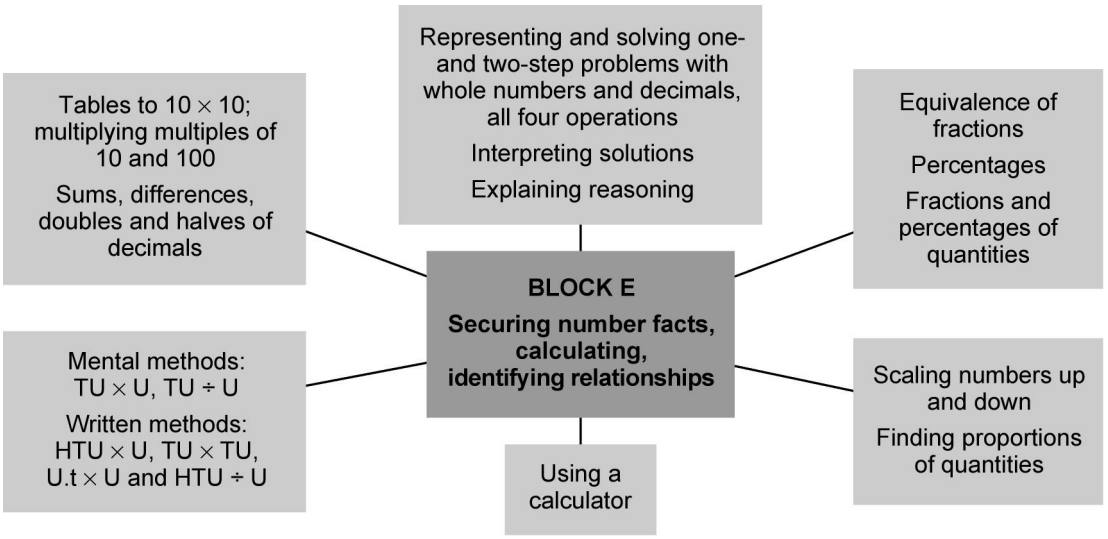
Year 5: Block E — Three 3-week units

Securing number facts, calculating, identifying relationships



Objectives End-of-year expectations (key objectives) are highlighted	Units 1	2	3
• Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem	✓	✓	✓
• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use	✓		✓
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols	✓	✓	
• Express a smaller whole number as a fraction of a larger one (e.g. recognise that 5 out of 8 is $^{5}/_{8}$); find equivalent fractions (e.g. $^{7}/_{10} = {}^{14}/_{20}$, or $^{19}/_{10} = 1{}^{9}/_{10}$); relate fractions to their decimal representations	✓	✓	✓
• Understand percentage as the number of parts in every 100 and express tenths and hundredths as percentages		✓	✓
• Use sequences to scale numbers up or down; solve problems involving proportions of quantities (e.g. decrease quantities in a recipe designed to feed six people)		✓	✓
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34)		✓	
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts	✓		
• Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9)	✓		

Objectives End-of-year expectations (key objectives) are highlighted	Units		
	1	2	3
• Extend mental methods for whole-number calculations, for example to multiply a two-digit number by a one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25), to subtract one near-multiple of 1000 from another (e.g. 6070 – 4097)	✓		
• Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U	✓		✓
• Find fractions using division (e.g. $^{1}/_{100}$ of 5 kg), and percentages of numbers and quantities (e.g. 10%, 5% and 15% of £80)	✓	✓	✓
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. find $^{3}/_{4}$ of 150 g); interpret the display correctly in the context of measurement	✓	✓	

Speaking and listening objectives for the block

Objectives	Units		
	1	2	3
• Present a spoken argument, sequencing points logically, defending views with evidence and making use of persuasive language	✓		✓
• Understand the process of decision making		✓	

Opportunities to apply mathematics in science

Activities		Units		
		1	2	3
5a	Keeping healthy: When investigating pulse rate, calculate beats per minute by counting the beats for 15 seconds and multiplying by 4.	✓		
5e	Earth, Sun and Moon: When describing the relative sizes of Sun, Earth and Moon, scale numbers up or down.		✓	
5b	Life cycles: Calculate the percentages of seeds which germinate in different conditions.			✓

Key aspects of learning: focus for the block

Enquiry	**Problem solving**	**Reasoning**	Creative thinking
Information processing	Evaluation	Self-awareness	Managing feeling
Social skills	**Communication**	Motivation	Empathy

