

Year 6 White Rose Maths (WRM) Spring Scheme of Learning, 2018 Alignment with Mathletics

Year 6 – Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number- Place Value		Number- Addition, Subtraction, Multiplication and Division				Fractions				Geometry- Position and Direction	Consolidation
Spring	Number- Decimals		Number- Percentages		Number- Algebra		Measurement Converting units	Measurement Perimeter, Area and Volume		Number- Ratio		Consolidation
Summer	Geometry- Properties of Shapes		Problem solving			Statistics		Investigations				Consolidation

This alignment document has been based on the White Rose Maths (WRM) scheme of learning available on the TES website. It contains the alignment information for the Spring Scheme of Learning.



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Purpose:

The aim of this document is to support Mathletics teachers, who use the WRM schemes of learning, to make full use of the resources available within Mathletics. Whenever possible, activities, pages from the eBooks or learning experiences on Rainforest Maths have been matched to each of the small steps on the corresponding WRM scheme of learning.

In Mathletics, many eBooks are available in the student interface, however all eBooks are available to teachers through the teacher console. These topic-based eBooks contain practice and fluency exercises, along with application questions and games. Only a small selection of the relevant pages is contained in this document.

Links to Rainforest Maths, which can be found in the 'Play' area in the Mathletics student interface, have also been included. This resource has engaging visuals which work well on interactive whiteboards and gives pupils further opportunities to practise their learning online.

Course selection:

A specific Mathletics course has been created in alignment with the WRM scheme of learning. You may wish to set this course for your class/groups.

England Yr 06 WRM Autumn and Spring Aligned



Data-Driven
Teaching and
Learning



Differentiation



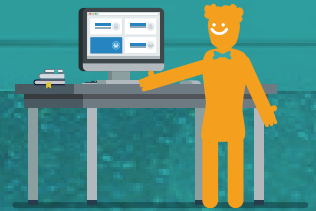
Feedback and
Reflection



Student Growth



Blended
Learning



Examples of alignment to Mathletics
Block 1 (Weeks 1-2) Number: Decimals

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> Identify the value of each digit in numbers given to 3 decimal places and multiply numbers by 10, 100 and 1,000 giving answers up to 3 decimal places. Multiply one-digit numbers with up to 2 decimal places by whole numbers. Use written division methods in cases where the answer has up to 2 decimal places. Solve problems which require answers to be rounded to specified degrees of accuracy. 	<ul style="list-style-type: none"> Three Decimal Places Multiply by 10, 100 and 1,000 Divide by 10, 100 and 1,000 Multiply Decimals by Integers Divide Decimals by Integers Division to Solve Problems Decimals as Fractions Fractions to Decimals (1) Fractions to Decimals (2)

Small step: Three Decimal Places

Topic: **Decimals**

Activity: *Decimals from Words to Digits 2*

Pupils read a decimal number written in words and write the number using digits. This activity progresses from tenths through to thousandths.

Decimal fractions – reading and writing decimals

When we write decimals we follow this place order:

Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
			2	.	2	

Numbers before the decimal point are whole numbers.
Numbers after the decimal point are parts of a whole number.
The further the digit is to the left in the number, the greater its value. The further it is to the right, the smaller its value.

eBook, G series: **Fractions, Decimals and Percentages, pages 11–12**

This page shows the relationship between fractions ($\frac{1}{10}$, $\frac{1}{100}$ and $\frac{1}{1,000}$ s) and decimals. Pupils shade parts of a whole and record the decimal.

On page 12, decimals are represented on a place value chart, emphasising the value of each digit beyond the decimal point, up to 3 decimal places.

1 What is the value of the digit in bold?

Tick the correct column:

	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
a 5.892							
b 15.05							
c 763.22							
d 89.021							
e 100.001							
f 560.45							
g 312.956							

Rainforest Maths – Level G – Decimals

Pupils convert tenths, hundredths and thousandths (shown as fractions) to decimals up to 3 decimal places. Checking shows them if they have completed the chart correctly. If they make a mistake they can try again and recheck their answer.



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Small step: Multiply by 10, 100 and 1,000

Topic: **Decimals**

Activity: **Multiply Decimals: 10, 100, 1,000**

Pupils multiply decimals to 1, 2 and 3 decimal places by 10, 100 and 1,000 respectively.

Calculating – multiplying decimals by 10, 100 and 1,000

When we multiply by 10 the number becomes larger by 1 place value.
 When we multiply by 100 the number becomes larger by 2 place values.
 When we multiply by 1,000 the number becomes larger by 3 place values.
 Look what happens to 45.216 when we apply these rules:

$45.216 \times 10 = 452.16$ $45.216 \times 100 = 4,521.6$ $45.216 \times 1,000 = 45,216$

1 Warm up with these. Work with a partner and a calculator. Predict your answers to the following then try out the problems. Your answers will be one or more of the following. The first one has been done for you.

tens tenths hundredths ones

What place values are in your answers? Multiply by 10:

a these ones: 6, 3, 1 We get 60, 30, 10 (Tens)

b these tenths: 0.6, 0.3 and 0.1 We get

c these hundredths: 0.06, 0.03 and 0.01 We get

eBook, G series: **Fractions, Decimals and Percentages, page 36**

Pupils practise multiplying decimals by 10, then 100 and 1,000, understanding how the digits move across the decimal places.

Rainforest Maths – Level G– **Decimals ... multiplying**

Select the option for x 10, x 100. The page explains how decimals are multiplied by 10 and 100. Pupils then complete examples and click 'check' to see that they are correct.

Small step: Divide by 10, 100 and 1,000

Topic: **Decimals**

Activity: **Divide Decimals: 10, 100, 1,000**

Pupils practise the division of decimals to 1, 2 and 3 decimal places by 10, 100 or 1,000.

Calculating – dividing decimals by 10, 100 and 1,000

When we divide by 10 the number becomes smaller by 1 place value.
 When we divide by 100 the number becomes smaller by 2 place values.
 When we divide by 1,000 the number becomes smaller by 3 place values.
 Look what happens to 45 when we apply these rules:

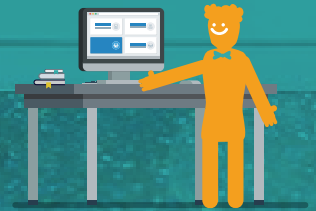
$45 \div 10 = 4.5$ $45 \div 100 = 0.45$ $45 \div 1,000 = 0.045$

1 Divide these numbers by 10, 100 and 1,000. Estimate first.

	$\div 10$	$\div 100$	$\div 1,000$
50	5		
25		0.25	
37.2			
48.5			0.0485
542			

eBook, G series: **Fractions, Decimals and Percentages, page 37**

Pupils practise dividing decimals by 10, 100 and then 1,000, understanding that the digits move across the decimal places towards the right. Completing a table to show numbers as they are divided by 10, 100 and then 1,000, will help to show the pattern and consolidate understanding.



Small step: Multiply Decimals by Integers

Topic: **Decimals**

Activity: *Decimal by Whole Number*

Pupils are encouraged to multiply a decimal to 1, 2, or 3 decimal places with a 1-digit number by first multiplying as though there is no decimal point. Pupils are then shown how to place the decimal point according to the number of decimal places in the question.

Calculating – multiplying decimal fractions

How do we multiply decimal fractions using a written strategy?
First we estimate: $5 \times 3 = 15$. Our answer will be around 15.
 3×5 tenths is 15 tenths. We rename this as 1 one and 5 tenths.
We write the 5 in the tenths column and move the one to the ones column.
 3×4 is 12. We also add the 1.
 $3 \times 4.5 = 13.5$
We check the answer against our estimate. Do they fit?

1 Multiply these decimal fractions:

a $\begin{array}{r} 2.6 \\ \times 7 \\ \hline \end{array}$	b $\begin{array}{r} 3.7 \\ \times 4 \\ \hline \end{array}$	c $\begin{array}{r} 5.2 \\ \times 5 \\ \hline \end{array}$
d $\begin{array}{r} 8.4 \\ \times 8 \\ \hline \end{array}$	e $\begin{array}{r} 14.5 \\ \times 3 \\ \hline \end{array}$	f $\begin{array}{r} 24.5 \\ \times 7 \\ \hline \end{array}$

eBook, G series: **Fractions, Decimals and Percentages, pages 38–40**

Pupils are reminded to estimate their answer first and then shown an example of multiplying a decimal by an integer. They work through examples with 1 decimal place, then moving on to multiplying numbers with 2 decimal places and finally they answer some questions given in the context of word problems.

Rainforest Maths – Level G – **Decimals ... multiplying**

Pupils can choose to use the contracted or extended method to multiply a decimal by an integer. Pupils are guided through the process and click 'check' to see if they are correct.

Small step: Divide Decimals by Integers

Calculating – dividing decimal fractions

Look at 64.4 divided by 5. We start with the largest place value.
6 tens divided by 5 is 1 ten with a remainder of 1 ten.
We rename this as 10 ones and carry it over to the ones column.
14 ones divided by 5 is 2 with 4 ones left over.
We rename this as 40 tenths and carry it. We now have 44 tenths.
44 tenths divided by 5 is 8 with a remainder of 4. We rename this as 40 hundredths. 40 hundredths divided by 5 is 8.
64.4 divided by 5 is 12.88

1 Divide these:

a $8 \overline{) 85.6}$	b $5 \overline{) 47.0}$	c $7 \overline{) 58.1}$
d $5 \overline{) 63.5}$	e $5 \overline{) 99.0}$	f $6 \overline{) 72.30}$

eBook, G series: **Fractions, Decimals and Percentages, pages 41–42**

Pupils are taken through an example, step by step and then complete an exercise to practise dividing decimals by an integer. The real-life context of using money and dividing a bill between diners is used as an example of when this calculation is used.



Year 6 White Rose Maths (WRM) Spring Scheme of Learning, 2018



Decimals ... dividing. score: 0

$6 \overline{)3.06}$ means 3.06 divided by 6.

