used these digit cards to make the number 367.98  Subtract 8.39 from Emma's number If you made the number that is four hundredths more than Emma's, which new digit card(s) would you need? How many prime numbers less than 100 can you make with these digit cards? What is the number half way between 12.215 and 40.617? Fill in the missing numbers: 0.06 x ☐ = 60 ☐ ÷ 1000 = 0.16 0.603 x ☐ = 603	


5
2
6
+
=

		Find the numbers that could fit the following clues: • Less than 100, square and odd • A multiple of 8 that rounds to 130 as the nearest ten • A cubed number greater than 100 Continue the sequence: 11, 8.5, 6, 3.5, 1, ☐ ☐ Find the number less than 30 that has the most factors	
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why **Solve problems involving addition, subtraction, multiplication and division** **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy**	Teaching of the skill to be in line with School Calculation Policy **Method for + and - :** • Column **Progression shown through:** Working with numbers up to THTU.t h th Ensure that children have opportunities to: • Estimate the answer	5487.324 + 2564.142 5487.324 + 2564.142 8051.466 Column 5487.324 – 2564.142 5487.324 – 2564.142 2923.182 Column **Following the calculation sequence for addition and subtraction** • Estimate 1245.854 + 1123.364	

Notes

	• Evidence the skill of addition and/or subtraction	• Calculate 1245.854 + 1123.364	
	• Prove the inverse using the skill of addition and/or subtraction	• Prove 2369.218 – 1123.364 = 1245.854	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 2369.21m – 1123.36m (when calculations include units of measure, a degree of accuracy to two decimal places allows sufficient challenge)	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 2369.218 - □ = 1245.854 (or, when including units of measure, a degree of accuracy to two decimal places allows sufficient challenge e.g. 2369.21cm - □ = 1245.85cm)	
	• Solve problems including those with more than one step	• I have 1245.85 litres of water in one container and 1123.36 litres in another container, how much do I have altogether? I pour out 450.5 litres, how much is now left?	
	• Solve open-ended investigations	□□□ + □□□ = □□□□ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is odd/even etc	

Notes

	Multiplication and division: Keeping size of calculations in line with the teaching of the skill (see Autumn 1) TU x TU, HTU x U, HTU x TU or THTU x U THTU ÷ U, HTU ÷ TU or THTU ÷ TU, ensure that children have opportunities to: • Estimate the answer • Evidence the skill of multiplication and division • Prove the inverse using the skill of multiplication and/or division • Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds) • Solve missing box questions including those where missing box represents a digit or represents a number • Solve problems including those with more than one step	**Following the calculation sequence for multiplication and division:** • Estimate 214 x 17 = • Calculate 214 x 17 = • Prove 3638 ÷ 17 = 214 • Calculate 214 ml x 17 = • 3638 ÷ ☐ = 214 • One full barrel holds 214 litres and there are 17 full barrels, how much do I have altogether? I sell 2 barrels, how many litres do I have left?	

Notes

	• Solve open-ended investigations	 • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is a multiple of 5 etc.	
Solve problems which require answers to be rounded to specified degrees of accuracy	For addition and subtraction, answers to be rounded to the nearest whole number, to one decimal place, two decimal places or three decimal places For multiplication and division, answers to be rounded to the nearest whole number, to one decimal place or two decimal places For division, rounding to the nearest whole number may be rounding up or down depending on the context (eg how many egg boxes are needed would be rounded up, but how many egg boxes are full would be rounded down)	Refer to **'Following the calculation sequence:'** section, including questions where rounding to specified degree is required	

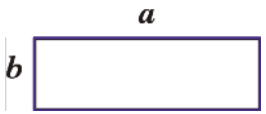

5


6
2


+


=

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	When given one fact, children can use their skills of multiplication or division to derive associated facts Build on the work in year 5 on scaling up and down, making connections with all measures Progression shown by using the skill of conversion in terms of weight, volume/ capacity and length	100g of bird seed costs £3.76 What does 50g cost, 200g, 1kg? Here is recipe in that feeds 3 people, what quantities would I need to feed 12 people? Answers to be expressed in kg Each person in a relay runs 150m. If there are 17 runners, what is the total distance covered in km? A square has an area of $25m^2$. Double the length of the sides and calculate the new area	
Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	Children apply their understanding of the relationship between percentages, fractions and decimals When making these connections, children work with fractions with a denominator of 100, 50, 25, 20, 10, 5 and 2, and convert these to decimals with up two decimal places	Which of the following discounts is the greatest and which is the least: $\frac{5}{25}$, 0.28, $\frac{2}{5}$, 0.3, 35%? Show your workings by converting each one into decimals and ordering them from smallest to largest There is 200ml of milk in the glass, Peter drinks $\frac{3}{5}$, what is the volume of milk remaining in millilitres?	

	Using knowledge of $\frac{1}{2} = 50\%$ and $\frac{1}{4} = 25\%$ and $\frac{1}{10} = 10\%$ to calculate percentages of quantities Find 10% and use this knowledge to then calculate 5% and other multiples of 5%	Find 75% of 900m Find 25% of £15 Here is a set of prices. All prices are to increase by 15% What is the increase in price? What is the new price? If a television cost £300 and is reduced by 35%, what is the new price?	
Solve problems involving similar shapes where the scale factor is known or can be found	Scale factor is the ratio of the length of a scale drawing to the corresponding length of the actual object Ratios can be used to scale drawings up or down Scale factor notation is the same as ratio, so a scale factor of 50 is represented by 1:50 Given or missing information may be actual measurements and /or scale measurements, and / or scale factors and / or ratios Solve problems by finding the missing information	 This is a scale drawing where $a = 7$cm and $b = 3$cm and the scale factor is 3. Use this information to draw the original shape The school is hall is 8m long and is represented on a scale drawing by 8cm What is the scale factor?	

