Spring Scheme of Learning

Year 5

#MathsEveryoneCan

2020-21

White Rose Maths

New for 2020/21

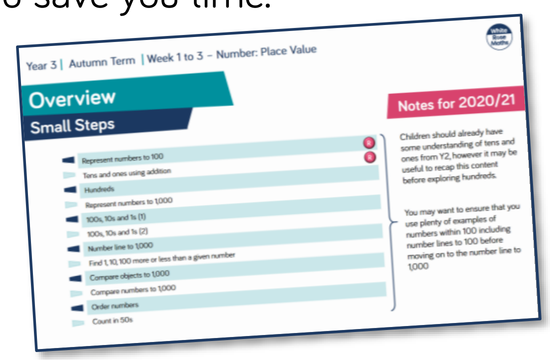
2020 will go down in history. The world has changed for all of us.

We want to do as much as we can to support children, teachers, parents and carers in these very uncertain times.

We have amended our schemes for 2020/21 to:

- ★ highlight key teaching points
- ★ recap essential content that children may have forgotten
- ★ flag any content that you might not have covered during the school closures period.

We hope these changes will add further value to the schemes and save you time.



Lesson-by-lesson overviews

We've always been reluctant to produce lesson-by-lesson overviews as every class is individual and has different needs. However, many of you have said that if blended learning becomes a key feature of school life next year, a weekly plan with linked content and videos could be really useful.

As always, we've listened! We've now produced a complete lesson-by-lesson overview for Y1 to Y9 that schools can use or adapt as they choose. Each lesson will be linked to a free-to-use home learning video, and for premium subscribers, a worksheet. This means that you can easily assign work to your class, whether they are working at home or in school.

Inevitably, this lesson-by-lesson structure won't suit everyone, but if it works for you, then please do make use of this resource as much as you wish.

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.