EXAMPLE: $6 \overline{)0.51}$

$6 \overline{)3.06}$

check next

Enter the answer in the box.

Rainforest Maths — Level F — Decimals ... dividing

Pupils practise dividing decimals by an integer. Clicking 'check' enables pupils to see if their answer is correct. Teachers should encourage pupils to record their working out and answers on paper or a dry wipe board before entering the answer on the screen.

Small step: Division to Solve Problems

Your bill comes to £20.60. You split the cost equally between 4 people. How much is each person's share?

Answer in pounds and pence.

£

Topic: Decimals
Activity: *Money Problems: Four Operations with Pounds*
Pupils solve various word problems involving the addition, subtraction, multiplication or division of money amounts.

Sharing money is a time when we divide decimal fractions. Add the bills then divide them evenly among 4 people. Don't listen to the guy who said he only ate the rice – he's a cheapskate.

2 hot chocolates.....	£5.60
2 milkshakes.....	£4.20
2 muffins.....	£5.80
1 large bowl chips.....	£4.60
Total	

1 sweet & sour chicken...£	9.50
1 king prawns with veg...£	19.30
1 beef and broccoli.....£	12.50
1 large rice.....	£ 3.30
4 colas.....	£ 8.60
Total	

eBook, G series: Fractions, Decimals and Percentages, pages 41–42
Sharing money is used as an example of when we divide decimals by integers. Pupils total the restaurant bill before dividing it by the number of people, to find out how much each person pays. Page 42 gives further examples of problems in real-life contexts.

Small step: Decimals as Fractions

Decimal to fraction.

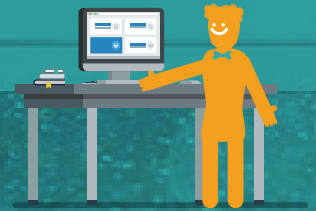
$0.72 = \frac{72}{100}$

Place the decimal digits in the numerator.

Hint: Note that 2 is in the hundredths place.

Back

Topic: Decimals
Activity: *Decimals to Fractions 1*
Pupils convert decimals to 1, 2 and 3 decimal places into fractions with denominators of 10, 100 or 1,000.



Small step: Fractions to Decimals (1)

Convert to a decimal.

$$\frac{121}{500} = \frac{242}{1000}$$

Write the equivalent numerator.

1000 is the smallest multiple of 500 that is a power of 10

Back Next

Topic: Decimals

Activity: *Fraction to Terminating Decimal*

This activity requires pupils to find an equivalent fraction with a denominator that is a power of 10 and then rewrite the fraction as a decimal.

4 Complete the missing information:

a $\frac{42}{100} = \frac{4}{10} = \frac{2}{50} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10}$

b $\frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10}$

c $\frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10}$

d $\frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10} = \frac{\square}{100} = \frac{\square}{10}$

eBook, F series: *Fractions, Decimals and Percentages*, page 21

On this page, fractions are shown as parts of a 100 square. Pupils record the fraction as a hundredth, as well as the related decimal and percentage.

1 Divide these wholes into tenths and shade the specified amounts. Write each as a decimal fraction:

a $\frac{4}{10}$ $\frac{\square}{10}$

b $\frac{9}{10}$ $\frac{\square}{10}$

c $\frac{10}{10}$ $\frac{\square}{10}$

eBook, G series: *Fractions, Decimals and Percentages*, page 12

In these exercises, pupils are asked to divide wholes into hundredths, shade specific amounts and record those amounts as decimals.

2 Now divide these wholes into hundredths and shade the specified amounts. Write each as a decimal fraction:

a $\frac{61}{100}$ $\frac{\square}{100}$

b $\frac{80}{100}$ $\frac{\square}{100}$

c $\frac{55}{100}$ $\frac{\square}{100}$

Fractions ... common fractions. score

WITH decimals and percentages.

fraction	10ths	decimal	percent
$\frac{60}{100}$	$\frac{3}{5}$	0.6	60%

EXAMPLE:

hundredths fifths decimal percent

$\frac{\square}{100}$ $\frac{\square}{5}$ 0. %

check next

Enter the numbers in the boxes, click check.

Rainforest Maths – Level G – *Fractions ... common fractions*

Fractions are shown as parts of a 100 square. Pupils record the fraction as a hundredth and then a common fraction, before showing the related decimal and percentage.



Small step: Fractions to Decimals (2)

Convert to a decimal:

$$\frac{93}{100} = 93 \div 100 = 0.93$$

Move the decimal point left by the number of zeros.

Working:

$$0.93$$

Back

Topic: **Decimals**

Activity: *Fractions to Decimals*

Pupils divide the numerator by the denominator to convert a fraction to a decimal. All denominators in this activity are powers of 10.

Write the fraction as a decimal.

$$\frac{7}{50} = 0.14$$

Divide the numerator by the denominator.

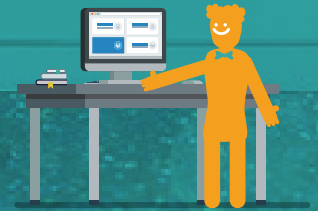
$$\begin{array}{r} 0.14 \\ 50 \overline{) 700} \\ \underline{50} \\ 200 \\ \underline{200} \\ 0 \end{array}$$

Back

Topic: **Decimals**

Activity: *Fractions to Decimals 2*

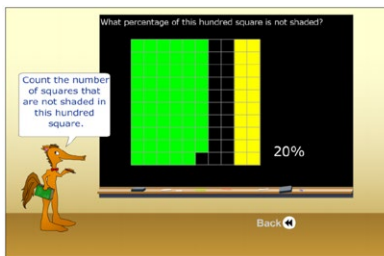
Pupils are encouraged to divide the numerator by the denominator to convert a fraction to a decimal.



Examples of alignment to Mathletics
Block 2 (Weeks 3-4) Number: Percentages

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison. Recall and use equivalences between simple fractions, decimals and percentages including different contexts. 	<ul style="list-style-type: none"> Fractions to Percentages Equivalent FDP Percentage of an Amount (1) Percentage of an Amount (2) Percentage – Missing Values Percentage Increase & Decrease Order FDP

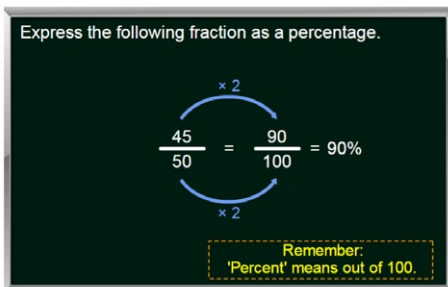
Small step: Fractions to Percentages



Topic: Percentages

Activity: *Modelling Percentages*

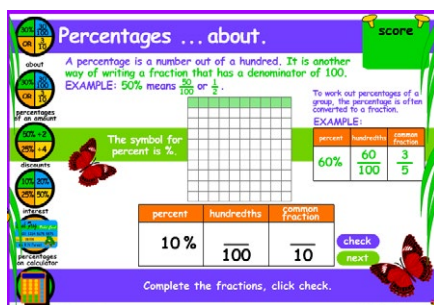
Pupils first count the number of squares in a hundred square to find the percentage of squares that are, or are not, shaded. The harder level moves to having pupils find the equivalent percentage for common fractions such as half, quarter, tenth, fifth, hundredth.



Topic: Percentages

Activity: *Fractions to Percentages (Non-Calculator)*

Pupils use mental strategies to convert fractions to equivalent fractions with a denominator of 100 to express the fraction as a percentage.



Rainforest Maths – Level 6 – Percentages ... about

Pupils are shown a fraction visually as a shaded area on a hundred square which represents 1 whole. They record the fractions in hundredths and tenths and show the equivalent percentage.

Small step: Equivalent FDP

Complete the table with the matching cards.

Fraction	Decimal	Percentage
$\frac{9}{10}$	0.9	90%



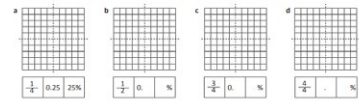
30%	0.3
0.2	

Topic: Percentages

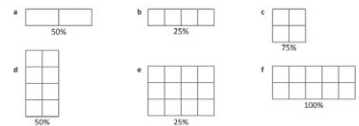
Activity: *Match Decimals and Percentages*

Pupils drag cards into a table to match the equivalent fraction, decimal and percentage (tenths, quarters, fifths).

1 Shade the grids and show the following fractions by completing the missing information:



2 Shade these shapes to show the following percentages:



eBook, F series: *Fractions, Decimals and Percentages*, pages 26–27

Pupils use fractions to shade parts of a hundred square and then write the decimal and percentage equivalents. They then shade a fraction of a shape from a given percentage.

Decimal fractions – percentages

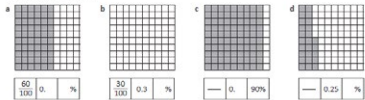
Percent comes from the Latin 'per centum' and means parts per hundred. It is expressed using the symbol %.

Here, 60% has been shaded. This is the same as 60 hundredths.

$$\frac{60}{100} = 0.60 = 60\%$$

We commonly use percentages in sales – 25% off everything TODAY ONLY, on tests – I got 85%, and when we are gathering and reporting on data – 78% of people surveyed love chocolate.

1 Fill in the missing values:



eBook, G series: *Fractions, Decimals and Percentages*, pages 16–17

Pupils shade the fraction on the hundred square and record the equivalent common fraction, decimal and percentage.



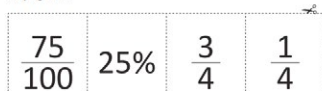
Cut out the playing cards, mix them up and put them face down in a pile. Cut out the blank cards on page 31 and divide them between the two of you. Make sure you both have a pencil each.

Turn over the first playing card. Both players write an equivalent fraction, decimal or percentage to match it on one of the blank cards and cover the playing card as quickly as possible.

For example, the playing card may say 50% – you could write $\frac{1}{2}$ or $\frac{5}{10}$ or $\frac{50}{100}$.