Vocabulary

problem, solution, calculator, calculate, calculation, equation, operation, symbol, inverse, answer, method, explain, predict, reason, reasoning, pattern, relationship

add, subtract, multiply, divide, sum, total, difference, plus, minus, product, quotient, remainder, multiple, common multiple, factor, divisor, divisible by

decimal fraction, decimal place, decimal point, percentage, per cent (%)

fraction, proper fraction, improper fraction, mixed number, numerator, denominator, unit fraction, equivalent, cancel

proportion, in every, for every, to every

Building on previous learning

Check that children can already:

- use diagrams to identify equivalent fractions, e.g. $^{6}/_{8}$ and $^{3}/_{4}$, or $^{70}/_{100}$ and $^{7}/_{10}$; interpret mixed numbers and position them on a number line, e.g. $3\frac{1}{2}$
- use decimal notation for tenths and hundredths and partition decimals; position one- and two-place decimals on a number line
- know the equivalence between decimal and fraction forms of one half, one quarter, tenths and hundredths
- double and halve two-digit numbers
- use written methods to record, support and explain multiplication and division of two-digit numbers by a one-digit number, including division with remainders, e.g. 15 × 9, 98 ÷ 6
- use the vocabulary of ratio and proportion

Unit 5E1 3 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem *I can break a problem into steps and say the calculation I need to do to work out each step. I can check that my answer is sensible*	How many calculations are needed to solve this problem? What is the first step towards solving this problem? How will you record your working for this step? What does this answer tell you? Roughly, what answer do you expect from this question?
• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use *I can decide whether to solve problems using mental, written or calculator methods and explain my choice*	How will you solve this problem? Will you use a mental, written or calculator method? Why did you choose this method? Change the numbers in the problem to ones where you would choose to use a mental method.
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols *I can use diagrams to check that two fractions are equivalent*	Explain what this diagram tells you. Use this fraction wall to find a fraction equivalent to $\frac{3}{4}$. Show me on the number line that four eighths are equivalent to one half.
• Express a smaller whole number as a fraction of a larger one (e.g. recognise that 5 out of 8 is $\frac{5}{8}$); find equivalent fractions (e.g. $\frac{7}{10} = \frac{14}{20}$, or $\frac{19}{10} = 1\frac{9}{10}$); relate fractions to their decimal representations *I can explain how I know that two fractions, such as $\frac{7}{10}$ and $\frac{14}{20}$, are equivalent*	Tell me some fractions that are equivalent to one quarter. How do you know? Are there others? What about two thirds? What is the missing number? $\frac{7}{10} = \frac{\square}{30}$ How do you know? How could you show that $\frac{3}{6}$ is equivalent to $\frac{1}{2}$?
• Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts *I can use multiplication and division facts to multiply and divide multiples of 10 and 100*	How many times bigger is 2400 than 6? How do you know? What is 1800 ÷ 20? Explain how you know. A number multiplied by itself gives 900. What is the number?
• Identify pairs of factors of two-digit whole numbers and find common multiples (e.g. for 6 and 9) *I can find pairs of factors that multiply to make a given number* *I can find a common multiple of two numbers*	5 is a factor of 85. What is its factor pair? Find a number that has exactly four factors. Which of these numbers are common multiples of 3 and 4? 6 10 12 16 24 Amy says that to get a common multiple of 4 and 6, you can multiply them together. Is she right?

Objectives *Children's learning outcomes in italic*	Assessment for learning
• Extend mental methods for whole-number calculations, for example to multiply a two-digit number by a one-digit number (e.g. 12 × 9), to multiply by 25 (e.g. 16 × 25), to subtract one near-multiple of 1000 from another (e.g. 6070 – 4097) *I can use different mental strategies for multiplication and division depending on the numbers involved. I can explain why I chose a particular method*	Explain how you would work out 25 × 5, 1000 ÷ 5, 23 × 7. Why did you choose this method for this calculation? Show me and explain the jottings that you did to support your mental calculation.
• Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U *I can solve multiplication calculations using written methods. I can explain each step*	What numbers did you multiply to find this part of your answer? Which parts of your answer will change if I change this digit? Roughly, what do you expect the answer to be for this calculation? What tips would you give to someone to help them to multiply one two-digit number by another?
• Find fractions using division (e.g. $\frac{1}{100}$ of 5 kg), and percentages of numbers and quantities (e.g. 10%, 5% and 15% of £80) *I can find fractions of numbers using division. For example, to find $\frac{1}{3}$ of a number, I divide it by 3*	What operation must you do to find one seventh of a number? One sixth of a number is 3. What is the number? What calculation would you key into a calculator to find $\frac{1}{13}$ of 403.
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. find $\frac{3}{4}$ of 150 g); interpret the display correctly in the context of measurement *I know what to enter into a calculator to find a fraction of an amount, for example to find $\frac{3}{4}$ of 150 g*	What two steps are involved in finding $\frac{3}{4}$ of a number? I divide a number by 5, then multiply the answer by 4. What fraction of the number have I found?
• Present a spoken argument, sequencing points logically, defending views with evidence and making use of persuasive language *I can describe each stage of my calculation method (e.g. for 18 × 25). I can explain why it is a good method for this calculation*	These cards describe the steps in adding up 2.86 m, 97 cm and 5.08 m. Arrange the cards in order. Explain to the class why you solved the problem in that way.