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	This is the basic introduction to ratio and proportion Ratio is used to keep things in proportion A ratio compares values, that is, how much of one thing there is compared to another, that is, part with part. They can be scaled up and down (see link to scale factors). We usually separate the two numbers in a ratio with a colon (:) The link with multiples should be explored here as children will be using this when scaling up or down to solve ratio problems Proportion is how many parts out of the whole thing and is often specified as 1 in every…, or 1 out of…, that is, part with whole. The link with fractions can be reinforced here in order that that children can use the skills of division and multiples to solve proportion problems	To dilute orange squash you use the ratio of 2 parts orange to 5 parts water. If I use 120ml of orange, how much water will I need? In a tray of 210 eggs, 1 in every 6 eggs is cracked. How many eggs are cracked and how many are not cracked? There are 250 pupils in the school and 3 in every 5 are boys. This can also be expressed as $\frac{3}{5}$ of the pupils are boys. How many of the pupils are girls? (This can be solved by using the skills of scaling up, or by using ÷ and x to find $\frac{3}{5}$ of 250)	

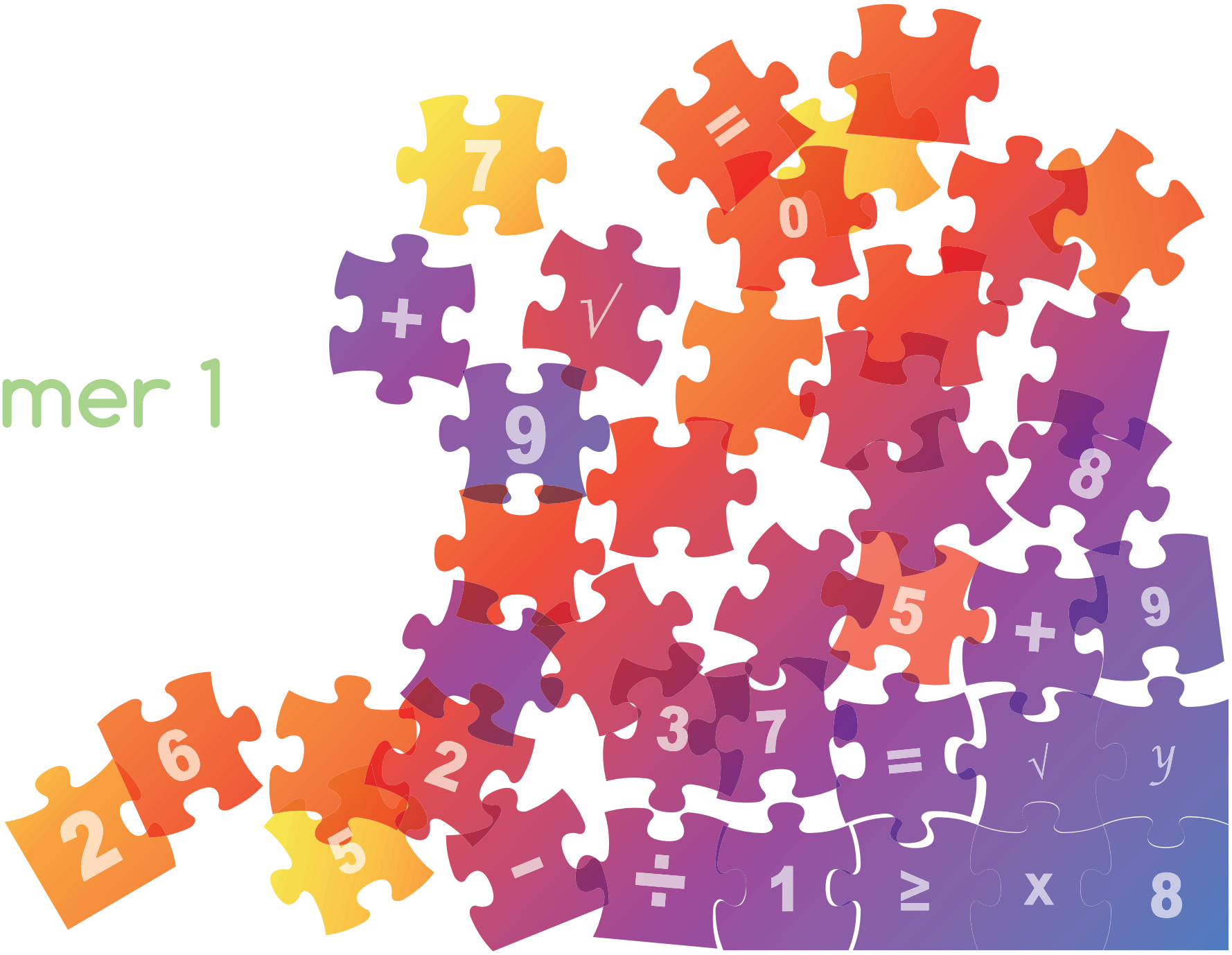
Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	Building on the objective above (converting units of measure) children can use the skills of converting between standards units of measurement and now apply this in problem solving contexts Progression shown through a focus on decimal notation to 3 decimal places Units: Length km, m, cm, mm Mass kg, g Volume/capacity l, cl, ml Time hrs, min, s	Refer to **'Following the calculation sequence:'** section, and showing progression by now including questions where conversions of measure are also required	