The first person to cover the card with a correct match wins and takes the pair. The player at the end of the game with the most cards is the winner.

Playing Cards

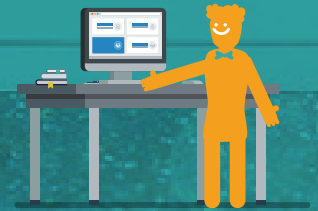


eBook, F series: *Fractions, Decimals and Percentages*, pages 30–31

In this game, students are encouraged to find equivalent fractions, decimals and percentages using cut-out playing cards

Rainforest Maths – Level G – *Fractions ... common fractions*

Pupils are shown the visual of a hundred square, representing 1, with an area shaded. They then identify the fraction shaded in hundredths and simplify the fraction, before recording the decimal and the related percentage.



Small step: Percentage of an Amount (1)

Percentage problems solve

Getting ready We have been using 100 grids to represent percentages, with each square representing 1%.

What to do These grids are set up a little differently. Work with a partner to figure out what each square represents and then answer the questions.

Problem 1
These 6 squares have a value of 36.
a What is the value of 1 square? _____
b What is the value of the entire grid? _____
c If 50% of the grid is shaded, what value is shaded? _____

eBook, G series: Fractions, Decimals and Percentages, page 19

In these examples the hundred square does not represent 100, so pupils are challenged to think about percentages of different amounts. They are encouraged to do this as a paired activity, so that they can discuss their thinking.

Percentages ... of an amount. score 0

To work out a percentage of an amount, the percentage is often converted to a fraction.

EXAMPLE: 10% means $\frac{10}{100}$ or $\frac{1}{10}$ or $\div 10$.

What is the percentage of the amount?

TIP: $20\% = \frac{1}{5}$ or $\div 5$

20% of 350 = check next

Enter the percentage in the box, click check.

Rainforest Maths – Level G – Percentages ... of an amount

To support pupils understanding of percentages they are shown the related common fraction and reminded by which number they should divide to find the percentage of an amount. For example, for 10% of an amount, they will be given a tip saying, $10\% = \frac{1}{10}$ or divide by 10.

Small step: Percentage of an Amount (2)

Evaluate:
 $3\% \times 300$

10%	$\frac{1}{10}$
50%	$\frac{1}{2}$
20%	$\frac{1}{5}$
25%	$\frac{1}{4}$
75%	$\frac{3}{4}$
1%	$\frac{1}{100}$

Work out what 1% is. Recall the equivalent fraction.

Topic: Percentages

Activity: Calculating Percentages 1

Pupils find percentages of amounts, including compound percentages. For example, pupils are asked to find 3% by first finding 1% and then multiplying by 3.

Fractions of an amount – percentage

We often have to find percentages in real life such as '40% off – today only!'
40% of 100 is $\frac{40}{100}$ or 40. A £100 item would be reduced by £40.
That's easy if everything costs £100 but how do we find percentages of numbers other than 100?
There are a number of ways to do this – here are some of them.

Look at this 100 grid. It represents the total cost of this phone which is £200.
Each of the 100 squares represents 2% of this.
To find the value of a single square we divide: $\pounds 200 \div 100 = \pounds 2$
Each square or percent represents £2.
How do we then find 7% of £200? $7 \times \pounds 2 = \pounds 14$.

Use the 100 grid to calculate:

a 5% of £200 is _____ b 20% of £200 is _____
c 30% of £200 is _____ d 25% of £200 is _____
e 15% of £200 is _____ f 50% of £200 is _____
g If the store advertises a sale of 15% off the cost of the phone, what is the saving in pounds? _____

eBook, G series: Fractions, Decimals and Percentages, pages 22–23

Pupils find percentages of amounts including compound percentages using a hundred square for support.

Small step: Percentage – Missing Values

Alex scored 10 out of 50 in a test.
What percentage does this represent?

Answer = %

Topic: Percentages

Activity: Percentage Word Problems

In this activity, pupils find percentages of quantities. They are also asked to use the percentage to find the whole or identify what percentage one quantity is of another quantity.

Small step: Percentage Increase & Decrease

Increase £60 by 20%.

$$20\% \text{ of } £60 = 0.2 \times £60$$

$$= £12$$

$$\text{Increased Value} = £60 + £12$$

$$= £72$$

Method 1 Method 2

Add to find the increased amount.

Topic: **Percentages**

Activity: **Percentage Change: Increase and Decrease**

Pupils are shown 2 methods to increase or decrease amounts by a given percentage. Method 1 shows pupils how to increase the actual percentage amount first to reflect the increase or decrease. Method 2 shows pupils how to find the percentage and then add or subtract the percentage to/from the original amount.

Percentages ... discounts. score 0

A discount is a reduction in the price of an item. To calculate a discount, work out how much the discount is and take that amount away from the original price.

REMEMBER: To work out a percentage of an amount, the percentage is often converted to a fraction.

EXAMPLE: 25% means $\frac{25}{100}$ or $\frac{1}{4}$ or $\div 4$ TIP: $\frac{\text{percent}}{100} \times \text{number} = \text{discount}$
 $10\% = \frac{1}{10}$ OR $\div 10$

RAINFOREST ACCOMMODATION SPECIAL DEALS

ROOM: Rainforest Palms CAMPING GROUND
 Safari tent with power and shower

SALE: 10% OFF Normally \$40

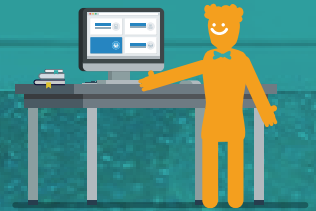
Normal price	\$	
Discount	\$	
Sale price	\$	

check next

What is the normal price?
 How much is the discount? What is the discounted price?
 Enter the answers, click check.

Rainforest Maths – Level 6 – Percentages

Pupils are shown how to calculate discounts of 10%, 20%, 25% or 50% by calculating the discount amount and decreasing the normal price by that amount.



Examples of alignment to Mathletics
Block 3 (Weeks 5–6) Number: Algebra

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> ▶ Use simple formulae. ▶ Generate and describe linear number sequences. ▶ Express missing number problems algebraically. ▶ Find pairs of numbers that satisfy an equation with two unknowns. ▶ Enumerate possibilities of combinations of two variables. 	<ul style="list-style-type: none"> ▶ Find a Rule – One Step ▶ Find a Rule – Two Step ▶ Use an Algebraic Rule ▶ Substitution ▶ Formulae ▶ Word Problems ▶ One Step Equations ▶ Two Step Equations ▶ Find Pairs of Values ▶ Enumerate Possibilities

Small step: Find a Rule – One Step

2 What numbers will come out of these function machines?

a

IN	RULE: -150	OUT
831		
1,050		
188		

b

IN	RULE: +75	OUT
640		
39		
362		

3 What numbers go in to these number function machines?

a

IN	RULE: +450	OUT
		831
		950
		672

b

IN	RULE: -175	OUT
		475
		173
		24

eBook, F series: Addition and Subtraction, pages 29–30

Pupils use a 1-step function rule to identify and enter the input or output numbers. Page 30 provides real-life examples and the use of function rules in tables.

Patterns and algebra – function number patterns

There are 2 different types of rules that a number pattern can be based upon:

- 1 A recursive rule – used to continue the sequence by doing something to the number before it.
- 2 A function rule – used to predict any number by applying the rule to the position of the number. A function rule is a rule based on the position of a number.

Consider this. Lucia was given this number pattern: 5, 10, 15, 20, 25

Her teacher asked her to work out what the 20th number would be without continuing the sequence. Lucia used a table to work out the rule between the position of a number and the number in the pattern. She worked out the rule to be $\times 5$.

Position of number	1	2	3	4	5	20
Function rule	$\times 5$	$\times 5$	$\times 5$	$\times 5$	$\times 5$	$\times 5$
Number pattern	5	10	15	20	25	100

So, following the rule based on the position of a number, the 20th number is 100. This is a function rule.

1 Use the function rule and then apply the rule to position 20.

Position of number	1	2	3	4	5	20
Function rule						
Number pattern	6	12	18	24	30	

eBook, F series: Multiplication and Division, pages 38–40

Pupils find the rule for a 1-step function using the input and output numbers and then use the rule to enter the output number for the 20th input number.

Functions ... rules in tables.

What's my rule?

input	+	20	29	32	37	43
output		25	34	37	42	48

Enter the number in the yellow circle. Click check.

Rainforest Maths – Level F – Functions

Pupils identify the 1-step function rule using the input and output numbers in a table.

Pupils can select addition, subtraction and multiplication rules to practise their knowledge.

Rainforest Maths — Level F — Functions

Pupils apply the given 1-step function rule to identify and enter output numbers. Pupils can select from all 4 operations to practise using function rules.

Rainforest Maths — Level F — Functions

Pupils select 'tables quiz' to practise calculating and entering output numbers using given addition, subtraction and multiplication 1-step function rules.

Small step: Find a Rule — Two Step

Function rules with 2 operations are easy to work out when we look at how they are linked to the multiplication tables.

Position of number	1	2	3	4	5
2 times table + 3	2 + 3	4 + 3	6 + 3	8 + 3	10 + 3
Number pattern	5	7	9	11	13
Function rule	Multiply by 2 and then add 3				

This table shows that the number pattern is the same as the 2 times table with 3 added to each answer.

2 Complete each table to show how function rules with 2 operations can be linked to multiplication tables.

a

Position of number	1	2	3	4	5
3 times table +	3 +	6 +	9 +	12 +	15 +
Number pattern	7	10	13	16	19
Function rule	Multiply by 3 and then add				

eBook, F series: Multiplication and Division, page 39

On this page, pupils find the rule for a 2-step function when they have already been given the multiplication step of a multiplication and addition rule.

This time the rule for this matchstick pattern has 2 operations. Can you see why? Look for a multiplication pattern and how many extra there are in each shape.

Look for a repeating element. Then look to see what is added. These are circled in the sequence below.