Learning overview

Children recall multiplication facts to 10 × 10 and the related division facts. They use these to **multiply and divide multiples of 10 and 100,** such as 30 × 7, 4200 ÷ 6. They use patterns to extend the facts that they know and they look at the relationships between the number of zeros that form the final digits.

4	×	80	=	320		320	÷	80	=	4
4	×	800	=	3200		3200	÷	800	=	4
40	×	8	=	320		320	÷	8	=	40
40	×	80	=	3200		3200	÷	80	=	40

40	×	800	=	32 000		32 000	÷	800	=	40
400	×	8	=	3200		3200	÷	8	=	400
400	×	80	=	32 000		32 000	÷	80	=	400

They use this new knowledge to extend the mental methods that they use for multiplication and division. They appreciate that multiplication can be done in any order and make sensible choices about how to multiply three numbers such as 4 × 7 × 5. They **multiply two-digit by one-digit numbers mentally by using partitioning**, calculating 26 × 7 by working out 20 × 7 and 6 × 7 then putting the answers together to get 182. They **use factors** where appropriate to help them to multiply numbers efficiently, for example calculating 35 × 6 by working out 35 × 2 × 3.

Children understand that 6 ÷ 3 gives a different answer from 3 ÷ 6. They **divide two-digit by one-digit numbers mentally** also by using partitioning, finding 51 ÷ 3 by splitting 51 into 30 and 21, dividing each part by 3 and then putting the answers back together to get 17. They **use factors** where appropriate; for example, they work out 90 ÷ 6 by dividing 90 by 3 and then dividing the answer by 2. Children **explore patterns in linked division calculations**; for example, they use a calculator to find the answers to the calculations 4000 ÷ 32, 2000 ÷ 16 and 1000 ÷ 8. They explain the patterns they notice, and suggest other linked calculations that will have the same answer as each other.

Children use mental methods (with jottings where appropriate) to **solve problems** involving multiplication and division, such as:

Is 81 a multiple of 3? How do you know?

Find a number that has exactly six factors.

Find a number that is a common multiple of 6 and 8.

Children **develop and refine written methods for multiplication**. They move from expanded layouts (such as the grid method) towards a compact layout for HTU × U and TU × TU calculations. They suggest what they expect the approximate answer to be before starting a calculation and use this to check that their answer sounds sensible. For example, 56 × 27 is approximately 60 × 30 = 1800.

```
  56
× 27
1000     50 × 20 = 1000
 120      6 × 20 =  120
 350     50 × 7  =  350
  42      6 × 7  =   42
1512
 1
```

Answer: 1512

```
  56
× 27
1120     56 × 20
 392     56 ×  7
1512
 1
```

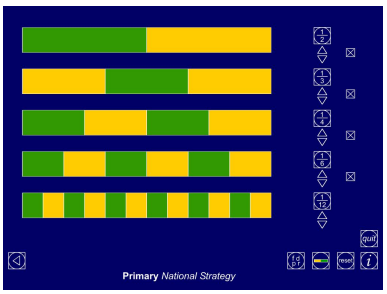
Answer: 1512

Children collaborate in a group to **solve problems and puzzles** such as:

Use the digits 2, 3, 5 and 7 and the × symbol once each to create a multiplication calculation, for example 572 × 3 or 35 × 72. How many different products can you make? What is the largest product? What is the smallest product?

Children record their working systematically. They use reasoning to explain how they know that they found every possible solution.

Children **use practical equipment and diagrams** to extend their understanding of fractions. They **recognise equivalence between fractions**. For example, they fold a strip of 20 squares into quarters and colour $^{3}/_{4}$ of the strip to establish that $^{3}/_{4}$ is the same as 15 out of 20 or $^{15}/_{20}$. They find other fractions that are equivalent to $^{3}/_{4}$, recording their results and identifying patterns and relationships in the set of equivalent fractions. They use these patterns to predict other fractions that are equivalent to $^{3}/_{4}$ and test their predictions. (The ITP 'Fractions' can also be used to establish equivalent fractions.)