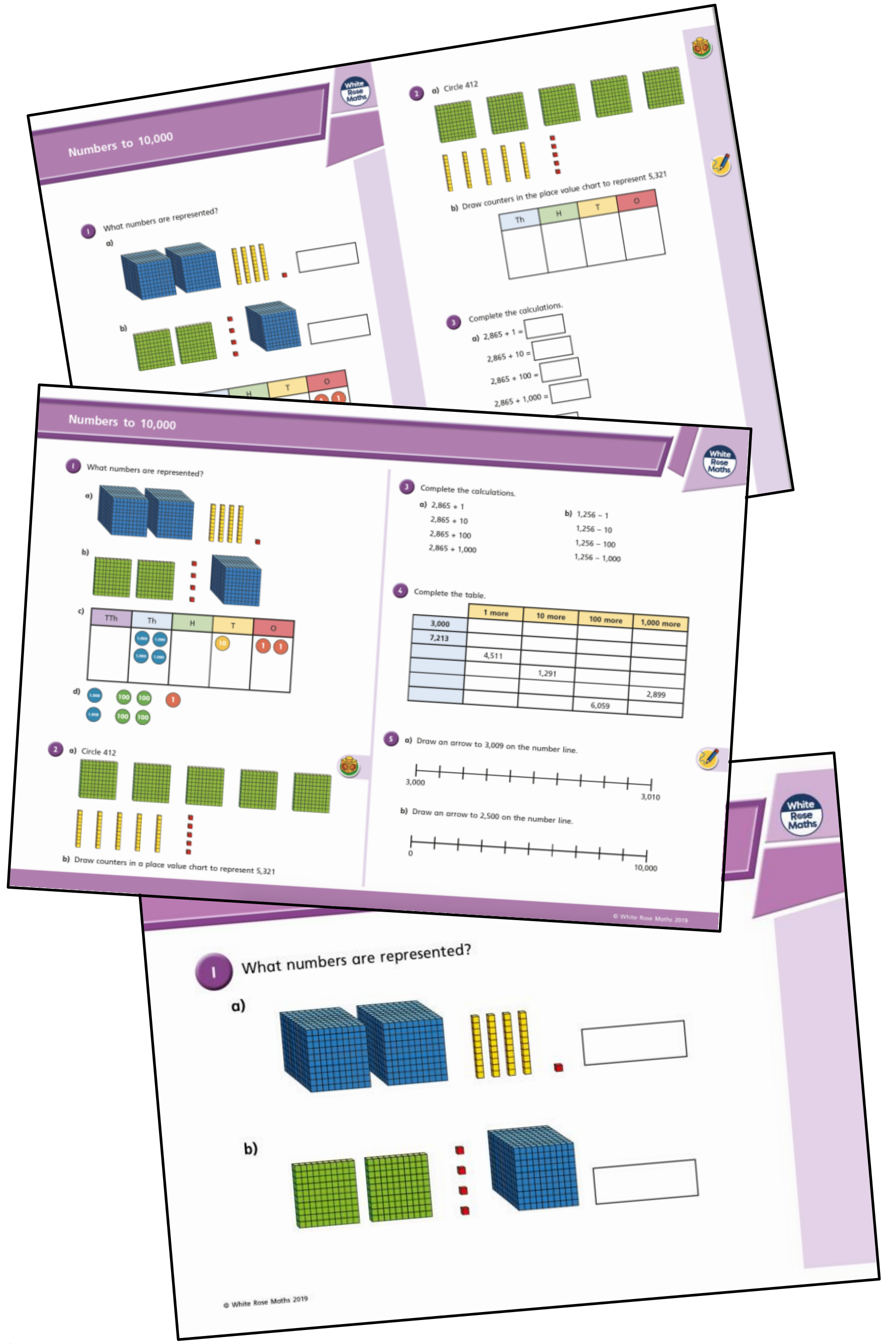
Supporting resources

We have produced supporting resources for every small step from Year 1 to Year 11.

The worksheets are provided in three different formats:

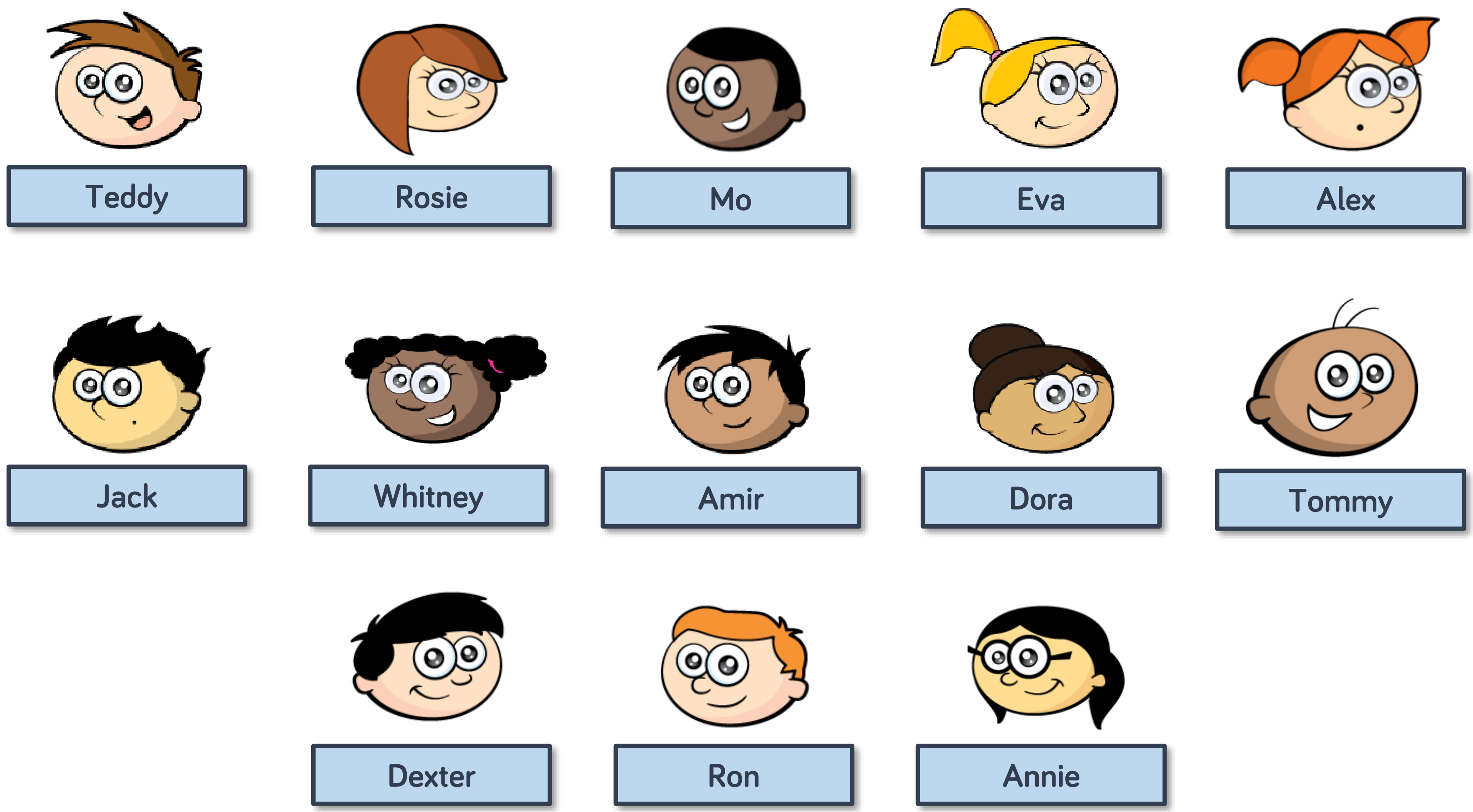
- Write on worksheet – ideal for children to use the ready made models, images and stem sentences.
- Display version – great for schools who want to cut down on photocopying.
- PowerPoint version – one question per slide. Perfect for whole class teaching or mixing questions to make your own bespoke lesson.