Shape 1 has 3 matchsticks $1 \times 2 + 1 = 3$
 Shape 2 has 5 matchsticks $2 \times 2 + 1 = 5$
 Shape 3 has 7 matchsticks $3 \times 2 + 1 = 7$

Shape number	1	2	3	4	5	20
Number of matchsticks	3	5	7	9	11	41
Function rule	Number of matchsticks = Shape number $\times 2 + 1$					

eBook, F series: Multiplication and Division, page 41

Pupils identify 2-step function rules involving multiplication and addition.

Patterns and functions – function number sequences

There are two different types of rules that we can apply to find out more about a sequence:

- 1 A recursive rule – gives the next number by applying a rule to the number before it
- 2 A function rule – predict any number by applying a rule to the position of the number

So far we have practised the recursive rule to work out the next number in a sequence.

Now we will apply the function rule to this problem:

How can we find out the 20th number in this sequence without writing out all of the numbers?

To use the function rule we:

- Use a table like this one below.
- Write each number of the sequence in position.
- Work out the rule, which is the relationship between the position of a number and the number in the pattern.
- Use the rule to work out the 20th number in the sequence.

Position of number	1	2	3	4	5	20
Rule	$\times 3 + 1$	$\times 3 + 1$	$\times 3 + 1$	$\times 3 + 1$	$\times 3 + 1$	$\times 3 + 1$
Number sequence	4	7	10	13	16	61

Hint: A good way to work out the rule is to see what the sequence is going up by. This tells you what the first operation is and then you adjust. This sequence is the 3 times tables moved up one so it is $\times 3 + 1$.

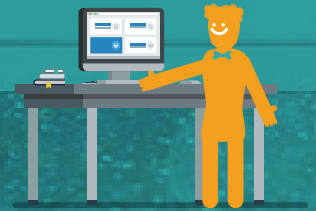
- 1 In each table, find the rule and write it in the middle row. Then apply the rule to position 20.

a

Position of number	1	2	3	4	5	20
Rule						
Number sequence	6	11	16	21	26	

eBook, G series: Patterns and Algebra, pages 3–4

These pages explore function number sequences with 2-step rules. Pupils must identify function rules to complete sequences and use the rule to find numbers which would occur further along the sequence.



Frog's functions. score 1

input	rule	output
10	$\times 10, - 4$	96
11		106
12		116

check next

FROG'S FUNCTION MACHINE
A function is like an input/output machine. It applies the same rule to each input to produce each output. Enter the output in the boxes.

Rainforest Maths – Level F – Functions

Pupils select the option, '2 operations' and then identify and enter the output numbers using a given 2-step function rule.

Frog's functions. score 0

input	rule	output
7	$\times + +$	17
8		19
9		21

check next

FROG'S FUNCTION MACHINE
Complete the rule. Enter the numbers in the yellow boxes.

Rainforest Maths – Level F – Functions

Pupils select the option 'Which rule?' to practise identifying a 2-step function rule. Pupils use the input and output numbers to identify the rule.

Small step: Use an Algebraic Rule

Write an algebraic expression for the phrase.
Phrase: 6 times a number increased by 9
Use n for the variable.

Write the expression using the variable and the operation(s).

Algebraic Expression: $6n + 9$

Topic: Algebra

Activity: Writing Algebraic Expressions

In this activity, pupils select the correct algebraic expression to represent a given number phrase.

Phrases as algebraic expressions

Write these phrases as algebraic expressions (let the number be ' n ').

- The sum of a number and 7: $n + 7$
- The difference between 9 and a number:
- The sum of 6 times a number and 1:
- The product (\times) of a number and 4:
- The quotient (\div) of two more than a number and 3:
- The difference between a number squared and 6:

eBook, H series: Algebra Basics, pages 10–11

Pupils read phrases and rewrite them as algebraic expressions where the unknown number is n .

Small step: Substitution

SUBSTITUTION

If $d = 7$, evaluate $1 + d$.

$$1 + d = 1 + 7$$

$$= 8$$

Topic: Algebra

Activity: Simple Substitution 1

In this activity pupils evaluate a simple algebraic expression by substituting the variable with the given value.



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Patterns and algebra – using symbols

Symbols help us when we have more than one number to find.
A symbol can be any shape and stands for any unknown numbers.

1 Work out the value of the diamond in each question. Notice the same symbol is added 3 times.
Your 3 times tables will help here.

a $\diamond + \diamond + \diamond = 12$ $\square + \square + \square = 12$

b $\diamond + \diamond + \diamond = 36$ $\square + \square + \square = 36$

c $\diamond + \diamond + \diamond = 45$ $\square + \square + \square = 45$

2 Find the value of the symbols. Remember that if a symbol is used more than once, it means it is the same value again.

a $\star + \star + \star = 9$ $\star = \square$

b $\heartsuit + \heartsuit = 36$ $\heartsuit = \square$

c $\odot + \odot = 49$ $\odot = \square$



Guess, check and improve strategy will help here.

[eBook, F series: Addition and Subtraction, pages 33–34](#)

These pages are an introduction to the use of symbols to represent numbers. Pupils use clues to work out the value of each symbol.

Known values can help us work out the values of the secret symbols.
Your knowledge of inverse operations will also come in handy.

$\odot = 3$
 $\odot + \odot = 24$
 $\triangle + \odot = 80$
 $\odot = \square$
 $\triangle = \square$

By knowing the value of \odot we can work out \triangle
 $3 \times \odot = 24$, so $\odot = 24 \div 3$, so $\odot = 8$

By knowing the value of \odot , we can work out \triangle
 $\triangle + 8 = 80$, so $\triangle = 80 - 8$, so $\triangle = 72$

3 Look carefully at the example above and follow the steps to find out the values of these secret symbols:

a $\star = 5$
 $\star + \odot = 45$
 $\triangle + \odot = 63$
 $\odot = \square$
 $\triangle = \square$

b $\diamond = 54$
 $\diamond + \odot = 9$
 $\triangle + \odot = 3$
 $\odot = \square$
 $\triangle = \square$

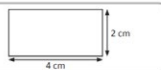
[eBook, F series: Multiplication and Division, page 38](#)

Pupils substitute values into a simple equation in order to find the values of the other unknown numbers.

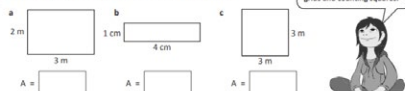
Small step: Formulae

Area – find area using formulae

We can use this formula to find the area of rectangles.
 Area = Length \times Width
 Area = 4 cm \times 2 cm = 8 cm²



1 Use the formula $A = L \times W$ to help you find the areas* of:



This saves us from ruling up grids and counting squares.



*Not drawn to scale.

2 Find the area of the following:

- a A rectangle measuring 8 cm \times 5 cm \square
- b A box measuring 30 cm \times 7 cm \square
- c A pool measuring 25 m \times 10 m \square
- d A phone measuring 4.5 cm \times 10 cm \square
- e A book measuring 35 cm \times 12 cm \square
- f A field measuring 60 m \times 25 m \square
- g A town square with 4 sides of 10 m \square
- h A rug measuring 10.2 m \times 3.4 m \square

[eBook, G series: Length, Perimeter and Area, pages 18–20](#)

Pupils substitute values into the formula for area to calculate the area of 2D shapes.

Equations and formulae

Topic 7: Formulae

QUESTION 1 Given the formula $V = Ah$, find V if:

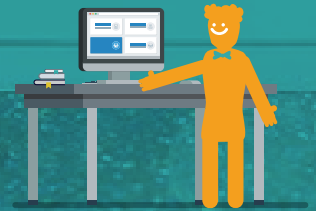
- a $A = 10, h = 3$ \square
- b $A = 15, h = 5$ \square
- c $A = 9, h = 4$ \square
- d $A = 12, h = 8$ \square
- e $A = 5, h = 3$ \square
- f $A = 24, h = 1.1$ \square
- g $A = 12, h = 7$ \square
- h $A = 3.7, h = 3$ \square
- i $A = 8.9, h = 5.2$ \square

QUESTION 2 Given the formula $P = 2L + 2B$, find P if:

- a $L = 18, B = 10$ \square
- b $L = 12, B = 5$ \square
- c $L = 9, B = 4$ \square
- d $L = 20, B = 10$ \square
- e $L = 4.8, B = 2.2$ \square
- f $L = 6.5, B = 3.3$ \square
- g $L = 8, B = 4$ \square
- h $L = 5, B = 3$ \square
- i $L = 7, B = 5$ \square

[eBook, H series: Algebra, page 5](#)

Pupils substitute values for variables using the formula for volume and perimeter.



Small step: Word Problems

What is the number?
When I add 8 to it,
the result is 4 less than 18.

Calculate the missing number.

right hand side
 $7 + 8 = 18 - 4$
 $7 + 8 = 14$
 $6 + 8 = 14$

The number is 6

Hint: What do I need to add to 8 to get 14?

Back

Topic: Algebra

Activity: *I am Thinking of a Number!*

In this activity, pupils read word problems and use the clues to identify a missing number.

Patterns and algebra – think of a number

Lim thinks of a number, adds 3 to it and then multiplies it by 4.
The answer is 20. What is Lim's number?
To answer this, first we need to write an equation with the unknown:

Step 1 Set up the equation. The heart shape stands for the unknown number.
 $\heartsuit + 3 \times 4 = 20$

Step 2 Cancel out the $\times 4$ with the inverse operation: $\div 4$
 $\heartsuit + 3 = 20 \div 4$

Step 3 Cancel out the $+ 3$ with the inverse operation: $- 3$
 $\heartsuit + 3 = 5$
 $\heartsuit = 5 - 3$
 $\heartsuit = 2$

1 Work out the numbers these children are thinking of:

a Jamilla says: "I'm thinking of a number. I divide it by 7 and then add 6. My answer is 13."
 $\heartsuit \div 7 + 6 = 13$
 $\heartsuit \div 7 = 13 - 6$
 $\heartsuit \div 7 = \square$
 $\heartsuit = \square \times 7$
 $\heartsuit = \square$

b Pablo says: "I'm thinking of a number. I multiply it by 6 and then add 7. My answer is 55."
 $\heartsuit \times 6 + 7 = 55$
 $\heartsuit \times 6 = 55 - 7$
 $\heartsuit \times 6 = \square$
 $\heartsuit = \square \div 6$
 $\heartsuit = \square$

eBook, F series: Multiplication and Division, page 53

Pupils read word problems and write them as equations using symbols for the unknown number.

