Scheme of Learning

Year 3

#MathsEveryoneCan

White Rose Maths

Contents

Welcome

Welcome to the White Rose Maths' new, more detailed schemes of learning for 2018-19.

We have listened to all the feedback over the last 2 years and as a result of this, we have made some changes to our primary schemes. *They are bigger, bolder and more detailed than before.*

The new schemes still have the *same look and feel* as the old ones, but we have tried to provide more detailed guidance. We have worked with enthusiastic and passionate teachers from up and down the country, who are experts in their particular year group, to bring you additional guidance. *These schemes have been written for teachers, by teachers.*

We all believe that every child can succeed in mathematics. Thank you to everyone who has contributed to the work of White Rose Maths. It is only with your help that we can make a difference.

We hope that you find the new schemes of learning helpful. As always, get in touch if you or your school want support with any aspect of teaching maths.

If you have any feedback on any part of our work, do not hesitate to contact us. Follow us on Twitter and Facebook to keep up-to-date with all our latest announcements.

White Rose Maths Team

#MathsEveryoneCan

White Rose Maths contact details

 support@whiterosemaths.com

 @WhiteRoseMaths

 White Rose Maths

What's included?

Our schemes include:

- Small steps progression. These show our blocks broken down into smaller steps.
- Small steps guidance. For each small step we provide some brief guidance to help teachers understand the key discussion and teaching points. This guidance has been written for teachers, by teachers.
- A more integrated approach to fluency, reasoning and problem solving.
- Answers to all the problems in our new scheme.
- We have also worked with Diagnostic Questions to provide questions for every single objective of the National Curriculum.

Meet the Team

The schemes have been developed by a wide group of passionate and enthusiastic classroom practitioners.

Caroline Hamilton

Beth Smith

Kelsey Brown

Mary-Kate Connolly

James Clegg

Jane Brown

Sam Shutkever

Kate Henshall

Special Thanks

The White Rose Maths team would also like to say a huge thank you to the following people who came from all over the country to contribute their ideas and experience. We could not have done it without you.

Year 2 Team

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Year 6 Team

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Kayleigh Parkes
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How to use the small steps

We were regularly asked how it is possible to spend so long on particular blocks of content and National Curriculum objectives.

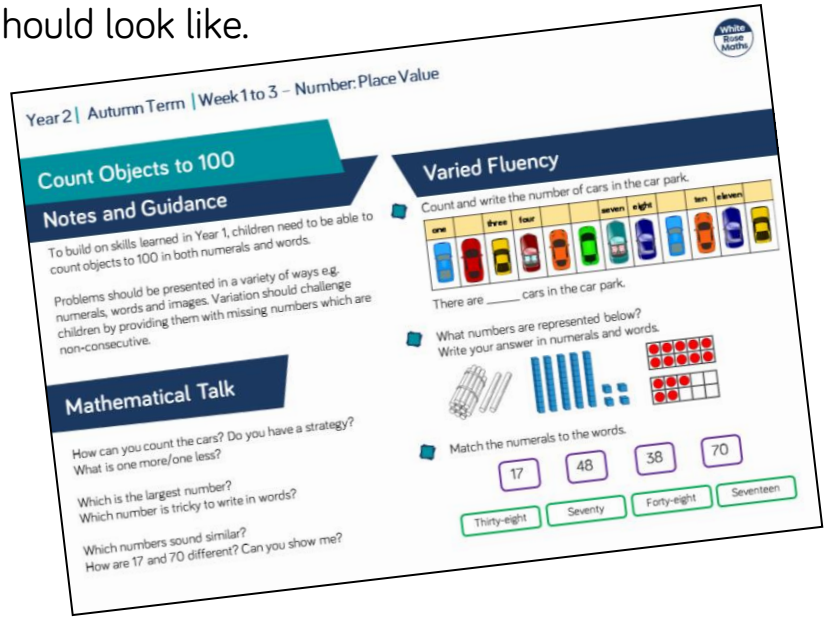
We know that breaking the curriculum down into small manageable steps should help children understand concepts better. Too often, we have noticed that teachers will try and cover too many concepts at once and this can lead to cognitive overload. In our opinion, it is better to follow a small steps approach.

As a result, for each block of content we have provided a "Small Step" breakdown. We recommend that the steps are taught separately and would encourage teachers to spend more time on particular steps if they feel it is necessary. Flexibility has been built into the scheme to allow this to happen.

Teaching notes

Alongside the small steps breakdown, we have provided teachers with some brief notes and guidance to help enhance their teaching of the topic. The "Mathematical Talk" section provides questions to encourage mathematical thinking and reasoning, to dig deeper into concepts.

We have also continued to provide guidance on what varied fluency, reasoning and problem solving should look like.