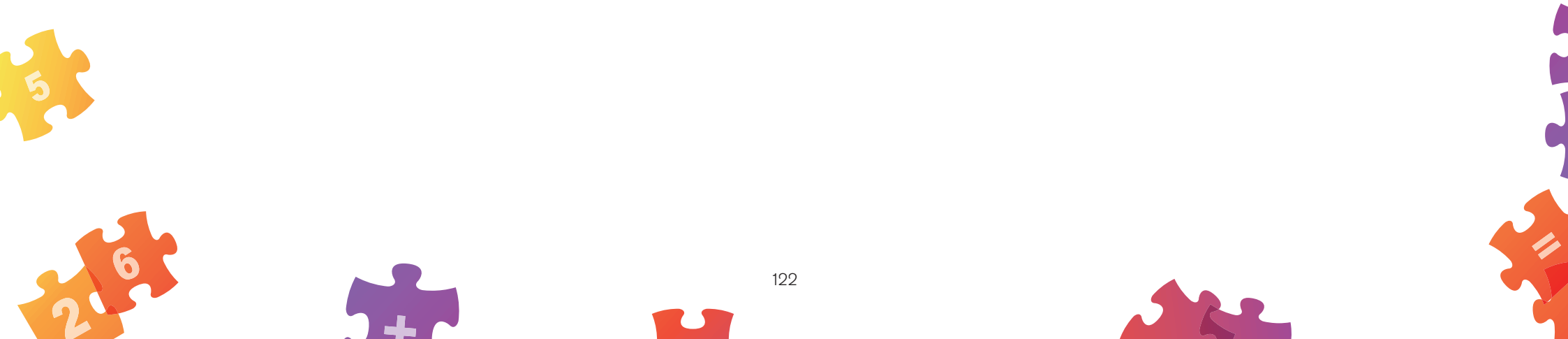

5

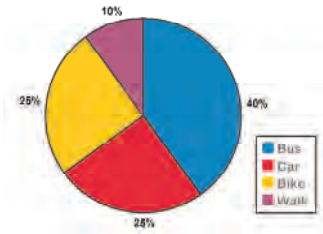

6
2


+

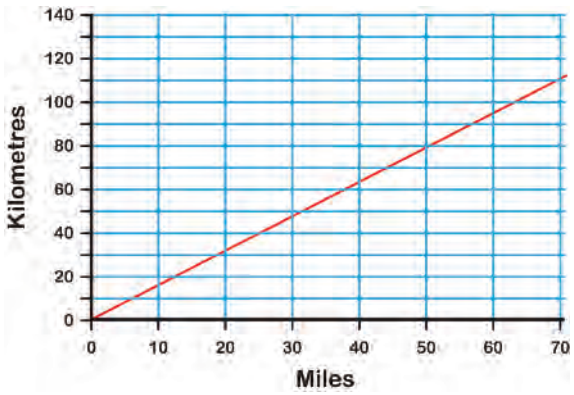
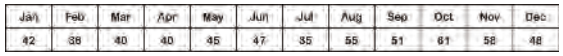
Summer 1




5
2
6
+
=

YEAR 6 PROGRAMME OF STUDY			
DOMAIN 4 – STATISTICS			
NEW OBJECTIVES – SUMMER 1			
Objectives (statutory requirements)	What does this mean?	Example questions	**Notes and guidance (non-statutory)**
Interpret and construct pie charts and line graphs and use these to solve problems	Pie charts use different sized sectors of a circle to represent data Know that there are 360˚ in a circle When reading and interpreting pie charts, children make links with: • the work on fractions and percentages in Autumn 2 (e.g. $\frac{1}{4}$ = 25%) • degrees around a point and on a straight line in Spring 2 (e.g. $\frac{1}{3}$ = 120˚) A line graph uses points connected by lines. It shows information that is connected in some way (such as a change in time) Construct a line graph by using collected or given information	 Which is the most common mode of transport? What fraction is purple? If the blue sector represents 100 people, how many people were interviewed as part of the survey? Distance Travelled (km): 12, 30, 41, 57, 70 Time Taken (hours): 0.5, 1, 1.5, 2, 2.5 Construct the line graph to show this information	Pupils connect their work on angles, fractions and percentages to the interpretation of pie charts. Pupils both encounter and draw graphs relating two variables, arising from their own enquiry and in other subjects. They should connect conversion from kilometres to miles in measurement to its graphical representation. Pupils know when it is appropriate to find the mean of a data set.