Write a number sentence for each problem. Use inverse operations to find the answer.

Example If you add 10 to my favourite number you have a number that is the square of half a dozen.
Number sentence: $\heartsuit + 10 = 6 \times 6$ Take 10 away (inverse operation) from 36 ($\heartsuit = 6 \times 6 - 10$), to arrive at the favourite number, 26.

- If you take my favourite number, multiply it by the sum of 7 and 9, and take away 14 you arrive at the answer of 18.
Number sentences: _____
Solution: _____
- After you have divided my number by 9, added 14 and multiplied by 3, you will end up with 66.
Number sentences: _____
Solution: _____
- If you halve my number, square the answer and subtract the difference between 70 and 36, you will arrive at a number equivalent to 11 times 6.
Number sentences: _____
Solution: _____

eBook, F & G series: Problem Solving, page 34

Pupils read word problems and write them as number sentences or equations. They can then solve the problems using symbols for the unknown number.

Small step: One Step Equations

Solve the equation.

$x + 1.1 = 8.8$
 $x + 1.1 - 1.1 = 8.8 - 1.1$
 $x = 7.7$

Simplify.

Back

Topic: Algebra

Activity: *Solve Equations: Add, Subtract 1*

Pupils use inverse strategies to solve 1-step addition and subtraction problems.



Year 6 White Rose Maths (WRM) Spring Scheme of Learning, 2018

Mathletics

Solve the equation.

$$8x = 64$$

$$\frac{8x}{8} = \frac{64}{8}$$

$$x = 8$$

Find the value of x .

Back

Topic: Algebra

Activity: *Solve Equations: Multiply, Divide 1*

Pupils use inverse strategies to solve 1-step multiplication and division problems.

The hockey team had 66 students try out for the team, which was 3 times the number of students who tried out for the baseball team. How many students tried out for the baseball team?

Use n for the variable.

$$66 = 3 \times n$$

$$\frac{66}{3} = \frac{3 \times n}{3}$$

$$22 = n$$

So 22 students tried out for the baseball team.

Solve the equation.

Back

Topic: Algebra

Activity: *Write an Equation: Word Problems*

This activity asks pupils to select the equation that matches a given word problem from 4 multiple choice options. They must then solve the equation.

How can we find out the value of the symbol in this equation?
We need to make it stand on its own while keeping the equation balanced. This is called the *balance strategy*.
We do this by performing the inverse operation to both sides.
Can you see why?

$$\star + 560 = 700$$

$$\star + 560 - 560 = 700 - 560$$

$$\star = 140$$

Doing the inverse cancels out a number and helps get the unknown to stand on its own.

eBook, F series: *Addition and Subtraction, pages 35–37*

These pages introduce pupils to the 'balance strategy' and inverse operations to find an unknown value in an equation.

1 Find out the value of each symbol by performing inverse operations:

a $\bigcirc + 450 = 900$
 $\bigcirc + 450 - \quad = 900 - \quad$
 $\bigcirc = \quad$

b $\star - 750 = 820$
 $\star - 750 + \quad = 820 + \quad$
 $\star = \quad$

c $\triangle + 492 = 743$
 $\triangle + 492 - \quad = 743 - \quad$

d $\diamond - 755 = 435$
 $\diamond - 755 + \quad = 435 + \quad$

Solving equations – using pronumerals in an equation

In algebra, pronumerals are used to represent the unknown number or what we are trying to find out. Look at this example:
Amity's teacher gave the class a mystery number question:
"The sum of a mystery number and 18 is 36. What is the number?"
Amity used a pronumeral x to stand for the mystery number.
She wrote: $x + 18 = 36$
This is really saying, "mystery number plus 18 is 36."
Next, Amity used the balance strategy to solve the equation:

$$x + 18 = 36$$

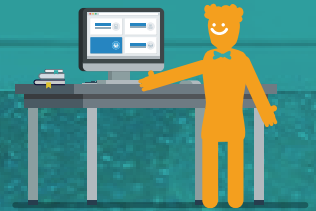
$$x + 18 = 36 - 18$$

$$x = 18$$

eBook, G series: *Patterns and Algebra, pages 27–28*

Pupils form an equation involving an unknown value, x , and then solve the equation to calculate its value.

- 1 For each question, write an equation using the pronumeral x for the mystery number, then solve it.
- a The sum of 7 and a mystery number is 26.
- b A mystery number increased by 15 is 48.
- c A mystery number doubled is 64.
- d The difference between a mystery number and 19 is 42.



Solving simple equations

When asked to solve an equation, you are really being asked:
"What value does the variable need to be to keep the equation in balance?"

Simple equations like these can be solved mentally.

Solve these equations:

(i) $a + 4 = 9$	$a + 4 = 9$ $\therefore a = 5$	Think "what number plus 4 will give 9?" This number plus 4 will equal 9.
(ii) $\frac{p}{8} = 2$	$\frac{p}{8} = 2$ $p = 8 \times 2$ $\therefore p = 16$	Think "what number does 8 go into twice?" This number divided by 8 will equal 2.

Always line up the equal signs vertically when setting out solutions.

Opposite operations can be used to get the variable by itself. Remember to keep the equation balanced.
Solve these equations by getting the variable all by itself.

eBook, I series: Equations, pages 8–10

Pupils use opposite operations and the concept of balancing equations to solve simple 1-step equations.

Small step: Two Step Equations

Two-step equations

These need two different opposite operations to solve them.
Remember that what is done to one side must be done to the other.

For simple two-step equations, usually the coefficient $\neq 1$.

Solve these equations by isolating the variable using inverse operations.

(i) $2x + 3 = 7$	$2x + 3 = 7 - 3$ $2x = 4$ $2x \div 2 = 4 \div 2$ $\therefore x = 2$	Subtract 3 from both sides x is still not by itself Divide both sides by 2.
(ii) $5 + 2a = 20$	$5 - 5 + 2a = 20 - 5$ $2a = 15$ $2a \div 2 = 15 \div 2$ $\therefore a = 7\frac{1}{2}$	Subtract 5 from both sides a is still not by itself Divide both sides by 2.

Coefficient of $a = 2$

eBook, I series: Equations, pages 11 and 12

These pages introduce pupils to 2-step equations involving 1 variable. They are then taught to carry out inverse operations until the variable is by itself on one side of the equation.

Equations ... solving. score

An equation is a mathematical sentence where the left side is equal to the right side.

Solve the equation - what number is x ?

ECHIDNA'S EQUATIONS choose

$x + 38 = 65 - 9$

$x =$ **check** **next**

Enter the correct number in the box.

Rainforest Maths — Level 6 — Algebra: Equations — balance

Pupils solve 2-step equations with addition and subtraction.

Small step: Enumerate Possibilities

Complete the table.

$y = x + 5$ ← Function rule

x	0	1	2	3	4
y	5	?	?	9	

Substitute the known value into the function rule.

$y = 1 + 5$
 $y = 6$

Back Next

Topic: Algebra

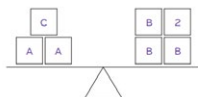
Activity: Function Rules and Tables

Pupils enter the missing values in a table using a 1-step or 2-step function rule.

We Balance!

Pattern and Algebra

If these scales balance and the masses are whole numbers of kilograms, how heavy are boxes A, B, and C?
Get lots of possibilities.



Rich Learning Task, E series: Patterns and Algebra; We Balance!

Pupils find multiple possibilities for the values of A, B and C for the equation $2A + C = 3B + 2$.



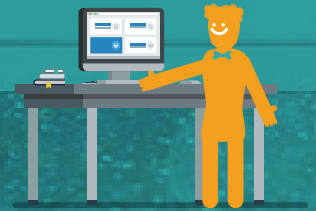
Equal for 10

Patterns and Algebra

$2x + 3$ is worth the same as another algebraic expression when $x = 10$ but not for other values of x .
What could the other expression be?
Are there other possibilities?
How could you use models to show that this is true?

Rich Learning Task, G series: Patterns and Algebra; Equal for 10

Pupils find multiple expressions equal to $2x + 3$ when $x = 10$.



Examples of alignment to Mathletics

Block 4 (Week 7) Measurement: Converting Units

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> 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 3dp. Convert between miles and kilometres. 	<ul style="list-style-type: none"> Metric Measures Convert Metric Measures Calculate with Metric Measures Miles and Kilometres Imperial Measures

Small step: Metric Measures

Which is the best unit to measure its mass?



g kg

Topic: **Converting units of measurement**Activity: *Which Unit of Measurement?*

Pupils choose the best unit of measurement for an everyday object. The choices are: millimetres, metres or centimetres for length; millilitres or litres for capacity; grams and kilograms for mass.

1 Think of all the units you know for measuring length. Can you show how they are connected?

metre — 1,000 m = 1 km — kilometre

When measuring length, it is important to choose a suitable unit of measurement. Using millimetres as the unit to measure the distance between London and Moscow is not the most efficient choice. Think of all those zeros.

2 Choose the conventional unit of length (cm, m, mm) to measure the following:

- a The length of your nose b The distance between England and France
- c The length of a swimming pool d The length of a ladybird

eBook G series: **Length, Perimeter and Area, pages 1–2**

Pupils select the different units of length they would use to measure given objects or distances using their understanding of the sizes of the units.

Small step: Convert Metric Measures

Convert from m to cm.

21.64 m = 2164 cm

21.64 × 100

1 m = 100 cm

Convert to the unit indicated.