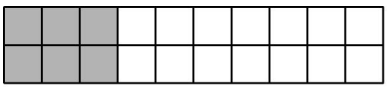
Children **express a smaller number as a fraction of a larger one**. For example, they compare a base-ten 'ten' stick to a 'hundred' flat, appreciate that it would take 10 'tens' to make 1 'hundred' so 10 is $^{1}/_{10}$ of 100. They compare a strip containing 3 squares with a strip containing 15 squares to establish that 3 is $^{1}/_{5}$ of 15. They use their knowledge of the relationships between measures to answer questions such as:

What fraction of £1 is 50p, 75p, 30p, …?

What fraction of 1 kg is 500 g, 400 g, …?

What fraction of a day is 1 hour, 12 hours, 8 hours, …?

Children **find fractions of amounts using division and multiplication**. For example, to find $^{3}/_{10}$ of 20 they first find $^{1}/_{10}$ by dividing 20 by 10, then multiply the answer by 3 to find $^{3}/_{10}$. They use diagrams to confirm their calculations.



They record their working efficiently using symbols, for example:

$20 \div 10 = 2$ $\quad \frac{1}{10}$ of 20 = 2

$2 \times 3 = 6$ $\quad \frac{3}{10}$ of 20 = 6

Children **solve word problems that involve fractions,** choosing to use a calculator where the calculations involved merit its use. They solve problems such as:

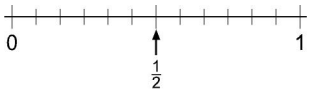
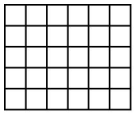
I pour $^{2}/_{5}$ of a litre of juice into a jug. How many millilitres is this?

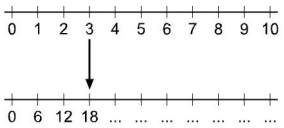
I have cycled $^{7}/_{10}$ of a distance of 50 km. How far do I still have to go?

I have saved £194.40. I plan to spend $^{5}/_{12}$ of this on a bicycle. How much will I have left?

Children check that each answer sounds reasonable in its original context.

Unit 5E2 3 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem *I can break a problem into steps and say the calculation I need to do to work out each step. I can check that my answer is sensible*	How many calculations are needed to solve this problem? What is the first step towards solving this problem? How will you record your working for this step? What does this answer tell you? Roughly, what answer do you expect from this question?
• Explain reasoning using diagrams, graphs and text; refine ways of recording using images and symbols *I can explain how to turn a mixed number such as $2\frac{3}{4}$ into an improper fraction. I can draw a diagram to support my explanation*	[Prepare a two-way Venn diagram showing 'multiples of 10' and 'numbers greater than 100'. Put the numbers 42, 90, 105, 171, 200 in the correct regions.] Explain what this diagram shows. Draw a different diagram to show the same information. What mixed number is equivalent to $1\frac{3}{4}$? How do you know? How many sevenths are there in three wholes? What calculation does this involve? Find an improper fraction that lies between 3 and 4. Sam says that $2\frac{3}{5}$ is equivalent to $\frac{13}{5}$. Explain how he found the numerator 13.
• Express a smaller whole number as a fraction of a larger one (e.g. recognise that 5 out of 8 is $\frac{5}{8}$); find equivalent fractions (e.g. $\frac{7}{10} = \frac{14}{20}$, or $\frac{19}{10} = 1\frac{9}{10}$); relate fractions to their decimal representations *I can give the decimal equivalent of a simple fraction such as $\frac{3}{10}$ and explain how I know*	Here is a chocolate bar.  Bill eats 3 pieces and Ann eats 2 pieces. What fraction of the chocolate bar remains? Mark $\frac{1}{3}$ and $\frac{5}{6}$ on this number line.  Tell me two fractions that are the same as 0.2. How would you write $\frac{37}{100}$ as a decimal? Tell me a fraction that is equivalent to $\frac{2}{3}$ but has a denominator of 9. How did you do it?
• Understand percentage as the number of parts in every 100 and express tenths and hundredths as percentages *I know that 'per cent' means 'parts in every 100', so 1% = $\frac{1}{100}$* *I can give a simple fraction such as $\frac{1}{10}$ as a percentage*	Shade 10% of this grid.  Which is bigger: 65% or $\frac{3}{4}$? How do you know? What percentage is the same as $\frac{7}{10}$? Explain how you know. What is $\frac{31}{100}$ as a percentage? Which is a better mark in a test: 61%, or 30 out of 50? How do you know?