For more information visit our online training and resources centre resources.whiterosemaths.com or email us directly at support@whiterosemaths.com



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?



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White Rose Maths

Spring - Block 1

Multiplication & Division

Overview

Small Steps

- Multiply 2-digits by 1-digit (R)
- Multiply 3-digits by 1-digit (R)
- Multiply 4-digits by 1-digit
- Multiply 2-digits (area model)
- Multiply 2-digits by 2-digits
- Multiply 3-digits by 2-digits
- Multiply 4-digits by 2-digits
- Divide 2-digits by 1-digit (1) (R)
- Divide 2-digits by 1-digit (2) (R)
- Divide 3-digits by 1-digit (R)
- Divide 4-digits by 1-digit
- Divide with remainders

Notes for 2020/21

Before moving on to 4-digit multiplication, children may need to work with place value counters to support their understanding, of multiplying by 2- and 3-digit numbers.

The division steps may look similar but this is a difficult concept and children need to spend time exploring partitioning and dividing 2- and 3-digit numbers before working with larger numbers.
In the recap steps they will cover division with remainders using place value counters.

Multiply 2-digits by 1-digit

Notes and Guidance

Children build on their understanding of formal multiplication from Year 3 to move to the formal short multiplication method.
Children use their knowledge of exchanging ten ones for one ten in addition and apply this to multiplication, including exchanging multiple groups of tens. They use place value counters to support their understanding.

Mathematical Talk

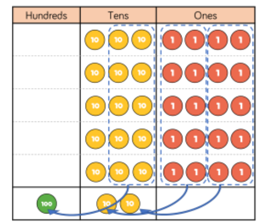
Which column should we start with, the ones or the tens?

How are Ron and Whitney's methods the same?
How are they different?

Can we write a list of key things to remember when multiplying using the column method?

Varied Fluency

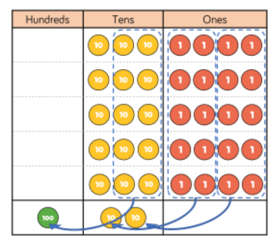
Whitney uses place value counters to calculate 5×34



	H	T	O		
		3	4		
×			5		
		2	0	(5 × 4)	
+	1	5	0	(5 × 30)	
	1	7	0		

Use Whitney's method to solve
5×42
23×6
48×3

Ron also uses place value counters to calculate 5×34



	H	T	O		
		3	4		
×			5		
	1	7	0		
	1	2			

Use Ron's method to complete:

	T	O
	4	3
×		3

	T	O
	3	6
×		4

	T	O
	7	4
×		5

Multiply 2-digits by 1-digit

Reasoning and Problem Solving

R

Here are three incorrect multiplications.