Topic: **Converting units of measurement**Activity: *Converting Units of Length*

In this activity pupils convert between millimetres, centimetres and metres.

Other similar activities in this topic practise converting between various units of length, for example metres and kilometres. These include:

Activity: *Converting cm and mm*Activity: *Centimetres and Metres*Activity: *Metres and Kilometres*



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Mathletics

Convert from kg to t

$$7,200 \text{ kg} = 7.2 \text{ t}$$

$$7,200 \div 1,000$$

1,000 kg = 1 t

Convert to the unit indicated.

Topic: **Converting units of measurement**

Activity: **Converting Units of Mass**

In this activity pupils convert between grams, kilograms and tonnes.

Another similar activity in this topic practises converting from grams to kilograms and vice versa.

Activity: **Grams and Kilograms**

Convert from mL to L

$$3\,500 \text{ mL} = 3.5 \text{ L}$$

$$3\,500 \div 1\,000$$

1,000 mL = 1 L

Convert to the unit indicated.

Back

Topic: **Converting units of measurement**

Activity: **Millilitres and Litres**

Pupils multiply or divide to convert from millilitres to litres and vice versa.

Calculate the number of minutes in $2\frac{1}{2}$ hours.

$$2\frac{1}{2} \text{ hours} = 150 \text{ minutes} \checkmark$$

Topic: **Converting units of measurement**

Activity: **Time Conversions: Simple Fractions**

Pupils use their understanding of simple fractions to convert between seconds, minutes and hours.

Units of length – convert measurements

Measurements can be expressed using different units.

When we convert from a larger unit to a smaller unit, we multiply:
 $\text{cm} \rightarrow \text{mm}$ $34 \text{ cm} = (34 \times 10) \text{ mm} = 340 \text{ mm}$

When we convert from a smaller unit to a larger unit, we divide:
 $\text{cm} \rightarrow \text{m}$ $34 \text{ cm} = (34 \div 100) \text{ m} = 0.34 \text{ m}$

1 Express the lengths shown on the ruler in 2 ways:



a	<input type="text"/> mm	<input type="text"/> cm	b	<input type="text"/> mm	<input type="text"/> cm
c	<input type="text"/> mm	<input type="text"/> cm	d	<input type="text"/> mm	<input type="text"/> cm

eBook G series: **Length, Perimeter and Area, pages 3–4**

On these pages pupils are encouraged to convert measurements between millimetres, centimetres and metres. They progress to converting metres to kilometres up to 3 decimal places.

Volume and capacity – millilitres and litres

Capacity refers to the amount a container can hold and is usually associated with liquid. Common capacity measurements are millilitres and litres.

1,000 millilitres = 1 litre
 1,000 ml = 1 l

1 When we convert:

a millilitres to litres, we by 1,000

b litres to millilitres, we by

2 Convert these amounts to litres:

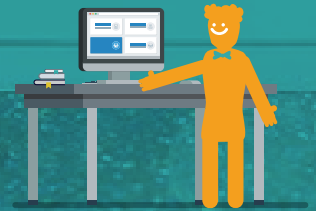
a	3,452 ml = <input type="text"/>	b	7,895 ml = <input type="text"/>
c	10,000 ml = <input type="text"/>	d	12,674 ml = <input type="text"/>
e	56,780 ml = <input type="text"/>	f	235 ml = <input type="text"/>

3 Convert these amounts to millilitres:

a	2.568 l = <input type="text"/>	b	3.999 l = <input type="text"/>
c	10.566 l = <input type="text"/>	d	1.78 l = <input type="text"/>

eBook G series: **Volume, Capacity and Mass, pages 2–3**

These pages provide practice in converting measurements between millilitres and litres.



Rainforest Maths – Level G– Length

Pupils are required to convert between millimetres, centimetres, metres and kilometres including decimals to 3 places.

Rainforest Maths – Level G– Mass

Pupils are required to convert between grams, kilograms and tonnes including decimals to 3 places.

Small step: Calculate with Metric Measures

Word problems solve

What to do

- If there are 60 brochures in a stack and each of them are 8 mm thick, how high is the stack?
- A plank of wood is 5 m long. If 150 cm is sawn off, how much is left?
- How many 20 mm pieces of gold wire can be cut from 1 m?

eBook, F series: Length, Perimeter and Area, page 9

This page provides pupils with word problems involving converting units of length: millimetres, centimetres and metres.

Small step: Miles and Kilometres

Units of length – metric and imperial

Most measurements used today in the UK (and in almost every country in the world apart from the USA) are metric, such as kilograms, metres and litres. They are based on the decimal number system, meaning that multiples of units are 10s, 100s or 1,000s. You will still come across some of the old 'imperial' units of measurement, though; in particular, miles, which continue to be used to measure longer distances on road signs. Therefore, it's useful to know how to convert between metric and imperial units and back. Most of the equivalents below have been rounded to 1 decimal place.

	Imperial to Metric	Metric to Imperial
Length:	1 inch = 2.5 cm	1 centimetre = 0.4 inches
	1 foot (12 inches) = 30.5 cm	1 metre = 3.3 feet
	1 yard (3 feet) = 91 cm	1 kilometre = 0.6 miles
	1 mile (1,760 yards) = 1.6 km	

- Convert these measurements from imperial to metric or metric to imperial:

a 2 metres = [] feet	b 3 inches = [] centimetres
c 10 yards = [] metres	d 5 centimetres = [] inches
e $1\frac{1}{2}$ miles = [] kilometres	f 3 feet = [] centimetres
g 20 millimetres = [] inches	h 3,520 yards = [] kilometres
- Draw a line between the equivalent distances in miles and kilometres:

30 miles	4 miles	6 miles	16 miles	20 miles	9 miles
6.4 km	32 km	48 km	9.6 km	25.6 km	14.4 km

eBook, G series: Length, Perimeter and Area, page 5

An explanation of metric and imperial units is given before pupils practise converting between different units. Question 2 specifically practises conversions between miles and kilometres.



Small step: Imperial Measures

Volume and capacity – metric and imperial

Most measurements used today in the UK (and in almost every country in the world apart from the USA) are metric, such as kilograms, metres and litres. They are based on the decimal number system, meaning that multiples of units are 10s, 100s or 1,000s. You will still come across some of the old 'imperial' units of measurement, though. Therefore, it's useful to know how to convert between metric and imperial units and back. Most of the equivalents below have been rounded to 1 decimal place.

	Imperial to Metric	Metric to Imperial
Mass:	1 ounce = 28 g	1 gram = 0.35 ounces
	1 pound (16 ounces) = 0.45 kg	1 kilogram (1,000 g) = 2.2 pounds
	1 stone (14 pounds) = 6.4 kg	1 tonne (1,000 kg) = 1.1 tons
	1 ton (2,000 pounds) = 0.9 tonnes	
Capacity:	1 fluid ounce = 30 ml	10 millilitres = 0.3 fluid ounces
	1 pint (16 fluid ounces) = 0.6 l	1 litre (1,000 ml) = 2.1 pints

1 Convert these measurements from imperial to metric or metric to imperial:

- | | |
|--|---|
| a 2 pounds = <input type="text"/> kilograms | b 7 tonnes = <input type="text"/> tons |
| c 10 grams = <input type="text"/> ounces | d 4 ounces = <input type="text"/> grams |
| e 4 pints = <input type="text"/> litres | f 8 tons = <input type="text"/> tonnes |
| g 20 kilograms = <input type="text"/> pounds | h 6 litres = <input type="text"/> pints |

eBook, G series: Volume, Capacity and Mass, page 1

This page provides opportunities for pupils to convert between metric and imperial units of mass and capacity.

Most measurements used today in the UK (and in almost every country in the world apart from the USA) are metric, such as kilograms, metres and litres. They are based on the decimal number system, meaning that multiples of units are 10s, 100s or 1,000s. You will still come across some of the old 'imperial' units of measurement, though; in particular, miles, which continue to be used to measure longer distances on road signs. Therefore, it's useful to know how to convert between metric and imperial units and back. Most of the equivalents below have been rounded to 1 decimal place.

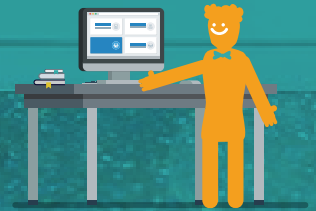
	Imperial to Metric	Metric to Imperial
Length:	1 inch = 2.5 cm	1 centimetre = 0.4 inches
	1 foot (12 inches) = 30.5 cm	1 metre = 3.3 feet
	1 yard (3 feet) = 91 cm	1 kilometre = 0.6 miles
	1 mile (1,760 yards) = 1.6 km	

1 Convert these measurements from imperial to metric or metric to imperial:

- | | |
|--|---|
| a 2 metres = <input type="text"/> feet | b 3 inches = <input type="text"/> centimetres |
| c 10 yards = <input type="text"/> metres | d 5 centimetres = <input type="text"/> inches |
| e 1 mile = <input type="text"/> kilometres | f 3 feet = <input type="text"/> metres |

eBook, G series: Length, Perimeter and Area, page 5

This page provides opportunities for pupils to convert between metric and imperial units of length.