Notes

	A conversion graph is a specific type of line graph that is used to convert one unit into another Explore such graphs (e.g. converting imperial units to metric units) and be able to read and interpret them		
Calculate and interpret the mean as an average.	From a set of data, children can calculate the mean as an average by adding up all the numbers and then dividing by the count	 This table shows the annual rainfall in London in mm Calculate the average monthly rainfall	

Notes

CONTINUOUS OBJECTIVES – SUMMER 1			
Solve number and practical problems that involve all of the above (number and place value)	Be able to answer word and reasoning problems linked to place value	Emma has used these digit cards to make the number 367.98  Subtract 8.39 from Emma's number If you made the number that is four hundredths more than Emma's, which new digit card(s) would you need? How many prime numbers less than 100 can you make with these digit cards? What is the number half way between 12.215 and 40.617 Fill in the missing numbers: 0.06 x ☐ = 60 ☐ ÷ 1000 = 0.16 0.603 x ☐ = 603	

Notes

		Find the numbers that could fit the following clues: • Less than 100, square and odd • A multiple of 8 that rounds to 130 as the nearest ten • A cubed number greater than 100 Continue the sequence: 11, 8.5, 6, 3.5, 1, ☐ ☐ Find the number less than 30 that has the most factors	
Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why **Solve problems involving addition, subtraction, multiplication and division** **Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy**	Teaching of the skill to be in line with School Calculation Policy **Method for + and - :** • Column **Progression shown through:** Working with numbers up to THTU.t h th	5487.324 + 2564.142 5487.324 + 2564.142 8051.466 1 1 1 Column 5487.324 – 2564.142 4 1 2 1 5487.324 – 2564.142 2923.182 Column	

Notes

	Ensure that children have opportunities to:	**Following the calculation sequence for addition and subtraction**	
	• Estimate the answer	• Estimate 1245.854 + 1123.364	
	• Evidence the skill of addition and/or subtraction	• Calculate 1245.854 + 1123.364	
	• Prove the inverse using the skill of addition and/or subtraction	• Prove 2369.218 – 1123.364 = 1245.854	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 2369.21m – 1123.36m (when calculations include units of measure, a degree of accuracy to two decimal places allows sufficient challenge)	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 2369.218 - ☐ = 1245.854 (or, when including units of measure, a degree of accuracy to two decimal places allows sufficient challenge e.g. 2369.21cm - ☐ = 1245.85cm)	
	• Solve problems including those with more than one step	• I have 1245.85 litres of water in one container and 1123.36 litres in another container, how much do I have altogether? I pour out 450.5 litres, how much is now left?	
	• Solve open-ended investigations	☐☐☐ + ☐☐☐ = ☐☐☐☐ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is odd/even etc	

Notes

	Multiplication and division: Keeping size of calculations in line with the teaching of the skill TU x TU, HTU x U, HTU x TU or THTU x U, THTU ÷ U, HTU ÷ TU or THTU ÷ TU, ensure that children have opportunities to:	**Following the calculation sequence for multiplication and division:**	
	• Estimate the answer	• Estimate 214 x 7 =	
	• Evidence the skill of multiplication and division	• Calculate 214 x 7 =	
	• Prove the inverse using the skill of multiplications and division	• Prove 1498 ÷ 7 = 214	
	• Practice calculation skill including units of measure (km, m, cm, mm, kg, g, l, cl, ml, hours, minutes and seconds)	• Calculate 214 ml x 7 =	
	• Solve missing box questions including those where missing box represents a digit or represents a number	• 3638 ÷ ☐ = 214	
	• Solve problems including those with more than one step	• One full barrel holds 214 litres and there are 7 full barrels, how much do I have altogether? I sell 2 barrels, how many litres do I have left?	
	• Solve open-ended investigations	☐☐☐ x ☐☐ = ☐☐☐☐ • Using the digit cards 1 to 9, make the smallest/biggest answer, an answer that is a multiple of 5 etc.	

Notes

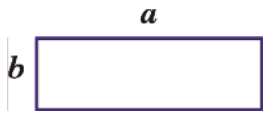
Solve problems which require answers to be rounded to specified degrees of accuracy	For addition and subtraction, answers to be rounded to the nearest whole number, to one decimal place, two decimal places or three decimal places For multiplication and division, answers to be rounded to the nearest whole number, to one decimal place or two decimal places For division, rounding to the nearest whole number may be rounding up or down depending on the context (eg how many egg boxes are needed would be rounded up, but how many egg boxes are full would be rounded down)	Refer to **'Following the calculation sequence:'** section, including questions where rounding to specified degree is required	
Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts	When given one fact, children can use their skills of multiplication or division to derive associated facts Build on the work in year 5 on scaling up and down, making connections with all measures Progression shown by using the skill of conversions are required in terms of weight, volume/ capacity and length	100g of bird seed costs £3.76 What does 50g cost, 200g, 1 kg? Here is recipe that feeds 3 people, what quantities would I need to feed 12 people? Answers to be expressed in kg Each person in a relay runs 150m. If there are 17 runners, what is the total distance covered in km? A square has an area of 25cm^2. Double the length of the sides and calculate the new area	