Assessments

Alongside these overviews, our aim is to provide an assessment for each term's plan. Each assessment will be made up of two parts:

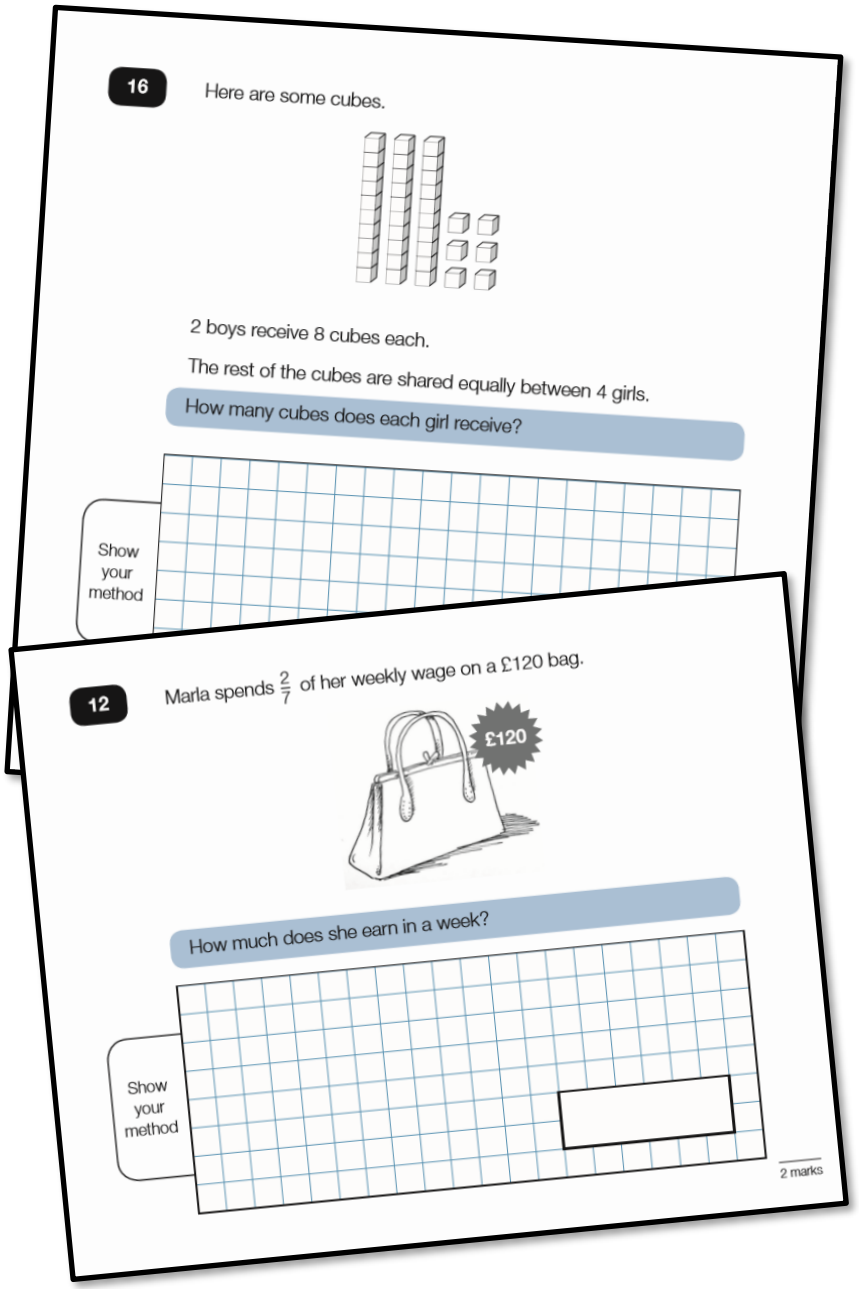
Part 1: Fluency based arithmetic practice

Part 2: Reasoning and problem solving based questions

Teachers can use these assessments to determine gaps in children's knowledge and use them to plan support and intervention strategies.

The assessments have been designed with new KS1 and KS2 SATs in mind.

For each assessment we provide a summary spread sheet so that schools can analyse their own data. We hope to develop a system to allow schools to make comparisons against other schools. Keep a look out for information next year.



Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

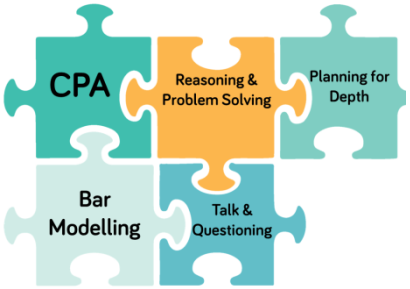
Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

Training

White Rose Maths offer a plethora of training courses to help you embed teaching for mastery at your school.