	T	O
	6	1
×		5
	3	5

	T	O
	7	4
×		7
4	9	8

	T	O
	2	6
×		4
8	2	4

Correct the multiplications.

	T	O
	6	1
×		5
3	0	5
3		

	T	O
	7	4
×		7
5	1	8
	2	

	T	O
	2	6
×		4
1	0	4
	2	

Always, sometimes, never

- When multiplying a two-digit number by a one-digit number, the product has 3 digits.
- When multiplying a two-digit number by 8 the product is odd.
- When multiplying a two-digit number by 7 you need to exchange.

Prove it.

Sometimes: 12 × 2 has only two-digits; 23 × 5 has three digits.

Never: all multiples of 8 are even.

Sometimes: most two-digit numbers need exchanging, but not 10 or 11

Multiply 3-digits by 1-digit

Notes and Guidance

Children build on previous steps to represent a three-digit number multiplied by a one-digit number with concrete manipulatives.
Teachers should be aware of misconceptions arising from 0 in the tens or ones column.
Children continue to exchange groups of ten ones for tens and record this in a written method.

Mathematical Talk

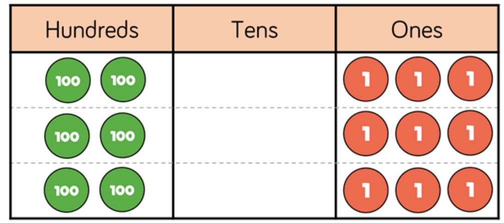
How is multiplying a three-digit number by one-digit similar to multiplying a two-digit number by one-digit?

Would you use counters to represent 84 multiplied by 8? Why?

Varied Fluency

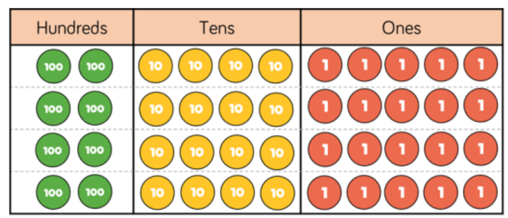
R

- Complete the calculation.



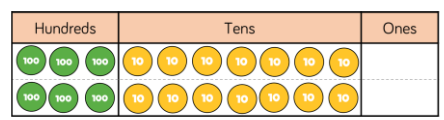
	H	T	O
	2	0	3
×			3

- A school has 4 house teams.
There are 245 children in each house team.
How many children are there altogether?



	H	T	O
	2	4	5
×			4

- Write the multiplication represented by the counters and calculate the answer using the formal written method.



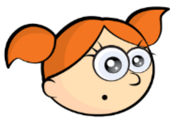
Multiply 3-digits by 1-digit

Reasoning and Problem Solving

R

Spot the mistake

Alex and Dexter have both completed the same multiplication.



Alex

	H	T	O
	2	3	4
×			6
1	2	0	4
	2	2	

Dexter

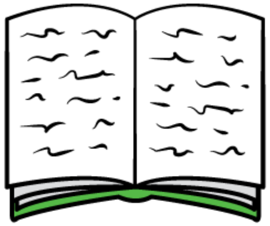
	H	T	O
	2	3	4
×			6
1	4	0	4
	2	2	

Who has the correct answer?
What mistake has been made by one of the children?

Dexter has the correct answer.

Alex has forgotten to add the two hundreds she exchanged from the tens column.

Teddy and his mum were having a reading competition.
In one month, Teddy read 814 pages.



His mum read 4 times as many pages as Teddy.
How many pages did they read altogether?
How many fewer pages did Teddy read?
Use the bar model to help.

Teddy	814			
Mum	814	814	814	814

$814 \times 5 = 4{,}070$

They read 4,070 pages altogether.

$814 \times 3 = 2{,}442$

Teddy read 2,442 fewer pages than his mum.

Multiply 4-digits by 1-digit

Notes and Guidance

Children build on previous steps to represent a 4-digit number multiplied by a 1-digit number using concrete manipulatives.
Teachers should be aware of misconceptions arising from using 0 as a place holder in the hundreds, tens or ones column.
Children then move on to explore multiplication with exchange in one, and then more than one column.