5


2
6


=

Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison	Children apply their understanding of the relationship between percentages, fractions and decimals When making these connections, children work with fractions with a denominator of 100, 50, 25, 20, 10, 5 and 2, and convert these to decimals with up two decimal places Using knowledge of $\frac{1}{2} = 50\%$ and $\frac{1}{4} = 25\%$ and $\frac{1}{10} = 10\%$ to calculate percentages of quantities Find 10% and use this knowledge to then calculate 5% and other multiples of 5%	Which of the following discounts is the greatest and which is the least: $\frac{5}{25}$, 0.28, $\frac{2}{5}$, 0.3, 35%? Show your workings by converting each one into decimals and ordering them from smallest to largest There is 200ml of milk in the glass, Peter drinks $\frac{3}{5}$, what is the volume of milk remaining in millilitres? Find 75% of 900m Find 25% of £15 Here is a set of prices. All prices are to increase by 15% What is the increase in price? What is the new price? If a television cost £300 and is reduced by 35%, what is the new price?	
Solve problems involving similar shapes where the scale factor is known or can be found	Scale factor is the ratio of the length of a scale drawing to the corresponding length of the actual object Ratios can be used to scale drawings up or down Scale factor notation is the same as ratio, so a scale factor of 50 is represented by 1:50		

	Given or missing information may be actual measurements and /or scale measurements, and / or scale factors and / or ratios Solve problems by finding the missing information	 This is a scale drawing where $a = 7$cm and $b = 3$cm and the scale factor is 3. Use this information to draw the original shape The school is hall is 8m long and is represented on a scale drawing by 8cm What is the scale factor?	
Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	This is the basic introduction to ratio and proportion Ratio is used to keep things in proportion A ratio compares values, that is, how much of one thing there is compared to another, that is, part with part. They can be scaled up and down (see link to scale factors). We usually separate the two numbers in a ratio with a colon (:) The link with multiples should be explored here as children will be using this when scaling up or down to solve ratio problems Proportion is how many parts out of the whole thing and is often specified as 1 in every…, or 1 out of…, that is, part with whole.	To dilute orange squash you use the ratio of 2 parts orange to 5 parts water. If I use 120ml of orange, how much water will I need? In a tray of 210 eggs, 1 in every 6 eggs is cracked. How many eggs are cracked and how many are not cracked?	

	The link with fractions can be reinforced here in order that that children can use the skills of division and multiples to solve proportion problems	There are 250 pupils in the school and 3 in every 5 are boys. This can also be expressed as $\frac{3}{5}$ of the pupils are boys. How many of the pupils are girls? (This can be solved by using the skills of scaling up, or by using ÷ and x to find $\frac{3}{5}$ of 250)	
Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	Building on the objective above (converting units of measure) children can use the skills of converting between standards units of measurement and now apply this in problem solving contexts Progression shown through a focus on decimal notation to 3 decimal places Units: Length km, m, cm, mm Mass kg, g Volume/capacity l, cl, ml Time hrs, min, s	Refer to **'Following the calculation sequence:'** section, and showing progression by now including questions where conversions of measure are also required	

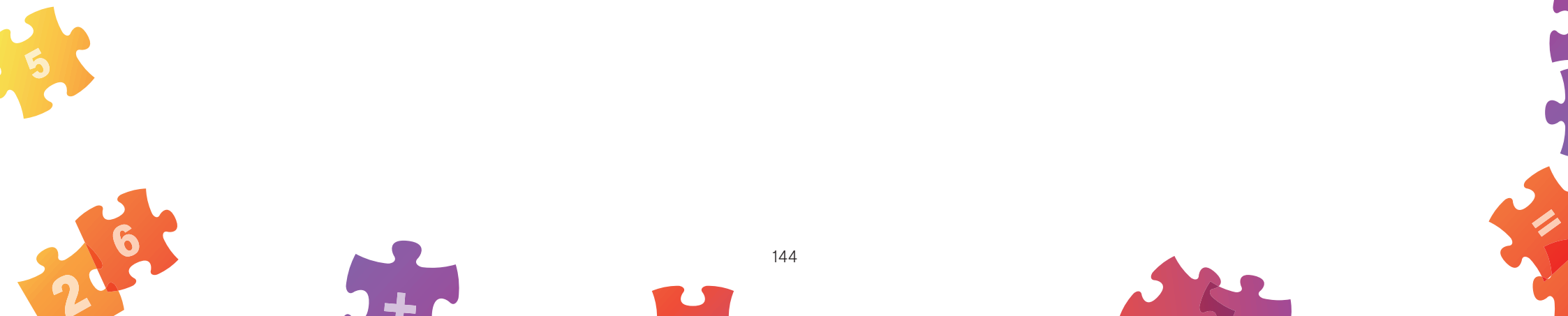

5


6
2


+

Basic Skills

Appendix 1


5
2
6
+
=

YEAR 6 - BASIC SKILLS	
SKILLS	**GUIDANCE NOTES**
Count forward and backwards in steps of powers of 10 for any given number up to 10 000 000	Count out loud, forwards and backwards in powers of 10 following the sequence 10, 100, 1000 etc. from different starting points Use different visuals to help children have a feel for the size of the numbers they are counting
Count forwards and backwards with positive and negative whole number including zero and calculate intervals across zero	Count forwards and backwards from different starting points in all multiples up to and including 12 Use temperature as the context when bridging zero into negative numbers Calculate differences in temperatures using both positive and negative values
Read, write, order and compare numbers up to 10 000 000 and determine the place value of each digit	Use structured apparatus and place value grid to support conceptual understanding of place value Play place value games to reinforce this concept Compare two numbers up to seven digits, children can say which is the bigger, the smaller, they also use the < and > signs Order consecutive and non-consecutive numbers both forwards and backwards
Partition numbers into place value columns	Partition any number up to 10, 000, 000 1 253 164 = 1 000 000 + 200 000 + 5 000 + 3 000 + 100 + 60 + 4
Partition numbers in different ways	3 213 164 = 3 000 000 + 200 000 + 10 000 + 3 000 + 100 + 60 + 4 and also = 3 000 000 + 130 000 + 80 000 + 2 000 + 1 100 + 50 + 14 etc. Include numbers with up to 3 decimal places