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Use sequences to scale numbers up or down; solve problems involving proportions of quantities (e.g. decrease quantities in a recipe designed to feed six people) *I can continue a sequence such as: 'There are 3 red sweets in every 10, there are 6 red sweets in every 20'*	18 is 6 times as many as 3.  What number is 6 times as many as 9? Draw a diagram that shows this statement: 'My necklace has 2 yellow beads for every 3 green beads.' There are 20 girls and 10 boys in a class. Describe this with a sentence that uses the words 'for every'. You earn one voucher for every £20 you spend at a shop. How much must you spend to get 4 vouchers? Tell me how you worked this out. One orange costs 15 pence. How much would five oranges cost?
• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ± 2.7, half of 5.6, double 0.34) *I can double and halve two-digit numbers and explain how to use this to double and halve related decimals*	A number when doubled gives 9.2. What is the number? Explain how you would find half of the number 38.78. Find $\frac{1}{2}$ of 34. Find $\frac{1}{2}$ of 0.34. What is the relationship between these two numbers? Why?
• Find fractions using division (e.g. $\frac{1}{100}$ of 5 kg), and percentages of numbers and quantities (e.g. 10%, 5% and 15% of £80) *I can use division to find a unit fraction ($\frac{1}{2}$, $\frac{1}{3}$, etc.) of a number* *I can find a simple percentage (50%, 25%, 75%, 10%) of a quantity*	$\frac{1}{3}$ of 75 is 25. Write this as a division statement. What operation would you key into a calculator to find $\frac{1}{8}$ of 256? One seventh of a number is 4. What is the number? Find 75% of 200 ml. How did you do this? What percentages can you easily work out in your head? Talk me through a couple of examples.
• Use a calculator to solve problems, including those involving decimals or fractions (e.g. find $\frac{3}{4}$ of 150 g); interpret the display correctly in the context of measurement *I can use a calculator to find the decimal equivalent of a fraction*	What calculation would you key into a calculator to find $\frac{3}{20}$ as a decimal? Use a calculator to establish whether $\frac{27}{40}$ is bigger or smaller than 0.75. What two numbers have a product of 912? Are there any other possibilities?
• Understand the process of decision making *I can explain why I decided to use a particular method to solve a problem. I can describe what was special about the problem that prompted my decision*	Why did you decide to use a mental/written/calculator method for this calculation? Why did you decide to change all the units to litres rather than millilitres?

Learning overview

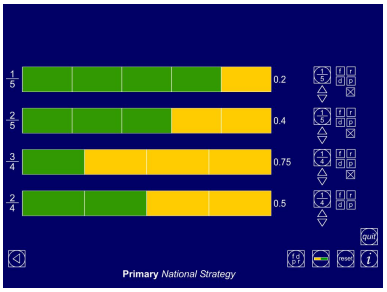
Children **double and halve decimal numbers** using their knowledge of doubling and halving whole numbers and decimal place value. They find, for example, double 0.47 and half of 7.2. They answer questions such as:

Find a number whose double lies between 1.3 and 1.4.

What number lies halfway between 2.47 and 2.83 on a number line?

Children **count in fractions**. For example, they count from 0 in steps of $\frac{1}{4}$ initially **using improper fractions** (0, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$, $\frac{5}{4}$, …) and then **using mixed numbers** (0, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, …). They record the count on a number line to establish equivalent pairs, e.g. $2\frac{3}{4} = \frac{11}{4}$. They discuss how to find equivalent pairs without a number line, establishing that 1 whole is equivalent to 4 quarters, so 2 wholes is 8 quarters (4 quarters × 2), and $2\frac{3}{4}$ is equivalent to 8 quarters + 3 quarters, or 11 quarters. They use diagrams where helpful to confirm the equivalent improper fraction for a given mixed number and vice versa.

Children **relate fractions to their decimal equivalents**. They recognise that fractions with a denominator of 10 or 100 can be converted to their decimal equivalent by placing the digits of the numerator in the appropriate column, e.g. $\frac{3}{10} = 0.3$, $\frac{7}{100} = 0.07$, $\frac{13}{100} = 0.13$. They use number lines (or the ITP 'Fractions') to establish the decimal equivalent of fractions such as $\frac{2}{5}$ or $\frac{1}{20}$.