Our popular JIGSAW package consists of five key elements:

- CPA
- Bar Modelling
- Mathematical Talk & Questioning
- Planning for Depth
- Reasoning & Problem Solving



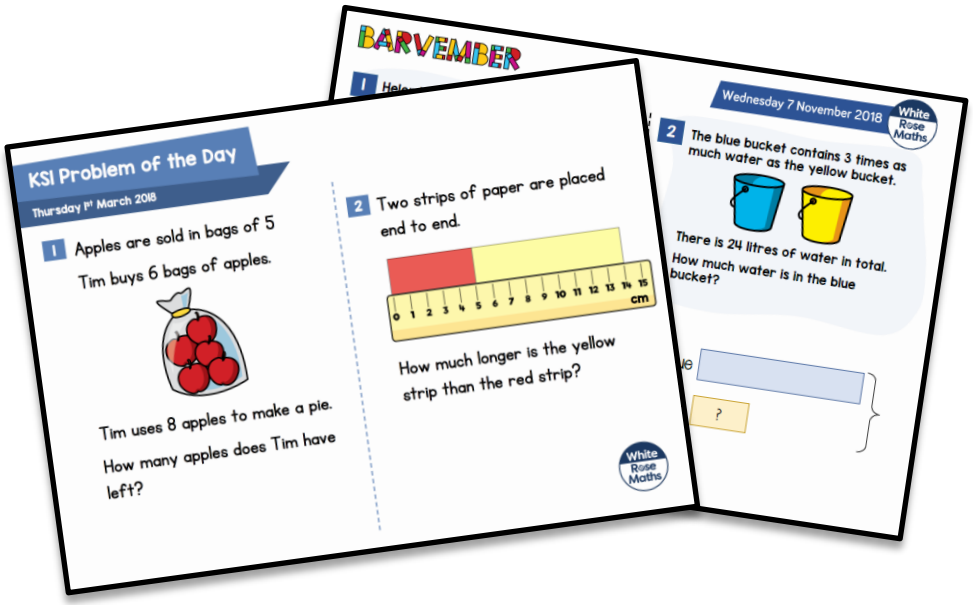
For more information and to book visit our website www.whiterosemaths.com or email us directly at support@whiterosemaths.com

Additional Materials

In addition to our schemes and assessments we have a range of other materials that you may find useful.

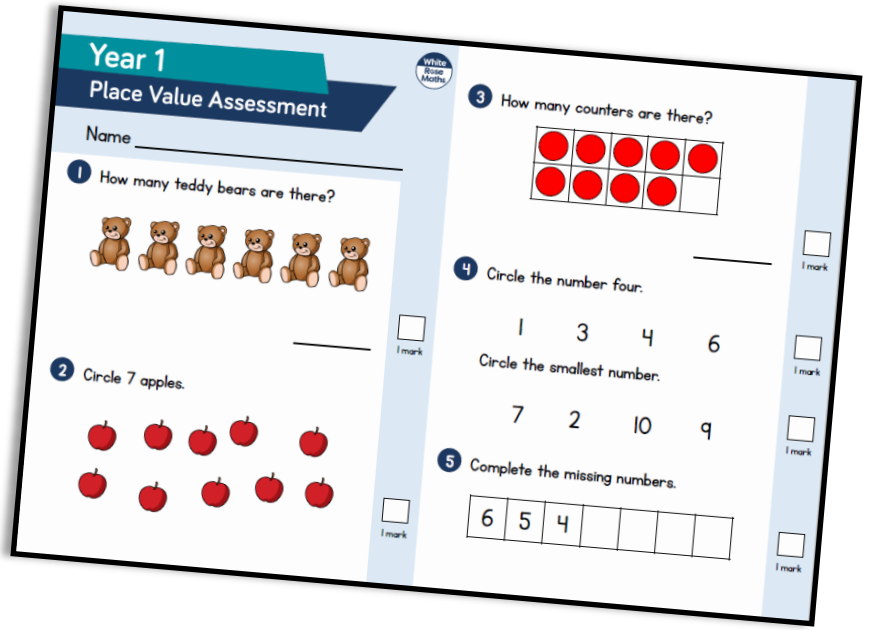
KS1 and KS2 Problem Solving Questions

For the last three years, we have provided a range of KS1 and KS2 problem solving questions in the run up to SATs. There are over 200 questions on a variety of different topics and year groups. You will also find more questions from our Barvember campaign.



End of Block Assessments

New for 2018 we are providing short end of block assessments for each year group. The assessments help identify any gaps in learning earlier and check that children have grasped concepts at an appropriate level of depth.



FAQs

If we spend so much time on number work, how can we cover the rest of the curriculum?

Children who have an excellent grasp of number make better mathematicians. Spending longer on mastering key topics will build a child's confidence and help secure understanding. This should mean that less time will need to be spent on other topics.

In addition, schools that have been using these schemes already have used other subjects and topic time to teach and consolidate other areas of the mathematics curriculum.

Should I teach one small step per lesson?

Each small step should be seen as a separate concept that needs teaching. You may find that you need to spend more time on particular concepts. Flexibility has been built into the curriculum model to allow this to happen. This may involve spending more or less than one lesson on a small step, depending on your class' understanding.

How do I use the fluency, reasoning and problem solving questions?

The questions are designed to be used by the teacher to help them understand the key teaching points that need to be covered. They should be used as inspiration and ideas to help teachers plan carefully structured lessons.

How do I reinforce what children already know if I don't teach a concept again?

The scheme has been designed to give sufficient time for teachers to explore concepts in depth, however we also interleave prior content in new concepts. E.g. when children look at measurement we recommend that there are lots of questions that practice the four operations and fractions. This helps children make links between topics and understand them more deeply. We also recommend that schools look to reinforce number fluency through mental and oral starters or in additional maths time during the day.