Notes

Round any whole number to a required degree of accuracy	2 562 234 is 2 562 230 (to the nearest 10), 2 562 200 (to the nearest 100), 2 562,000 (to the nearest 1000) 2 560 000 (to the nearest 10 000) and 2 600 000 (to the nearest 100 000) and 3 000 000 (to the nearest 1 000 000)
Use rounding to support estimation and calculation	Before calculating, make reasonable estimates 512 234 + 3168 is approximately 512 000 + 3000 = 515 000 etc
Use knowledge of place value to derive new addition and subtraction facts	If I know 830 + 170 = 1 000, I know: 8 300 + 1 700 = 10 000, 83 000 + 17 000 =100 000, 0.83 + 0.17 = 1
Recognise and use square and cube numbers Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers. Establish whether a number up to 100 is prime and recall prime numbers up to 19	Identify the squares of single digit numbers Be able to calculate simple cube numbers Know the difference between a prime number and a composite number and identify prime numbers Can find the prime factors of a given number
Double any number between 1 and 1000 and find all corresponding halves	Use partitioning to double 365 so that it becomes double 300 + double 60 + double 5 Halve 730 by partitioning it into 600, 120 and 10 then halving each and recombining
Add and subtract mentally with jottings with increasingly large numbers to aid fluency E.g. HthTthTHTU ± TthTHTU TthTHTU ± THTU HTU.t ± TU.t	Secure the skills of bridging, partitioning, doubling and knowledge of number pairs up to ten to add and subtract mentally 312 462 ± 42 300 14 756 ± 1 230 367.6 ± 10.3

Notes

Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 giving answers up to 3 decimal places	Use knowledge of place value columns when multiplying and dividing by 10, 100 and 1000, that is, when moving from right to left, each place value column is ten times bigger and vice versa
Perform mental calculations including with mixed operations	After completing a mental addition calculation, can then find $\frac{1}{4}$ of it After muliplying a two digit number by 5, can then find 10% of it
Count up and down in tenths, hundredths and thousandths in decimals and fractions including bridging zero for example on a number line	Count forwards and backwards, from different starting points, consecutively and non-consecutively (e.g. $\frac{3}{100}$, $\frac{4}{100}$, $\frac{5}{100}$) and make connections with the decimal equivalents during counting (e.g. $\frac{3}{100}$, 0.4, $\frac{5}{100}$, 0.06 etc)
Use their knowledge of the order of operations to carry out calculations involving the four operations	Understand the order of operations using brackets such as $2 + (1 \times 3) = 5$ and $(2 + 1) \times 3 = 9$ Follow rules of BIDMAS to solve calculations including brackets
Use factors to simplify fractions	Identify common factors to reduce fractions to their simplest form Express the fraction $\frac{12}{18}$ in its simplest form
Compare and order decimals and fractions including fractions >1	Use knowledge of finding common denominators to convert fractions to the same denominator, and then compare and order these fractions Include mixed numbers and improper fractions For decimals use knowledge of place value to place decimals in ascending or descending order
Calculate simple percentages of amounts	Work with percentages that are multiples of 25%, 10% and 5% Calculate 15% of £45.00 30% of 230cm 75% of 360°

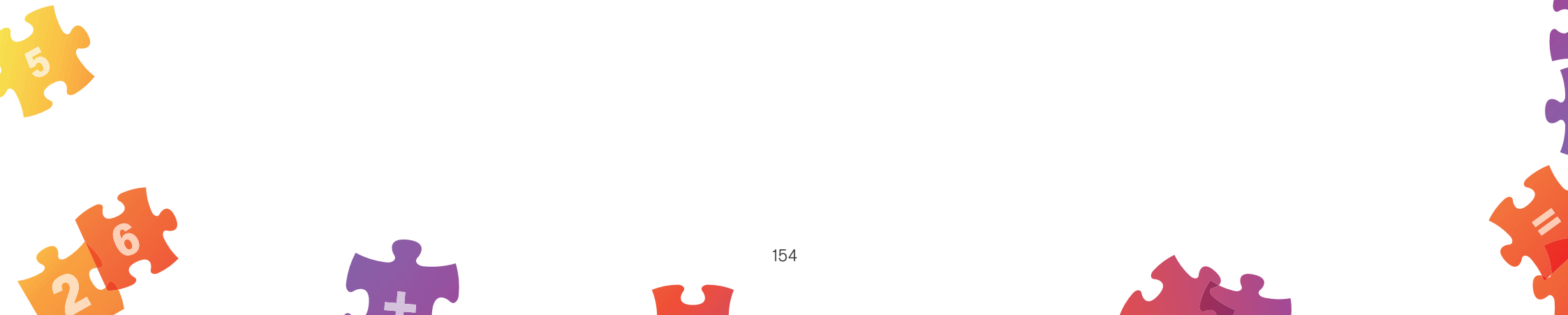
Notes

Recognise mixed numbers and improper fractions and convert from one form to another and write mathematical statements > 1 as a mixed number	$\frac{6}{5} = 1\frac{1}{5}$ $3\frac{1}{4} = \frac{13}{4}$
Derive decimal complements to 1 working with decimals up to 3 decimal places	Decimal complements of 1 $0.83 + 0.17 = 1$, $0.348 + 0.652 = 1$
Recall and derive equivalences between fractions, decimals and percentages	Convert fractions to decimals by finding equivalent fractions with a denominator of 10, 100 or 1000 Use this knowledge to then convert into percentages
Convert between money and measures including time	Use the rules of x and ÷ by 10, 100 and 1000 convert lengths (km, m, cm), mass (kg, g) volume and capacity (l, cl, ml) to include decimals Also convert time (hours, minutes, seconds)