Mathematical Talk

Why is it important to set out multiplication using columns?

Explain the value of each digit in your calculation.

How do we show there is nothing in a place value column?

What do we do if there are ten or more counters in a place value column?

Which part of the multiplication is the product?

Varied Fluency

- Complete the calculation.

Thousands	Hundreds	Tens	Ones
1000		10 10	1 1 1
1000		10 10	1 1 1
1000		10 10	1 1 1

	Th	H	T	O
	1	0	2	3
×				3

- Write the multiplication calculation represented and find the answer.

Thousands	Hundreds	Tens	Ones
1000 1000	100		1 1 1 1 1 1
1000 1000	100		1 1 1 1 1 1

Remember if there are ten or more counters in a column, you need to make an exchange.

- Annie earns £1,325 per week.
How much would he earn in 4 weeks?

Thousands	Hundreds	Tens	Ones
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1
1000	100 100 100	10 10	1 1 1 1 1

	Th	H	T	O
	1	3	2	5
×				4

Multiply 4-digits by 1-digit

Reasoning and Problem Solving

Alex calculated 1,432 × 4

Here is her answer.

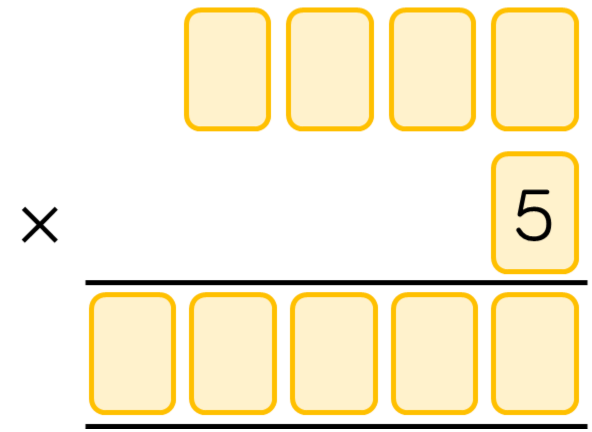
	Th	H	T	O
	1	4	3	2
×				4
	4	16	12	8

1,432 × 4 = 416,128

Can you explain what Alex has done wrong?

Alex has not exchanged when she has got 10 or more in the tens and hundreds columns.

Can you work out the missing numbers using the clues?



- The 4 digits being multiplied by 5 are consecutive numbers.
- The first 2 digits of the product are the same.
- The fourth and fifth digits of the answer add to make the third.

2,345 × 5 = 11,725

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Multiply 2-digits (Area Model)

Notes and Guidance

Children use Base 10 to represent the area model of multiplication, which will enable them to see the size and scale linked to multiplying.

Children will then move on to representing multiplication more abstractly with place value counters and then numbers.

Mathematical Talk

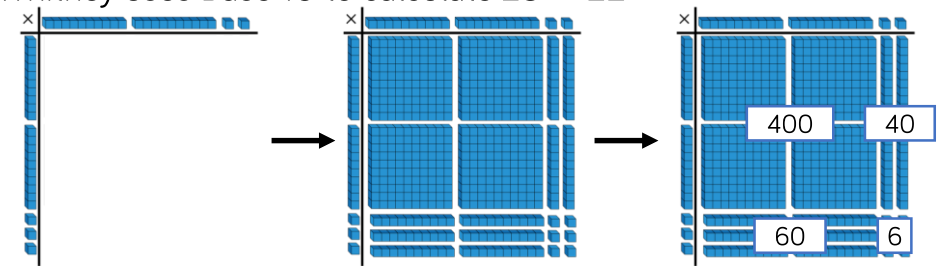
What are we multiplying?
How can we partition these numbers?

Where can we see 20 × 20?
What does the 40 represent?

What's the same and what's different between the three representations (Base 10, place value counters, grid)?