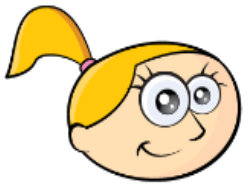
Meet the Characters

Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who's your favourite?


Teddy


Rosie


Mo


Eva


Alex


Jack


Whitney


Amir


Dora


Tommy


Dexter


Ron


Annie

	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 and Subtraction					Number: Multiplication and Division			Consolidation
Spring	Number: Multiplication and Division			Measurement: Money	Statistics		Measurement: Length and Perimeter			Number: Fractions		Consolidation
Summer	Number: Fractions			Measurement: Time			Geometry: Properties of Shape		Measurement: Mass and Capacity			Consolidation

White Rose Maths

Spring - Block 1

Multiplication & Division

Overview

Small Steps

1. Comparing statements
2. Related calculations
3. Multiply 2-digits by 1-digit (1)
4. Multiply 2-digits by 1-digit (2)
5. Divide 2-digits by 1-digit (1)
6. Divide 2-digits by 1-digit (2)
7. Divide 2-digits by 1-digit (3)
8. Scaling
9. How many ways?

NC Objectives

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

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

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

Comparing Statements

Notes and Guidance

Children use their knowledge of multiplication and division facts to compare statements using inequality symbols.

It is important that children are exposed to a variety of representations of multiplication and division, including arrays and repeated addition.

Mathematical Talk

What other number sentences does the array show?

If you know your 4 times-table, how can you use this to work out your 8 times-table?

What's the same and what's different about 8 × 3 and 7 × 4?

Varied Fluency

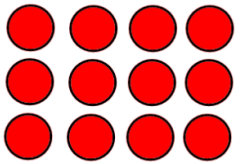
Use the array to complete the number sentences.

$3 \times 4 = \square$

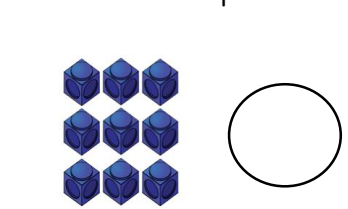
$4 \times 3 = \square$

$\square \div 3 = \square$

$\square \div 4 = \square$



Use <, > or = to compare.



$\square \times \square = \square$

$\square \times \square = \square$

$8 \times 3 \bigcirc 7 \times 4$

$36 \div 6 \bigcirc 36 \div 4$

Complete the number sentences.

$5 \times 1 < \_\_\_\_ \times \_\_\_\_$

$4 \times 3 = \_\_\_\_ \div 3$

Comparing Statements

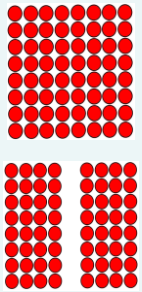
Reasoning and Problem Solving

Whitney says,

8 × 8 is greater than two lots of 4 × 8

Do you agree?
Can you prove your answer?

Possible answer:
She is wrong because they are equal.



True or false?

$6 \times 7 < 6 + 6 + 6 + 6 + 6 + 6 + 6$

False

$7 \times 6 = 7 \times 3 + 7 \times 3$

True

$2 \times 3 + 3 > 5 \times 3$

False

Can you find three different ways to complete each number sentence?

$\_\_\_ \times 3 + \_\_\_ \times 3 < \_\_\_ \div 3$

$\_\_\_ \div 4 < \_\_\_ \times 4 < \_\_\_ \times 4$

$\_\_\_ \times 8 > \_\_\_ \div 8 > \_\_\_ \times 8$

Possible answers include:

$1 \times 3 + 1 \times 3 < 21 \div 3$
$1 \times 3 + 1 \times 3 < 24 \div 3$
$1 \times 3 + 1 \times 3 < 27 \div 3$

$24 \div 4 < 8 \times 4 < 12 \times 4$
$16 \div 4 < 5 \times 4 < 7 \times 4$
$8 \div 4 < 3 \times 4 < 4 \times 4$

$4 \times 8 > 88 \div 8 > 1 \times 8$
$2 \times 8 > 80 \div 8 > 1 \times 8$
$6 \times 8 > 96 \div 8 > 1 \times 8$

Related Calculations

Notes and Guidance

Children use known multiplication facts to solve other multiplication problems.
They understand that because one of the numbers in the calculation is ten times bigger, then the answer will also be ten times bigger.
It is important that children develop their conceptual understanding through the use of concrete manipulatives.

Mathematical Talk

What is the same and what is different about the place value counters?

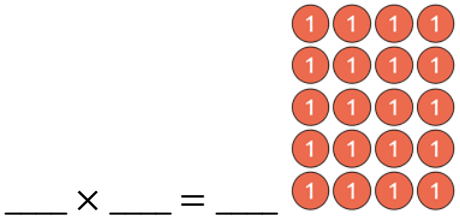
How does this fact help us solve this problem?

If we know these facts, what other facts do we know?