5
2
6
+

Progression

Appendix 2


5
2
6
+
=

PROGRESSION THROUGH THE DOMAINS		
NUMBER AND PLACE VALUE		
Y5	**Y6**	**Y7**
read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit	**read, write, order and compare numbers up to 10 000 000 and determine the value of each digit**	understand and use place value (up to 3 decimal places) for decimals, measures and integers of any size
count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000	**round any whole number to a required degree of accuracy**	round decimal numbers to up to 2 decimal places and whole numbers to 1 significant figure
round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000	**use negative numbers in context, and calculate intervals across zero**	estimate answers to calculations using one significant figure for whole numbers
interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers including through zero	**solve number and practical problems that involve all of the above**	order positive and negative integers, decimals and fractions; use the number line as a model for ordering real numbers; use the symbols =, ≠, <, >, ≤, ≥
solve number problems and practical problems that involve all of the above		solve number problems and practical problems that involve all of the above
read Roman numerals to 1000 (M) and recognise years written in Roman numerals		

Notes

ADDITION AND SUBTRACTION		
Y5	**Y6**	**Y7**
add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)	**solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why**	add and subtract decimal numbers with up to 2 decimal places including using formal written methods (column addition and subtraction)
add and subtract numbers mentally with increasingly large numbers	**perform mental calculations, including with mixed operations and large numbers**	recognise and use relationships between operations including inverse operations
use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy	**identify common factors, common multiples and prime numbers**	use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple
solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	**use their knowledge of the order of operations to carry out calculations involving the four operations**	use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals
	solve problems involving addition, subtraction, multiplication and division	estimate answers to calculations using one significant figure for whole numbers
	use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy	

Notes

MULTIPLICATION AND DIVISION		
Y5	**Y6**	**Y7**
identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.	**multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication**	multiply and divide whole and decimal numbers with up to 2 decimal places including using formal written methods
solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes	**divide numbers up to 4 digits by a two-digit whole number using the formal written method of short division where appropriate, interpreting remainders according to context**	recognise and use relationships between operations including inverse operations
know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers	**divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context**	use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor and lowest common multiple
establish whether a number up to 100 is prime and recall prime numbers up to 19	**perform mental calculations, including with mixed operations and large numbers.**	use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals
multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers	**identify common factors, common multiples and prime numbers**	use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations
multiply and divide numbers mentally drawing upon known facts	**use their knowledge of the order of operations to carry out calculations involving the four operations**	estimate answers to calculations using one significant figure for whole numbers
divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context	**solve problems involving addition, subtraction, multiplication and division**	
multiply and divide whole numbers and those involving decimals by 10, 100 and 1000	**use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy**	
recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3})		
solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign		

Notes

MULTIPLICATION AND DIVISION		
Y5	**Y6**	**Y7**
solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates		

Notes

FRACTIONS (INCLUDING DECIMALS AND PERCENTAGES)		
Y5	**Y6**	**Y7**
compare and order fractions whose denominators are all multiples of the same number	**use common factors to simplify fractions; use common multiples to express fractions in the same denomination**	find equivalent fractions and use equivalence to solve problems
identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths	**compare and order fractions, including fractions >1**	use the four operations with decimals, proper fractions and improper fractions
recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements >1 as a mixed number (for example $+\frac{4}{5}=\frac{6}{5}=1\frac{1}{5}$)	**add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions**	work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and or 0.375 and)
add and subtract fractions with the same denominator and multiples of the same number	**multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $\frac{1}{4}\times\frac{1}{2}=\frac{1}{8}$)**	interpret fractions and percentages as operators as well as numbers
multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams	**divide proper fractions by whole numbers (e.g. $\frac{1}{3}\div 2=\frac{1}{6}$)**	interpret percentages and percentage changes as a fraction or a decimal
read and write decimal numbers as fractions (for example $0.71=\frac{71}{100}$)	**associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g.)**	find percentages of amounts, and increase or decrease amounts by a percentage using the unitary method and/or multiplier methods using equivalent fractions and decimals
recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents	**identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places**	express one quantity as a percentage of another
round decimals with two decimal places to the nearest whole number and to one **decimal place**		compare two quantities using percentages
		work with percentages greater than 100%

Notes

FRACTIONS (INCLUDING DECIMALS AND PERCENTAGES)		
Y5	**Y6**	**Y7**
solve problems involving number up to three decimal places	**multiply one-digit numbers with up to two decimal places by whole numbers**	
recognise the per cent symbol (%) and understand that per cent relates to "number of parts per hundred", and write percentages as a fraction with denominator 100, and as a decimal	**use written division methods where the answer has up to two decimal places**	
solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$, $\frac{2}{5}, \frac{4}{5}$ and those with a denominator of a multiple of 10 or 25	**solve problems which require answers to be rounded to specified degrees of accuracy**	
	recall and use equivalences between simple fractions, decimals and percentages, including in different contexts	