For example, they use a 0 to 1 number line marked in steps of 0.1, divide it into fifths and mark $\frac{1}{5}$, $\frac{2}{5}$, … on it. They use this to establish that $\frac{1}{5} = 0.2$, $\frac{2}{5} = 0.4$, … They use the patterns in such sequences to predict other equivalents, predicting, for example, that $\frac{4}{5}$ will be equivalent to 0.8. Children understand how to **use a calculator to convert a fraction to a decimal**. They appreciate that $\frac{4}{5}$ is equivalent to 4 ÷ 5. They appreciate that when they key this calculation into a calculator it will give them the answer in decimal form. So one way to find the decimal equivalent of $\frac{4}{5}$ is to key 4 ÷ 5 into a calculator.

Children **solve problems involving fractions**, including some where the calculations merit use of a calculator. For example, they find $\frac{2}{3}$ of 150 ml by dividing 150 ml by 3 to find $\frac{1}{3}$, then multiplying the answer by 2 to find $\frac{2}{3}$. They solve problems such as:

Jay buys a 2 litre bottle of pop. He drinks $\frac{1}{4}$ of the bottle and spills $\frac{2}{5}$ of the bottle. How many millilitres are left?

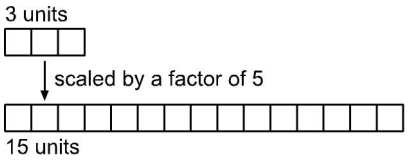
A mile is 1760 yards. I have walked $\frac{5}{11}$ of a mile. How many yards is this?

Find different ways to complete:

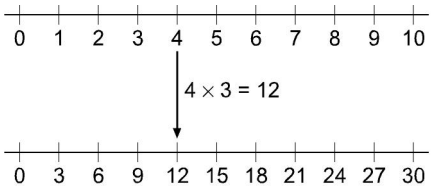
$\frac{\square}{\square}$ of $\square$ = 12

Children **understand percentage as the number of parts in every 100**. They represent particular percentages using practical resources such as money (£1, 10p and 1p coins) or images such as a 10 by 10 square grid, for example shading 35 squares in the grid to represent 35%. To find the percentage equivalent for simple fractions such as $\frac{3}{4}$ they shade this fraction of a 10 by 10 grid and consider what percentage this represents. Children appreciate that 10% is equivalent is $\frac{1}{10}$, so to find 10% of an amount they can divide it by 10. They find 10% of numbers and measures such as £2.00, 150, 25, 700 ml, 3 kg. They begin to use 10% of an amount to find 5%, then 20%, 30%, … They use this method to work out percentages of quantities such as 20% of 1 kg, 30% of 200 ml, 5% of £80.

Children recognise and interpret the vocabulary of ratio and proportion, using diagrams or objects to represent the situation. They understand that **scaling** involves increasing a quantity by a given factor. Multiplication by 5 means scaling a number or quantity by a factor of 5, and making it 5 times as big.



They use pairs of number lines to show scaling, for example by a factor of 3:



They scale up a relationship such as '*There are 3 red sweets in every pack of 10'* to establish that there would be 6 red sweets in every 20 sweets, 9 red sweets in every 30 sweets, and so on. They **solve problems** such as:

At the gym club there are 2 boys for every 3 girls. Suggest some numbers of boys and girls that there might be at the club.

A mother seal is fed 5 fish for every 2 fish for its baby. Alice fed the mother seal 15 fish. How many fish did she feed to the baby?

Paul uses 3 tomatoes for every ½ litre of sauce. How much sauce can he make from 15 tomatoes? How many tomatoes would he need for 2 litres of sauce?