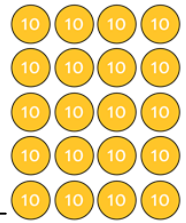
Can you prove your answer using manipulatives?

Varied Fluency

Complete the multiplication facts.



___ × ___ = ___



___ × ___ = ___

The number pieces represent 5 × ___ = ____

If each hole is worth ten, what do the pieces represent?

If we know 2 × 6 = 12, we also know 2 × 60 = 120
Use this to complete the fact family.

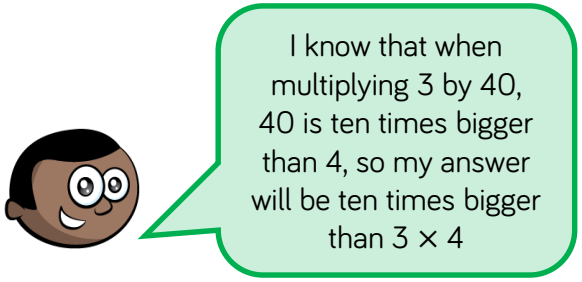
2 × 60 = 120	□ × □ = □
□ ÷ □ = □	□ ÷ □ = □

Complete the fact families for the calculations.

3 × 30 = □
□ = 4 × 80
160 ÷ 2 = □

Related Calculations

Reasoning and Problem Solving



Is Mo correct?
Explain your answer.

Mo is correct. I know 3 × 4 = 12, so if he has 3 × 40 then his answer will be ten times bigger because 4 has become ten times bigger.

Rosie has 240 cakes to sell.
She puts the same number of cakes in each box and has no cakes left over.
Which of these boxes could she use?

She could use 10, 20, 30, 40, 60, 80 because 240 is a multiple of all of these numbers.
10 × 24 = 240
20 × 12 = 240
30 × 8 = 240
40 × 6 = 240
60 × 4 = 240
80 × 3 = 240

True or false?

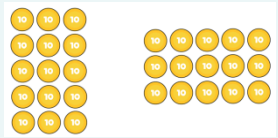
$$5 \times 30 = 3 \times 50$$

Prove it.

Possible response:

Children may represent it with place value counters.

True because they are equal.



Children may explore the problem in a context.

e.g. 5 lots of 30 apples compared to 3 lots of 50 apples.

Multiply 2-digits by 1-digit (1)

Notes and Guidance

Children use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives. They use the formal method of column multiplication alongside the concrete representation. They also apply their understanding of partitioning to represent and solve calculations.
In this step, children explore multiplication with no exchange.

Mathematical Talk

How does multiplication link to addition?

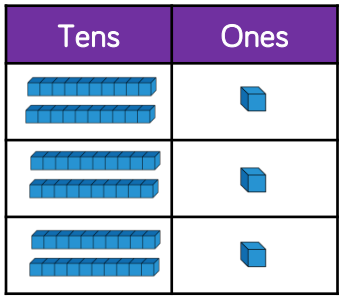
How does partitioning help you to multiply 2-digits by a 1-digit number?

How does the written method match the concrete representation?

Varied Fluency

There are 21 coloured balls on a snooker table.
How many coloured balls are there on 3 snooker tables?

Use Base 10 to calculate:
21 × 4 and 33 × 3



Complete the calculations to match the place value counters.

□ + □ + □ + □ = □

□ × □ = □

Annie uses place value counters to work out 34 × 2

	T	O
	3	4
×		2
	6	8

Use Annie's method to solve:
23 × 3
32 × 3
42 × 2

Multiply 2-digits by 1-digit (1)

Reasoning and Problem Solving

Alex completes the calculation:

$$43 \times 2$$

Can you spot her mistake?

	T	O
	4	3
×		2
		6
+		8
	1	4

Alex has multiplied 4 by 2 rather than 40 by 2

Teddy completes the same calculation as Alex.
Can you spot and explain his mistake?

	T	O
	4	3
×		2
8	0	6

Teddy has written 80 where he should have just put an 8 because he is multiplying 4 tens by 2 which is 8 tens. The answer should be 86

Dexter says,

$4 \times 21 = 2 \times 42$

Is Dexter correct?

True. Both multiplications are equal to 84

Children may explore that one number has halved and the other has doubled.

Multiply 2-digits by 1-digit (2)

Notes and Guidance

Children continue to use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives.
They move on to explore multiplication with exchange. Each question in this step builds in difficulty.

Mathematical Talk

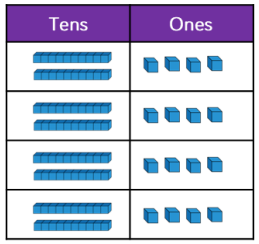
What happens when we have ten or more ones in a column?
What happens when we have twenty or more ones in a column?

How do we record our exchange?

Do you prefer Jack's method or Amir's method?
Can you use either method for all the calculations?