Examples of alignment to Mathletics

Block 5 (Weeks 8–9) Measurement: Perimeter, Area and Volume

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> ▶ 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 cm^3, m^3 and extending to other units [for example, mm^3, km^3]. 	<ul style="list-style-type: none"> ▶ Shapes – Same Area ▶ Area and Perimeter ▶ Area of a Triangle (1) ▶ Area of a Triangle (2) ▶ Area of a Triangle (3) ▶ Area of a Parallelogram ▶ Volume – Counting Cubes ▶ Volume of a Cuboid

Small step: Shapes – Same Area

	<p>Rich Learning Task, G series – Predicting Area</p> <p>Using the interactive, teachers introduce the task to their pupils. It involves pupils creating shapes using the pegs as vertices and ensuring that 1 peg is left inside the shape. Pupils will explore the area of the shapes they create and discover that the area of the shape is the same as half the number of pegs on the boundary.</p>
	<p>eBook, G series: Length, Perimeter and Area, page 29</p> <p>In this task, pupils are given the opportunity to explore rectangles with the same area but different side lengths. They should be encouraged to notice that the side lengths are factors of the area.</p>
	<p>Rainforest Maths – Level F – Area ... square units</p> <p>Select the option, 'draw your own shapes'.</p> <p>Pupils are instructed to draw different shapes with the same area, using the coloured pens and the squares on the screen.</p>

Small step: Area and Perimeter

Add the lengths of all sides.

$$P = 7 + 7 + 7 + 7 = 28$$

Perimeter = 28 cm

Back

Topic: **Perimeter, Area and Volume**

Activity: **Perimeter**

This activity can be used as a reminder of the formula for calculating perimeter.

Calculating area.

$$A = \text{Length} \times \text{Width} = 50 \times 8 = 400 \text{ m}^2$$

Calculate the answer.

Rectangle: A = Length x Width
Square: A = Length x ?

Back

Topic: **Perimeter, Area and Volume**

Activity: **Area: Squares and Rectangles**

Pupils use the formula to calculate the area of squares and rectangles.

Area – area and perimeter

Do shapes with the same area have the same perimeter? 4 cm² 4 cm²

No.

1 Draw some shapes with an area of 12 cm². Measure and record their perimeters in the table below. What do you find?

Length	Width	Area

2 This time, use a perimeter of 20 cm as your starting point. Create different shapes with a perimeter of 20 cm and calculate their area.

Length	Width	Area

eBook, G series: **Length, Perimeter and Area, page 21**

This page provides pupils with the opportunity to explore shapes with the same perimeter but different areas and vice versa.

Area ... square centimetres.

We measure area in square units.

The formula for finding the area of a rectangle is: Area = Length x Breadth or A = L x B

Example: 6 cm x 3 cm = 18 cm²

Area = 18 cm²

The area of the shape is 18 cm².

Use the formula A = L x B to calculate the area of the shape in square centimetres.

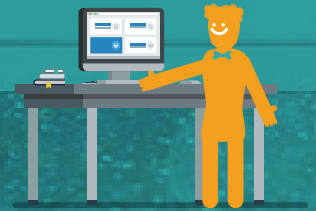
Area units & abbreviations: square centimetres – cm², square metre – m², hectares – ha, square kilometres – km²

Rainforest Maths – Level F – Area

Pupils are given the formula and dimensions for finding the area of a rectangle.

Using this activity on the interactive whiteboard can provide opportunity for a discussion about the perimeter of the shape and its relationship to area.

Clicking 'next' provides a range of rectangles, all labelled in centimetres.



4 Different plans

Use the squared paper (scale 0.5 cm = 1 m) to lay out your plans for the following questions.

1 You have 24 m² of carpet. What sized rooms can you carpet with it? The rooms can be regular or irregular shapes.
Are the rooms all the same size in area? _____
Do they all have the same perimeter? _____

2 You have 30 m of rope. What sized sections can you rope off on your lawn? They may be regular or irregular shapes. Use thread 15 cm long for the rope and pins for the corners.
Do the shapes have the same area? _____
Do they have the same perimeter? _____

eBook, F&G series: Problem Solving, page 65

In this problem solving task pupils create different shapes with a given area or perimeter and discover that shapes with the same area do not necessarily have the same perimeter and vice versa.

Small step: Area of a Triangle (2)

Area – find area using formulae

Each triangle is half of a rectangle. To find the area of a triangle, we find the area of the rectangle and then divide by two.

Rectangle = 8 cm × 4 cm = 32 cm²
Triangle = 32 cm² ÷ 2 = 16 cm²
The formula for this is:
 $\frac{1}{2} \times \text{Base} \times \text{Height}$

1 Find the area of the shaded triangles inside the rectangles:

a Area = cm²

b Area = cm²

c Area = m²

Area = cm²

Area = cm²

This works for all triangles – right angled, isosceles, equilateral and scalene. One formula fits all!

eBook, G series: Length, Perimeter and Area, page 19

The formula for finding the area of a triangle is explained in relation to the formula for finding the area of a rectangle. Pupils then apply the formula to help find the area of a range of triangles, with the base and height of each triangle given.

Small step: Area of a Triangle (3)

Find the area.

Not drawn to scale.

Calculate the area. Notice that the area is in square units.

Formula
 $A = \frac{\text{Base} \times \text{Height}}{2}$

$A = \frac{\text{Base} \times \text{Height}}{2}$
 $= \frac{9 \times 9}{2}$
 $= 40.5$
 $A = 40.5 \text{ sq. cm}$

Back

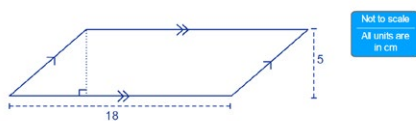
Topic: Perimeter, Area and Volume

Activity: *Area of Triangles*

In this activity, pupils apply the formula for finding the area of a triangle.

Small step: Area of a Parallelogram

Calculate the area of the parallelogram.



$A = \text{ cm}^2$

Topic: Perimeter, Area and Volume

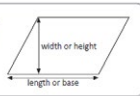
Activity: *Area: Parallelograms (Metric)*

In this activity, pupils apply the formula for finding the area of a parallelogram. The image provides visual support in relating parallelograms to rectangles.

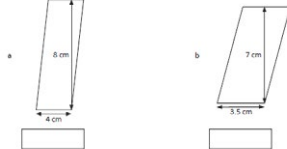


Area – find area of parallelograms

A parallelogram is a quadrilateral with opposite sides of equal length and opposite angles of equal size. To find the area of a parallelogram, you use the same formula as for rectangles – that is, length \times width or base \times height. So if the base is 10 cm long and the height is 8 cm long, the area of the parallelogram will be $10 \times 8 = 80 \text{ cm}^2$.



1 Find the areas of these parallelograms (not drawn to scale):



eBook, G series: Length, Perimeter and Area, page 20

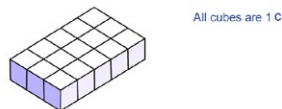
An explanation and illustration of a parallelogram shows pupils why the area of a parallelogram is calculated using the same formula as for rectangles. Pupils then explore a range of parallelograms and find their areas.

Rainforest Maths – Level G – Area

The formulae for finding the area of squares, rectangles and parallelograms, and triangles are given and illustrated to create a deeper understanding of area for pupils.

Small step: Volume – Counting Cubes

Find the volume of the solid.



Volume = cm^3

Topic: Perimeter, Area and Volume

Activity: *Volume of Solids and Prisms – 1cm³ blocks*

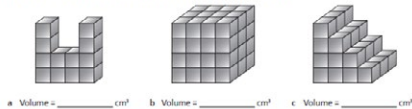
Pupils count cubic centimetre blocks to find the volume of various solids.

Volume and capacity – cubic centimetres and cubic metres

Remember that volume refers to the amount of space occupied by an object or substance. Commonly used volume measurements are the cubic centimetre and the cubic metre.



1 Find the volume of these shapes by counting the cubes. Each cube is 1 cm³.



a Volume = cm^3 b Volume = cm^3 c Volume = cm^3

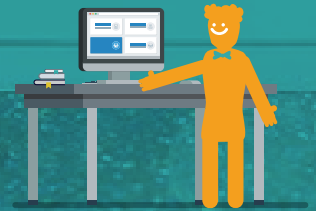
eBook, G series: Volume, Capacity and Mass, page 4

The concept of finding volume is explained and illustrated showing cubic centimetres and metres.

In question 1, pupils count cubes to find the volume of the shown shapes.

Rainforest Maths – Level E – Volume

In this activity pupils click 'fill' and the centimetre cubes automatically fill the container. Pupils count the cubes to find the volume of the container.



Small step: Volume of a Cuboid

Calculating Volume.

20 cm 10 cm

20 cm

$V = L \times W \times H$
 $= 20 \times 10 \times 20$
 $= 4000 \text{ cm}^3$

Calculate the answer.

Formula
Volume = Length x Width x Height

Back

Topic: Perimeter, Area and Volume

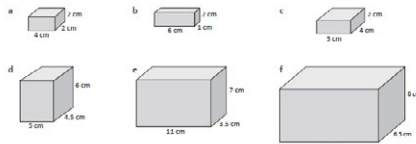
Activity: *Volume: Rectangular Prisms 1*

Pupils use the formula to find the volume of cuboids.

We can find out the volume of a rectangular prism or cube without counting each block. We just multiply the length by the width by the height.



Use the formula $L \times W \times H = V$ to find the volume of these prisms. You may use a calculator.



Shape	a	b	c	d	e	f
Volume						

eBook, G series: Volume, Capacity and Mass, page 4

The formula for calculating volume: length x width x height = volume is explained and illustrated.

Pupils use the formula to find the volume of a range of cuboids.

Volume ... cubic centimetres.

We measure volume in cubic units.

The formula for finding the volume of a rectangular prism is
Volume = Length x Breadth x Height or $V = L \times B \times H$

What is the volume of the block prism?

A cubic centimetre is a cube with 1 cm sides.
ABBREVIATION: cm^3

3 x 3 x 2 = 18 cm^3

Length Breadth Height

Enter the numbers. Click check.

score 2

check next

Rainforest Maths – Level G – Volume ... cubic centimetres

Pupils are shown a cuboid modelled in centimetre cubes and enter the dimensions as centimetres for the length, breadth (width) and height. They calculate the volume and enter the answer.

volume

To find the volume of this shape, we find its length, width and height.

Each layer is 4 blocks long and 2 blocks wide, making 8 blocks.
The shape is 2 blocks high, so there are 2 layers.
Altogether, the volume of the shape is $4 \times 2 \times 2 = 16$ blocks.

Concept Search – volume

This animation shows a cuboid being stacked with blocks. Each block is a cube. The volume is worked out by counting the number of blocks along each dimension and then multiplying.