Unit 5E3 3 weeks

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Represent a puzzle or problem by identifying and recording the information or calculations needed to solve it; find possible solutions and confirm them in the context of the problem *I can break a problem into steps and say the calculation I need to do to work out each step* *I can check that my answers are sensible*	How many calculations are needed to solve this problem? What is the first step towards solving this problem? How will you record your working for this step? What does this answer tell you? Roughly, what answer do you expect from this question?
• Solve one-step and two-step problems involving whole numbers and decimals and all four operations, choosing and using appropriate calculation strategies, including calculator use *I can decide and justify what calculations to do to solve a problem and whether I will do these mentally, using a written method or with a calculator*	How will you solve this problem? Will you use a mental, written or calculator method? Why did you choose this method? Change the numbers in the problem to ones where you would choose to use a mental method. How do you know whether you need to add, subtract, multiply or divide? What clues do you look for?
• Express a smaller whole number as a fraction of a larger one (e.g. recognise that 5 out of 8 is $^{5}/_{8}$); find equivalent fractions (e.g. $^{7}/_{10} = {}^{14}/_{20}$, or $^{19}/_{10} = 1{}^{9}/_{10}$); relate fractions to their decimal representations *I can say what fraction a smaller number is of a larger one* *I can find fractions that are equivalent to each other*	What is one fifth of 20? One third of a number is 7. What is the number? What fraction of £1 is 30p? Explain how you know. Complete this statement in different ways: $\square$ is $\frac{1}{4}$ of $\square$ Find the missing number: $\frac{3}{\square} = \frac{12}{16}$ Which number represents the shaded part of the figure?  A 2.8 B 0.5 C 0.2 D 0.02 Write four tenths as a decimal number. What is three quarters as a decimal? Write 0.23 as a fraction.
• Understand percentage as the number of parts in every 100 and express tenths and hundredths as percentages *I can give a simple fraction such as $^{3}/_{100}$ as a percentage*	What percentage of the bar is shaded?  40% of a class of children are boys. What percentage are girls? Rick says that 3% is equivalent to $^{3}/_{10}$. Is he right? How do you know? A test has 50 marks. Rory gets 40 marks. What is his percentage score?

Objectives *Children's learning outcomes in italic*	**Assessment for learning**
• Refine and use efficient written methods to multiply and divide HTU × U, TU × TU, U.t × U and HTU ÷ U *I can use a written method to divide a three-digit number by a one-digit number and explain each step*	Find a number between 350 and 360 that gives a remainder of 5 when divided by 8. Work out 261 ÷ 3. Explain each step. These division calculations have errors. What are the errors? Explain how to put them right. 25 × 18 is more than 24 × 18. How much more? A 1 B 18 C 24 D 25
• Use sequences to scale numbers up or down; solve problems involving proportions of quantities (e.g. decrease quantities in a recipe designed to feed six people) *I can use the relationships between numbers to solve ratio and proportion questions*	A recipe gives amounts to feed 2 people. Explain how you would change the amounts to feed 6 people. A pattern of tiles is organised so that there are 2 red tiles for every 3 blue tiles. How many blue tiles are needed for a pattern that contains 12 red tiles? How did you work this out? Paul uses 5 tomatoes to make half a litre of tomato sauce. How much sauce can he make from 15 tomatoes? A One and a half litres B Two litres C Two and a half litres D Three litres
• Find fractions using division (e.g. $^1/_{100}$ of 5 kg), and percentages of numbers and quantities (e.g. 10%, 5% and 15% of £80) *I can tell you what calculations I will do to find a fraction of a quantity* *I can tell you what calculations I will do to find a percentage of a quantity*	Find $^1/_{100}$ of 3 km. Tell me how to find three quarters of £60. Kate says: 'To find 10% of an amount, you divide it by 10. So to find 20% of an amount, you divide it by 20.' Is Kate correct? How do you know? What calculations would you do to find 15% of £150? What percentage of the whole numbers from 1 to 10 are even?
• Present a spoken argument, sequencing points logically, defending views with evidence and making use of persuasive language *I can describe each stage of my calculation method (e.g. for 186 ÷ 6). I can explain why it is a good method for this calculation*	Make a list of the steps you would take to solve this problem: A pack of frozen peas costs £1.72. Sally bought three packs of frozen peas. How much change did he get from a £10 note? Explain to the class why you solved the problem in that way.

Learning overview

Children use multiplication (and division) to **solve problems involving ratio and proportion**. They answer questions such as:

Mary posts a package. She uses 10p and 2p stamps. She uses two 2p stamps for every 10p stamp. What could the package cost to post?

There are 25 ml of cordial in every 100 ml of juice drink. How much cordial is needed to make $^1/_2$ litre of juice drink?

Children **scale** the ingredients in recipes up or down, for example rewriting a recipe for 8 people so that it would feed 16 or 4 people.

Children use division and multiplication to **find fractions and percentages of numbers and quantities**, for example:

35% of the children in a class are girls. What percentage are boys?

A shop is selling trainers at 75% of normal price. A pair of trainers usually costs £24. How much will they cost in the sale?

I spend 30% of my £1 pocket money. How much do I have left?

Richard got 40 marks out of 80 in a test. Sarah got 45%. Who had the better score, Richard or Sarah?

Asif buys a 1 kg bag of flour. He uses 30% of it to make biscuits and $^{2}/_{5}$ of it to bake a cake. How much of the flour is left?