Varied Fluency

- Jack uses Base 10 to calculate 24 × 4

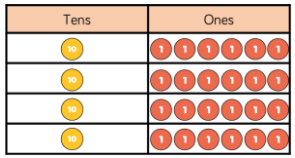


	T	O
	2	4
×		4
	9	6

1

Use Jack's method to solve:
13 × 4
23 × 4
26 × 3

- Amir uses place value counters to calculate 16 × 4



	T	O
	1	6
×		4
	6	4

2

Use Amir's method to solve:
16 × 6
17 × 5
28 × 3

- Amir then calculates 5 × 34

	T	O
	3	4
×		5
1	7	0

1 2

Use Amir's method to solve:
36 × 6
48 × 4

Multiply 2-digits by 1-digit (2)

Reasoning and Problem Solving

Always, Sometimes, Never?

A two-digit number multiplied by a one-digit number has a two-digit product.

Sometimes.

e.g.

$13 \times 5 = 65$

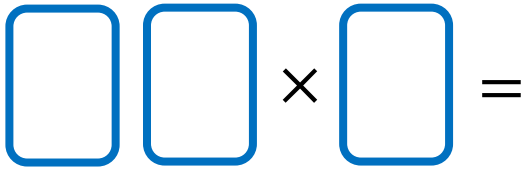
$31 \times 5 = 155$

Explain the mistake.

H	T	O
	2	7
×		3
6	2	1

They have not performed the exchange correctly.
6 tens and 2 tens should be added together to make 8 tens so the correct answer is 81

How close can you get to 100?
Use each digit card once in the multiplication.



You can get within 8 of 100

$23 \times 4 = 92$ this is the closest answer.

$24 \times 3 = 72$

$32 \times 4 = 128$

$34 \times 2 = 68$

Divide 2-digits by 1-digit (1)

Notes and Guidance

Children divide 2-digit numbers by a 1-digit number by partitioning into tens and ones and sharing into equal groups.

They divide numbers that do not involve exchange or remainders.

It is important that children divide the tens first and then the ones.

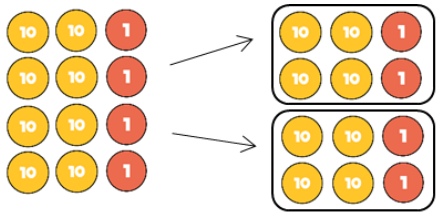
Mathematical Talk

How can we partition the number?
How many tens are there?
How many ones are there?
What could we use to represent this number?
How many equal groups do I need?

How many rows will my place value chart have?
How does this link to the number I am dividing by?

Varied Fluency

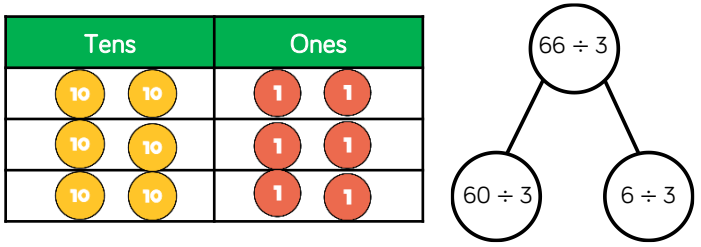
Ron uses place value counters to solve 84 ÷ 2



Use Ron's method to calculate:

84 ÷ 4 66 ÷ 2 66 ÷ 3

Eva uses a place value grid and part-whole model to solve 66÷ 3



Use Eva's method to calculate:

69 ÷ 3 96 ÷ 3 86 ÷ 2

Divide 2-digits by 1-digit (1)

Reasoning and Problem Solving

Teddy answers the question 44 ÷ 4 using place value counters.

Tens	Ones
10 10	1 1
10 10	1 1

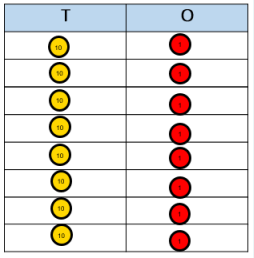
Is he correct?
Explain your reasoning.

Teddy is incorrect. He has divided 44 by 2 instead of by 4

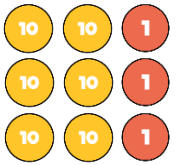
Dora thinks that 88 sweets can be shared equally between eight people.

Is she correct?

Dora is correct because 88 divided by 8 is equal to 11



Alex uses place value counters to help her calculate 63 ÷ 3



Tens	Ones
10	10 1
10	10 1
10	10 1

She gets an answer of 12
Is she correct?

Alex is incorrect because she has not placed counters in the correct columns.

It should look like this:

Tens	Ones
10 10	1
10 10	1
10 10	1

The correct answer is 21

Divide 2-digits by 1-digit (2)

Notes and Guidance

Children divide 2-digit numbers by a 1-digit number by partitioning into tens and ones and sharing into equal groups.

They divide numbers that involve exchanging between the tens and ones. The answers do not have remainders.

Children use their times-tables to partition the number into multiples of the divisor.