Examples of alignment to Mathletics Block 6 (Weeks 10–11) Number: Ratio

National Curriculum Objectives	WRM Small Steps
<ul style="list-style-type: none"> Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. 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. 	<ul style="list-style-type: none"> Using Ratio Language Ratio and Fractions Introducing the Ratio Symbol Calculating Ratio Using Scale Factors Calculating Scale Factors Ratio and Proportion Problems

Small step: Ratio and Fractions Small step: Introducing the Ratio Symbol

A ratio is a comparison between two different things.

There are three red squares and one blue square, so we can say that the ratio of red squares to blue is 3 to 1. This can be written as 3:1. The order of the numbers follows the order of the words. The ratio of blue to red squares is 1 to 3 or 1:3.

You can also express ratios in relation to a total as a fraction. There are a total of four squares. Therefore, the ratio of red squares to the total is $\frac{3}{4}$. The ratio of blue squares to the total is $\frac{1}{4}$.

We can sometimes simplify ratios. Two of the squares are green and four are white, so the ratio of green to white is 2:4. Both sides of this ratio can be divided by 2 so it can be simplified to 1:2. For every one green square there are two white squares.

If two ratios are the same, we say they are in proportion. 2:4 and 1:2 are in proportion. The ratio of green blocks to the total number of blocks as a fraction is $\frac{2}{6}$. This can be simplified to $\frac{1}{3}$, so $\frac{2}{6}$ and $\frac{1}{3}$ are in proportion.

- Complete the following word problems:
- There are 17 boys and 13 girls in a class. Express the ratio of boys to girls in the form a:b, and the ratio of girls to the total number of children in the class as a fraction.
 - There are 35 sweets in a bag. 8 are red and the rest are green. Express the ratio of green to red sweets in the form a:b, and the ratio of green to the total number of sweets as a fraction.

eBook, G series: Fractions, Decimals and Percentages, page 24

This page provides an extensive introduction to ratio including the relationship between ratio and fractions. Pupils are asked to express simple ratios in the form a:b and as fractions.

How does it work? Rates and Ratios

Ratios

A ratio compares two quantities in a given order.

For example, if the number of oranges in a bag is twice that of the number of apples, this is a ratio of 2 to 1 and is written as:

2:1

Each number is called a term of the ratio.

The order in a ratio is important. The ratio of oranges to apples is 2:1. The ratio of apples to oranges is 1:2.

The shapes below are divided into equal rectangular regions. For each region:

- Write down the ratio of the shaded region to unshaded region.
- Write down the ratio of the shaded region to the whole shape.

- 1 part is shaded, while 3 parts are unshaded, so the ratio of shaded to unshaded parts is 1:3 or using ratio notation, 1:3.
- There are 4 equal parts in total. ∴ The ratio of shaded to the whole is 1:4.

eBook, I series: Rates and Ratios, pages 2–4

These pages also describe and define ratio. Pupils are asked to use the ratio symbol to record ratios presented in word problems and images.

Small step: Calculating Ratio

The ratio of waiters to chefs is 6:4 respectively.

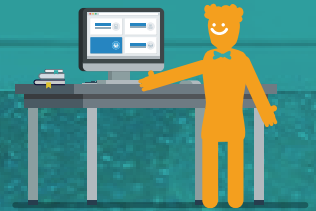
If there are 18 waiters, how many chefs are there?

Number of chefs =

Topic: Ratio

Activity: Word Problems: Ratio

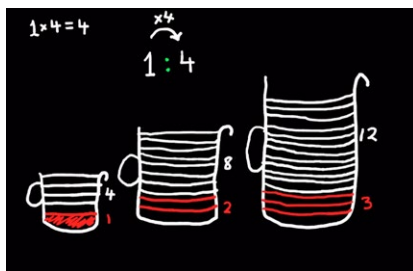
Pupils use multiplication and division facts to calculate amounts using a given ratio.



- 3 I have a recipe for making 20 cup cakes, but I want to make 60 cakes. How much of each ingredient will I need?
- | | |
|---------------------------|--|
| For 20 cup cakes | For 60 cup cakes |
| 3 cups flour | <input type="text"/> cups flour |
| 1 teaspoon salt | <input type="text"/> teaspoons salt |
| 2 teaspoons baking powder | <input type="text"/> teaspoons baking powder |
| $\frac{1}{2}$ cup butter | <input type="text"/> cups butter |
| $\frac{3}{4}$ cup sugar | <input type="text"/> cups sugar |
| 2 eggs | <input type="text"/> eggs |
| 1 cup milk | <input type="text"/> cups milk |

eBook, G series: Fractions, Decimals and Percentages, page 25

This page provides an opportunity to calculate quantities of ingredients using a simple ratio.



Conceptual Video: Ratios

This video can be found by doing a search in 'Lessons' through the older Mathletics interface. Search for the 'Ratios' activity and by clicking preview you will see the video on the left-hand side near the support button. The video introduces ratios and demonstrates the part-whole relationship.

Small step: Calculating Scale Factors

2 Compare the pictures below and answer the following questions:

a Look at the outline of the 2 pictures. How much longer is Picture 2 compared to Picture 1 (from top to bottom)?

b Have the angles changed?

c Has the shape been rotated?

d Has the area changed?

eBook, G series: Geometry, page 25

This page introduces scale (without using scale factor). Pupils are asked to enlarge or reduce shapes using a grid. Question 2 asks pupils to identify the differences in the lengths of 2 identical pictures. This is an opportunity for teachers to introduce scale factor as it has a scale factor of 2.

Small step: Ratio and Proportion Problems

Which of the following represents the 'best buy'?

1 loaf of bread for £4.02 1 loaf of bread costs: $£4.02 \div 1 = £4.02$

3 loaves of bread for £12.90 1 loaf of bread costs: $£12.90 \div 3 = £4.30$

Thus, 1 loaf of bread for £4.02 is the 'best buy'.

Topic: Ratio
Activity: Best Buy

Pupils practise finding the unit cost in order to compare prices and determine the best buy.

Divide 48 in the ratio of 4 : 2

Ratio = 4 : 2

Total parts = $4 + 2 = 6$

1 part = $48 \div 6$

 = 8

$\therefore 4 : 2 = 32 : 16$

Topic: Ratio
Activity: Dividing a Quantity in a Ratio

Pupils practise dividing a quantity into a given ratio. Remind pupils of the importance of the order of a ratio. Pupils will need support with harder questions as 3-part ratios are included. Alternatively, use this activity as a demonstration tool and cycle through the easier and medium questions.



Year 6 White Rose Maths (WRM) Spring Scheme of Learning, 2018

Mathletics

We use scale drawings to represent larger measurements or objects.
Maps and floor plans are good examples of when we use scale in real life.
We use one measurement to represent another, like this: $1 \text{ cm} = 5 \text{ km}$

1 If the length of each cell on the square grid to the right represents 3 km, how long is each line?

a		km
b		km
c		km
d		km
e		km

2 What about if each cell represents 20 cm?

a cm b cm c cm d cm e cm

3 If the length of (a) was 1.5 m, what would each cell represent in cm? cm

eBook, G series: Length, Perimeter and Area, pages 25–26

Pupils investigate the use of scale drawings, both through calculating and creating scale drawings.



Use the fraction pies to help you solve the following problems:
Sarah's gran gave her some money for her birthday. Sarah saved $\frac{1}{2}$ of the money and spent $\frac{1}{4}$ of the money on a book. That left her with £15 in her purse. How much money did her gran give her?

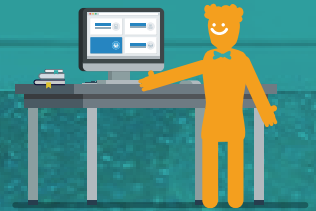


Martha opened her piggy bank and decided to spend it this way: $\frac{1}{3}$ on magazines, $\frac{1}{4}$ on snacks, $\frac{1}{5}$ on a necklace. The necklace cost £12. How much money did she have in her piggy bank?



eBook, G series: Fractions, Decimals and Percentages, pages 10–11

Pupils solve word problems involving unequal sharing and grouping with fractions. This page can lead to discussions around the relationship between fractions, ratios and proportions.



Live Mathletics

What's in level 5?

Addition from 1 - 500

$20 + 40 + 35 = ?$

Subtraction from 1 - 100

$15 - 3 = ?$

Addition from 1 to 100 with a missing addend

$30 + ? = 100$

All multiplication and division facts to 10×10

$10 \times 7 = ?$

Time conversions

How many seconds in 8 minutes?

Length conversions

? mm = 96m

What's in level 6?

Operations with decimals

$1.8 + 2 = ?$

Calculations using brackets

$6 \times (5 - 3) = ?$

Simple percentages

25% of 80 = ?

Converting mm, cm and m

1000 mm = ? m

24 hour time

1:00 PM in 24 hour time is ? :00

Timetable calculations

Trams departing at 6:19 AM and 5:19 PM are ? h apart.

Live Mathletics engages pupils in 60-second real-time games, testing speed and accuracy of maths facts.

To support progress in Year 6, encourage pupils to use **Level 5** and **6** of Live Mathletics.

Teachers can set minimum levels on Live Mathletics by clicking the 'switch to old Mathletics' button, selecting **Results** and selecting **Minimum levels** on the left-hand side of the page. Students can still access higher levels once you set a minimum level, so encourage students to challenge themselves and move on to the next level when they are ready.

(**Note:** Live Mathletics levels are a sliding scale, with no relationship to classes or old National Curriculum levels. As a resource which is also used in secondary schools, the levels from 6 upwards are intended for older students.)

When assigning activities with calculations that do not have spaces for recording any working out, consider getting pupils to record their thinking strategies in their Maths books or on a whiteboard, before answering the question in Mathletics. Pupils can then self-mark their work after each question. If they have made a mistake, they can correct their work using the support feature in the activities. Instant feedback and learning!



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For more information about Mathletics,
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