Children secure their understanding of the **equivalence of fractions**. They use a fraction wall or other diagrams and their understanding of scaling to identify families of fractions that are equivalent to, for example, $^{2}/_{3}$:

$$\frac{2}{3}=\frac{4}{6}=\frac{6}{9}=\frac{8}{12}=\frac{10}{15}=\frac{12}{18}=...$$

They recognise that the numerator and the denominator of $^{2}/_{3}$ have both been multiplied by 3 to create the equivalent fraction $^{6}/_{9}$. They understand that when you multiply (or divide) the numerator and the denominator of a fraction by the same number, you create an equivalent fraction. They use this to find the missing numbers in equations such as:

$\frac{4}{5}=\frac{\square}{20}$ and $\frac{16}{24}=\frac{\square}{8}$

Through practical experience, children establish **relationships between common fractions**. They know that, for example, $^{1}/_{7}$ is smaller than $^{1}/_{6}$. They recognise that $^{1}/_{6}$ is half of $^{1}/_{3}$. They use the patterns to predict and test similar relationships such as '$^{1}/_{10}$ is half of $^{1}/_{5}$'. Children use diagrams, images (such as fraction walls or number lines) or practical equipment to solve problems involving fractions such as:

What fraction lies halfway between $^{3}/_{10}$ and $^{7}/_{10}$?

Which of these fractions is less than $^{1}/_{2}$?

$^{7}/_{10}$, $^{60}/_{100}$, $^{2}/_{5}$, $^{1}/_{10}$, $^{11}/_{20}$, $^{1}/_{20}$

Place these fractions in order, smallest first:

$^{1}/_{2}$, 2, $1\frac{3}{4}$, $^{3}/_{2}$, $^{1}/_{4}$

Children **express one amount as a fraction of another**. For example, they compare two strips of stickers, one of 2 stickers and one of 10 stickers. They understand that 10 is 5 times 2 and 2 is $^{1}/_{5}$ of 10. They recognise that there are 5 times as many stickers in the longer strip as in the small, and that the short strip has $^{1}/_{5}$ of the number of stickers on the long strip. They answer questions such as:

I drink 100 ml of a 1 litre bottle of lemonade. What fraction of the lemonade in the bottle have I drunk? What fraction of the lemonade is left?

There are 30 children in a class. 6 children are girls. What fraction of the class are the girls? What fraction of the class are boys?

Children consolidate their understanding of **equivalence between simple fractions, decimals and percentages**. For example, they complete a table showing equivalent fractions, decimals and percentages, such as:

Fraction	Decimal	Percentage
$\frac{1}{2}$		
	0.1	
		25%
$\frac{3}{10}$		
		7%

Children extend written methods for division to include HTU ÷ U, including calculations with remainders. They suggest what they expect the approximate answer to be before starting a calculation and use this to check that their answer sounds sensible. They increase the efficiency of the methods that they are using. For example:

196 ÷ 6 is approximately 200 ÷ 5 = 40

$6\overline{)196}$

$-\ 60$ $\quad 6 \times 10$

136

$-\ 60$ $\quad 6 \times 10$

76

$-\ 60$ $\quad 6 \times 10$

16

$-\ 12$ $\quad 6 \times 2$

$4 \qquad 32$

Answer: $\quad 32\ \mathrm{R}\ 4$

$6\overline{)196}$

-180 $\quad 6 \times 30$

16

$-\ 12$ $\quad 6 \times 2$

$4 \qquad 32$

Answer: $\quad 32\ \mathrm{R}\ 4$

Children know that, depending on the context, answers to division questions may need to be rounded up or rounded down. They explain how they decided whether to round up or down to answer problems such as:

Egg boxes hold 6 eggs. A farmer collects 439 eggs. How many boxes can he fill?

Egg boxes hold 6 eggs. How many boxes must a restaurant buy to have 200 eggs?

Children use their understanding of equivalence between fractions and decimals to begin to write the remainder to a division calculation as a fraction and as a decimal. They discuss a practical situation such as:

7 apples are shared out fairly between 4 children. How many apples does each child get?

They realise that the remaining 3 apples can be shared by dividing them into quarters to give each child $1\frac{3}{4}$ apples or 1.75 apples. They find the exact answer to other division calculations such as 28 ÷ 5, 37÷ 4, 366 ÷ 8, 734 ÷ 5, and to problems such as:

Eight children share equally the cost of a present costing £20. How much does each child pay?

Seven tins of dog food are shared equally between five big dogs. How many tins of dog food does each dog get?