Notes

RATIO AND PROPORTION		
Y5	**Y6**	**Y7**
	solve problems involving the relative sizes of two quantities where missing values can be found using integer multiplication and division facts	introduce formal language and notation of ratio (in every, for every, colon notation)
	solve problems involving the calculation of percentages [for example, of measures such as 15% of 360] and the use of the percentage for comparison	cancel ratios to their lowest terms and link to equivalent fractions
	solve problems involving similar shapes where the scale factor is known or can be found	divide amounts in a given ratio using the unitary method and/or multiplier method using fractional scale factors
	solve problems involving unequal sharing and grouping using knowledge of fractions and multiples	express the division of a quantity into two parts as a ratio
		solve simple proportional reasoning problems

Notes

ALGEBRA		
Y5	**Y6**	**Y7**
	use simple formulae	use and interpret algebraic notation, including: • ab in place of $a \times b$ • $3y$ in place of $y + y + y$ and $3 \times y$ • a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$; a^2b in place of $a \times a \times b$ • $\frac{a}{b}$ in place of $a \div b$ • coefficients written as fractions rather than as decimals • brackets
	generate and describe linear number sequences	
	express missing number problems algebraically	
	find pairs of numbers that satisfy an equation with two unknowns	substitute numerical values into simple formulae and expressions
	enumerate possibilities of combinations of two variables	understand and use the concepts and vocabulary of expressions, equations, terms and factors
		simplify and manipulate linear algebraic expressions to maintain equivalence by: • collecting like terms • multiplying a single term over a bracket • taking out common factors (one factor only)
		use algebraic methods to solve linear equations in one variable up to 2 step equations, including brackets, where the answer is a whole number
		work with coordinates in all four quadrants and recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y
		generate terms of a linear sequence from either a term-to-term or a position-to-term rule
		recognise linear arithmetic sequences and find the nth term of simple sequences

Notes

MEASUREMENT		
Y5	**Y6**	**Y7**
convert between different units of metric measure (e.g. kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) understand and use approximate equivalences between metric units and imperial units such as inches, pounds and pints measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres calculate and compare the area of squares and rectangles (including squares) and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes estimate volume (e.g. using 1 cm^3 blocks to build cuboids) and capacity (e.g. using water) solve problems involving converting between units of time use all four operations to solve problems involving measure (e.g. length, mass, volume, money) using decimal notation including scaling	**solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate** **use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places** **convert between miles and kilometres** **recognise that shapes with the same areas can have different perimeters and vice versa** **recognise when it is possible to use formulae for area and volume of shapes** **calculate the area of parallelograms and triangles** **calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3]**	draw and measure line segments and angles in geometric figures, including interpreting simple scale drawings derive and apply formulae to calculate and solve problems involving: • perimeter and area of rectangles, triangles, parallelograms, trapezia • volume of cuboids (including cubes) calculate and solve problems involving: perimeters and areas of 2D rectilinear and composite shapes

Notes

GEOMETRY		
Y5	**Y6**	**Y7**
Properties of shapes identify 3-D shapes, including cubes and other cuboids, from 2-D representations know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles draw given angles, and measure them in degrees (°) Identify: angles at a point and one whole turn (total 360°) angles at a point on a straight line and $\frac{1}{2}$ a turn (total 180°) other multiples of 90° use the properties of rectangles to deduce related facts and find missing lengths and angles distinguish between regular and irregular polygons based on reasoning about equal sides and angles.	**Properties of shapes** **draw 2-D shapes using given dimensions and angles** **recognise, describe and build simple 3-D shapes, including making nets** **compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons** **illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius** **recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles**	**Properties of shapes** describe, sketch and draw: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric use the standard conventions for labelling the sides and angles of triangle ABC derive and illustrate properties of triangles and quadrilaterals [for example, equal lengths and angles] using appropriate language understand and use the angle facts, angles at a point, on a straight line, in a triangle and vertically opposite angles to solve geometrical reasoning problems, explaining solutions derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve simple problems in 3-D

Notes

GEOMETRY		
Y4	**Y5**	**Y6**
Position and direction identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed	**Position and direction** **describe positions on the full coordinate grid (all four quadrants)** **draw and translate simple shapes on the coordinate plane, and reflect them in the axes**	**Position and direction** work with coordinates in all four quadrants identify properties of, and describe the results of, translations, rotations and reflections applied to given figures

Notes

STATISTICS		
Y5	**Y6**	**Y7**
solve comparison, sum and difference problems using information presented in a line graph	**interpret and construct pie charts and line graphs and use these to solve problems**	construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
complete, read and interpret information in tables, including timetables	**calculate and interpret the mean as an average**	understand the difference between discrete and grouped data, and that different statistical diagrams are used to represent them.
		describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range)

Notes

PROBABILITY		
Y5	Y6	Y7
		understand and use the language of probability understand and use the probability scale understand that the probabilities of all possible outcomes sum to 1 record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes

For more information please contact:

School Improvement Liverpool
E-mail: SIL@liverpool.gov.uk
Telephone: 0151 233 3901