Varied Fluency

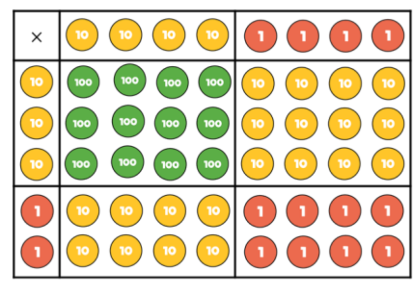
- Whitney uses Base 10 to calculate 23 × 22



How could you adapt your Base 10 model to calculate these:

32 × 24 | 25 × 32 | 35 × 32

- Rosie adapts the Base 10 method to calculate 44 × 32



×	40	4
30	1,200	120
2	80	8

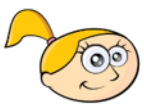
Compare using place value counters and a grid to calculate:

45 × 42 | 52 × 24 | 34 × 43

Multiply 2-digits (Area Model)

Reasoning and Problem Solving

Eva says,

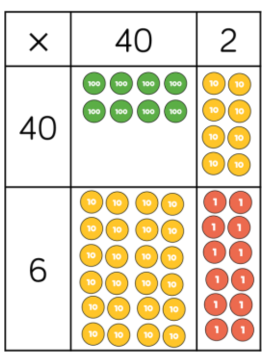


To multiply 23 by 57 I just need to calculate 20 × 50 and 3 × 7 and then add the totals.

What mistake has Eva made?
Explain your answer.

Eva's calculation does not include 20 × 7 and 50 × 3
Children can show this with concrete or pictorial representations.

Amir hasn't finished his calculation.
Complete the missing information and record the calculation with an answer.



Amir needs 8 more hundreds, 40 × 40 = 1,600 and he only has 800

His calculation is 42 × 46 = 1,932

Farmer Ron has a field that measures 53 m long and 25 m wide.

Farmer Annie has a field that measures 52 m long and 26 m wide.

Dora thinks that they will have the same area because the numbers have only changed by one digit each.

Do you agree? Prove it.

Dora is wrong. Children may prove this with concrete or pictorial representations.

White Rose Maths

Multiply 2-digits by 2-digits

Notes and Guidance

Children will move on from the area model and work towards more formal multiplication methods.

They will start by exploring the role of the zero in the column method and understand its importance.

Children should understand what is happening within each step of the calculation process.

Mathematical Talk

Why is the zero important?

What numbers are being multiplied in the first line and in the second line?

When do we need to make an exchange?

What can we exchange if the product is 42 ones?

If we know what 38 × 12 is equal to, how else could we work out 39 × 12?

Varied Fluency

Complete the calculation to work out 23 × 14

		2	3	
×		1	4	
		9_{1}	2	(23 × 4)
	2	3	0	(23 × 10)

Use this method to calculate:

34 × 26 58 × 15 72 × 35

Complete to solve the calculation.

		4	6	
×		2	7	
	3	2_{4}	2	(___ × ___)
	9_{1}	2	0	(___ × ___)

Use this method to calculate:

27 × 39 46 × 55 94 × 49

Calculate:

38 × 12 39 × 12 38 × 11

What's the same? What's different?

Multiply 2-digits by 2-digits

Reasoning and Problem Solving

Tommy says,

> It is not possible to make 999 by multiplying two 2-digit numbers.

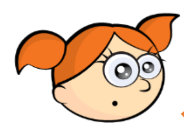
Do you agree?
Explain your answer.

Children may use a trial and error approach during which they'll further develop their multiplication skills.
They will find that Tommy is wrong because 27 × 37 is equal to 999

Amir has multiplied 47 by 36

		4	7
×		3	6
	2	8 $_{4}$	2
	1	4 $_{2}$	1
	3	2	3

Alex says,



> Amir is wrong because the answer should be 1,692 not 323

Who is correct?
What mistake has been made?

Alex is correct.
Amir has forgotten to use zero as a place holder when multiplying by 3 tens.

White Rose Maths

Multiply 3-digits by 2-digits

Notes and Guidance

Children will extend their multiplication skills to multiplying 3-digit numbers by 2-digit numbers. They will use multiplication to find area and solve multi-step problems.
Methods previously explored are still useful e.g. using an area model.

Mathematical Talk

Why is the zero important?

What numbers are being multiplied in the first line and the second line?

When do we need to make an exchange?

What happens if there is an exchange in the last step of the calculation?