Mathematical Talk

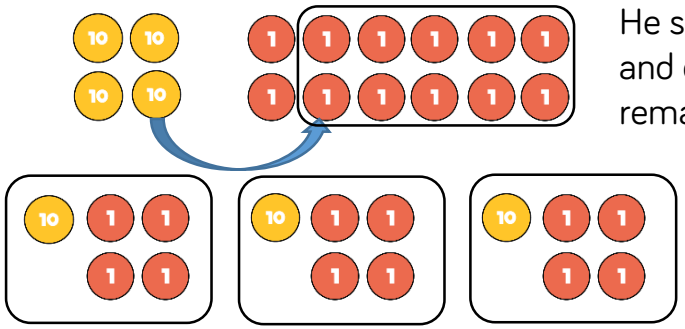
Why have we partitioned 42 into 30 and 12 instead of 40 and 2?

What do you notice about the partitioned numbers and the divisor?

Why do we partition 96 in different ways depending on the divisor?

Varied Fluency

Ron uses place value counters to divide 42 into three equal groups.



He shares the tens first and exchanges the remaining ten for ones.

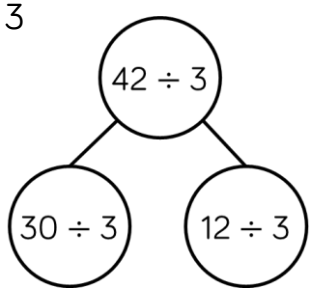
Then he shares the ones.

$42 \div 3 = 14$

Use Ron's method to calculate $48 \div 3$, $52 \div 4$ and $92 \div 8$

Annie uses a similar method to divide 42 by 3

Tens	Ones
10	1 1 1 1
10	1 1 1 1
10	1 1 1 1



Use Annie's method to calculate:

$96 \div 8$ $96 \div 4$ $96 \div 3$ $96 \div 6$

Divide 2-digits by 1-digit (2)

Reasoning and Problem Solving

Compare the statements using <, > or =

48 ÷ 4 ◯ 36 ÷ 3

52 ÷ 4 ◯ 42 ÷ 3

60 ÷ 3 ◯ 60 ÷ 4

=

<

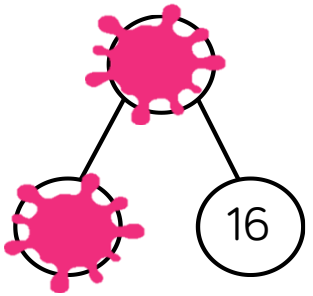
>

Amir partitioned a number to help him divide by 8

Some of his working out has been covered with paint.

What number could Amir have started with?

÷ 8



The answer could be 56 or 96

Divide 2-digits by 1-digit (3)

Notes and Guidance

Children move onto solving division problems with a remainder.
Links are made between division and repeated subtraction, which builds on learning in Year 2
Children record the remainders as shown in Tommy's method.
This notation is new to Year 3 so will need a clear explanation.

Mathematical Talk

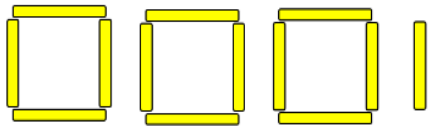
How do we know 13 divided by 4 will have a remainder?

Can a remainder ever be more than the divisor?

Which is your favourite method?
Which methods are most efficient with larger two digit numbers?

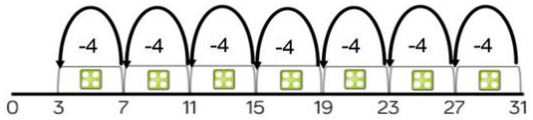
Varied Fluency

- How many squares can you make with 13 lollipop sticks?
There are ___ lollipop sticks.
There are ___ groups of 4
There is ___ lollipop stick remaining.
13 ÷ 4 = ___ remainder ___



Use this method to see how many triangles you can make with 38 lollipop sticks.

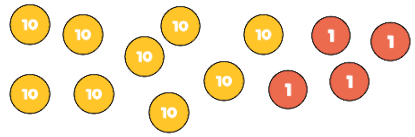
- Tommy uses repeated subtraction to solve 31 ÷ 4



31 ÷ 4 = 7 r 3

Use Tommy's method to solve 38 divided by 3

- Use place value counters to work out 94 ÷ 4
Did you need to exchange any tens for ones?
Is there a remainder?



Tens	Ones

Divide 2-digits by 1-digit (3)

Reasoning and Problem Solving

Which calculation is the odd one out?
Explain your thinking.

64 ÷ 8 | 77 ÷ 4 | 49 ÷ 6 | 65 ÷ 3

64 ÷ 8 could be the odd one out as it is the only calculation without a remainder.

Make sure other answers are considered such as 65 ÷ 3 because it is the only one being divided by an odd number.

Jack has 15 stickers.

He sorts his stickers into equal groups but has some stickers remaining.
How many stickers could be in each group and how many stickers would be remaining?

There are many solutions, encourage a systematic approach.
e.g. 2 groups of 7, remainder 1
3 groups of 4, remainder 3
2 groups of 6, remainder 3

Dora and Eva are planting bulbs.
They have 76 bulbs altogether.

Dora plants her bulbs in rows of 8 and has 4 left over.
Eva plants her bulbs in rows of 10 and has 2 left over.

How many bulbs do they each have?

Dora has 44 bulbs.
Eva has 32 bulbs.