Varied Fluency

Complete:

		1	3	2	
×			1	4	
		5	2 (1)	8	(132 × 4)
	1	3	2	0	(132 × 10)

Use this method to calculate:

264 × 14 264 × 28

What do you notice about your answers?

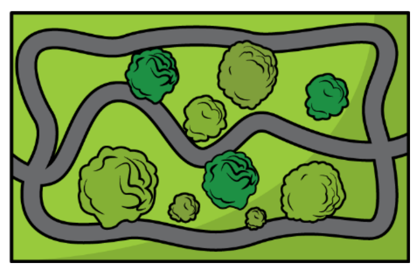
Calculate:

637 × 24

573 × 28

573 × 82

A playground is 128 yards by 73 yards.



Calculate the area of the playground.

Multiply 3-digits by 2-digits

Reasoning and Problem Solving

22 × 111 = 2442
23 × 111 = 2553
24 × 111 = 2664

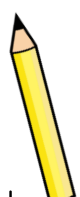
What do you think the answer to 25 × 111 will be?

What do you notice?

Does this always work?

The pattern stops at up to 28 × 111 because exchanges need to take place in the addition step.

Pencils come in boxes of 64
A school bought 270 boxes.
Rulers come in packs of 46
A school bought 720 packs.
How many more rulers were ordered than pencils?



15,840

Here are examples of Dexter's maths work.

			9	8	7
×				7	6
		5	$_{5}9$	$_{4}2$	2
		6	$_{6}9$	$_{4}0$	9
	1	$_{1}2$	8	$_{1}3$	1

			3	2	4
×				7	8
		$_{2}$	$_{1}5$	$_{3}9$	2
	$_{2}$	$_{1}2$	$_{2}6$	8	0
		3	2	7	2

He has made a mistake in each question.

Can you spot it and explain why it's wrong?

Correct each calculation.

In his first calculation, Dexter has forgotten to use a zero when multiplying by 7 tens.
It should have been
987×76 = 75,012

In the second calculation, Dexter has not included his final exchanges.
324 × 8 = <u>2</u>,592
324 × 70 = <u>2</u>2,680
The final answer should have been 25,272

Multiply 4-digits by 2-digits

Notes and Guidance

Children will build on their understanding of multiplying a 3-digit number by a 2-digit number and apply this to multiplying 4-digit numbers by 2-digit numbers.

It is important that children understand the steps taken when using this multiplication method.

Methods previously explored are still useful e.g. grid.

Mathematical Talk

Explain the steps followed when using this multiplication method.

Look at the numbers in each question, can they help you estimate which answer will be the largest?

Explain why there is a 9 in the thousands column.

Why do we write the larger number above the smaller number?

What links can you see between these questions? How can you use these to support your answers?

Varied Fluency

Use the method shown to calculate 2,456 × 34

		3	2	5	0	
×				2	6	
	1	9_1	5_3	0	0	(3,250 × 6)
	6	5_1	0	0	0	(3,250 × 20)
	8	4	5	0	0	

Calculate

3,282 × 32

7,132 × 21

9,708 × 38

Use <, > or = to make the statements correct.

4,458 × 56	◯	4,523 × 54
4,458 × 55	◯	4,523 × 54
4,458 × 55	◯	4,522 × 54

Multiply 4-digits by 2-digits

Reasoning and Problem Solving

Spot the Mistakes

Can you spot and correct the errors in the calculation?

		2	5	3	4
×				2	3
		$_{1}7$	5	$_{1}9$	2
		$_{1}5$	0	6	8
	1	2	$_{1}6$	$_{1}6$	0

There are 2 errors. In the first line of working, the exchanged ten has not been added. In the second line of working, the place holder is missing. The correct answer should be 58,282

Teddy has spilt some paint on his calculation.

		2		6	9
×				2	
	2	$_{6}2$	$_{5}9$	$_{7}5$	2
	$_{1}5$	$_{1}7$	$_{1}3$		0
	$_{1}$	$_{1}0$	$_{1}3$	3	2

What are the missing digits?

What do you notice?

The missing digits are all 8

Divide 2-digits by 1-digit (1)

Notes and Guidance

Children build on their knowledge of dividing a 2-digit number by a 1-digit number from Year 3 by sharing into equal groups.