Scaling

Notes and Guidance

It is important that children are exposed to problems involving scaling from an early age.
Children should be able to answer questions that use the vocabulary "times as many".
Bar models are particularly useful here to help children visualise the concept. Examples and non-examples should be used to ensure depth of understanding.

Mathematical Talk

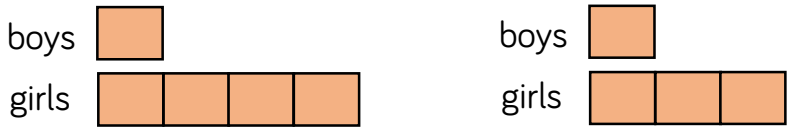
Why might someone draw the first bar model? What have they misunderstood?

What is the value of Amir's counters? How do you know?

How many adults are at the concert? How will you work out the total?

Varied Fluency

- In a playground there are 3 times as many girls as boys.



Which bar model represents the number of boys and girls?
Explain your choice.

- Draw a bar model to represent this situation.

In a car park there are 5 times as many blue cars as red cars.

- Eva has these counters 

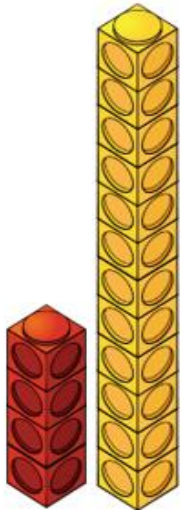
Amir has 4 times as many counters.
How many counters does Amir have?

- There are 35 children at a concert.
3 times as many adults are at the concert.
How many people are at the concert in total?

Scaling

Reasoning and Problem Solving

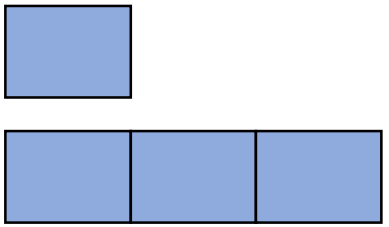
Dora says Mo's tower is 3 times taller than her tower.
Mo says his tower is 12 times taller than Dora's tower.
Who do you agree with?
Explain why?



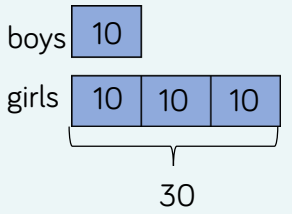
Dora's tower Mo's tower

I agree with Dora. Her tower is 4 cubes tall. Mo's tower is 12 cubes tall. 12 is 3 times as big as 4. Mo has just counted his cubes and not compared them to Dora's tower.

In a playground there are 3 times as many girls as boys.
There are 30 girls.
Label and complete the bar model to help you work out how many boys there are in the playground.



There are 10 boys in the playground.



A box contains some counters.
There are twice as many green counters as pink counters.
There are 18 counters in total.
How many pink counters are there?

There are 6 pink counters.

How Many Ways?

Notes and Guidance

Children list systematically the possible combinations resulting from two groups of objects. Encourage the use of practical equipment and ensure that children take a systematic approach to each problem.
Children should be encouraged to calculate the total number of ways without listing all the possibilities. e.g. Each T-shirt can be matched with 4 pairs of trousers so altogether $3 \times 4 = 12$ outfits.

Mathematical Talk

What are the names of the shapes on the shape cards?
How do you know you have found all of the ways?
Would making a table help?

Without listing, can you tell me how many possibilities there would be if there are 5 different shape cards and 4 different number cards?

Varied Fluency

Jack has 3 T-shirts and 4 pairs of trousers.
Complete the table to show how many different outfits he can make.

T-shirt	Trousers
Blue	Blue
Blue	Dark blue
Blue	Orange
Blue	Green

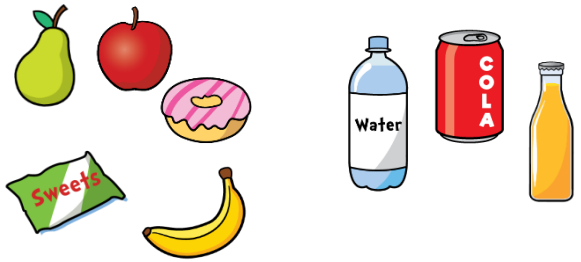
Alex has 4 shape cards and 3 number cards.

She chooses a shape card and a number card.
List all the possible ways she could do this.

How Many Ways?

Reasoning and Problem Solving

Eva chooses a snack and a drink.



What could she have chosen?
How many different possibilities are there?

____ × ____ = ____

There are ____ possibilities.

How many of the ways contain an apple?

There are 15 possibilities.
AW
AC
AO
PW
PC
PO
SW
SC
SO
DW
DC
DO
BW
BC
BO

3 ways contain an apple.

Jack has some jumpers and pairs of trousers.
He can make 15 different outfits.
How many jumpers could he have and how many pairs of trousers could he have?

He could have:
1 jumper and 15 pairs of trousers.
3 jumpers and 5 pairs of trousers.
15 jumpers and 1 pair of trousers.
5 jumpers and 3 pairs of trousers.