Children use examples where the tens and the ones are divisible by the divisor, e.g. 96 divided by 3 and 84 divided by 4. They then move on to calculations where they exchange between tens and ones.

Mathematical Talk

How can we partition 84?
How many rows do we need to share equally between?

If I cannot share the tens equally, what do I need to do?
How many ones will I have after exchanging the tens?

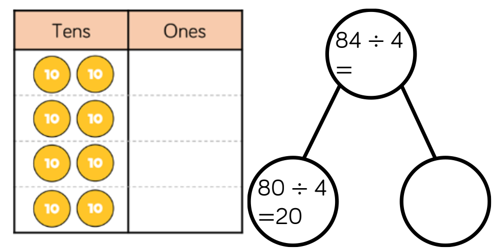
If we know 96 ÷ 4 = 24, what will 96 ÷ 8 be?
What will 96 ÷ 2 be? Can you spot a pattern?

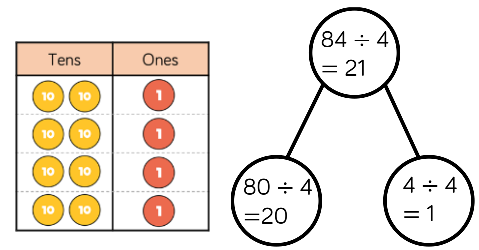
Varied Fluency

R

Jack is dividing 84 by 4 using place value counters.

First, he divides the tens. Then, he divides the ones.

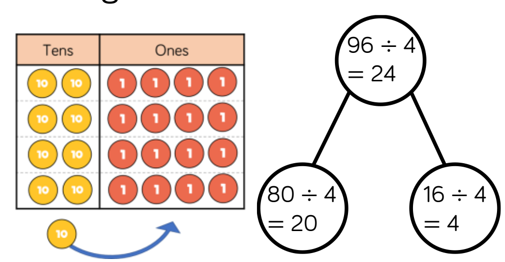




Use Jack's method to calculate:

69 ÷ 3   88 ÷ 4   96 ÷ 3

Rosie is calculating 96 divided by 4 using place value counters. First, she divides the tens. She has one ten remaining so she exchanges one ten for ten ones. Then, she divides the ones.



Use Rosie's method to solve
65 ÷ 5
75 ÷ 5
84 ÷ 6

Divide 2-digits by 1-digit (1)

Reasoning and Problem Solving

Dora is calculating 72 ÷ 3 Before she starts, she says the calculation will involve an exchange. Do you agree? Explain why.	Dora is correct because 70 is not a multiple of 3 so when you divide 7 tens between 3 groups there will be one remaining which will be exchanged.
Use $<$, $>$ or $=$ to complete the statements. 69 ÷ 3 ◯ 96 ÷ 3 96 ÷ 4 ◯ 96 ÷ 3 91 ÷ 7 ◯ 84 ÷ 6	$<$ $<$ $<$

Eva has 96 sweets. She shares them into equal groups. She has no sweets left over. How many groups could Eva have shared her sweets into?	Possible answers 96 ÷ 1 = 96 96 ÷ 2 = 48 96 ÷ 3 = 32 96 ÷ 4 = 24 96 ÷ 6 = 16 96 ÷ 8 = 12

Divide 2-digits by 1-digit (2)

Notes and Guidance

Children explore dividing 2-digit numbers by 1-digit numbers involving remainders.

They continue to use the place value counters to divide in order to explore why there are remainders. Teachers should highlight, through questioning, that the remainder can never be greater than the number you are dividing by.

Mathematical Talk

If we are dividing by 3, what is the highest remainder we can have?

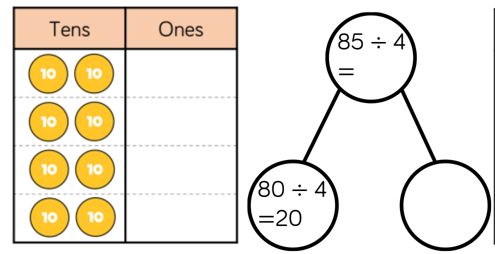
If we are dividing by 4, what is the highest remainder we can have?

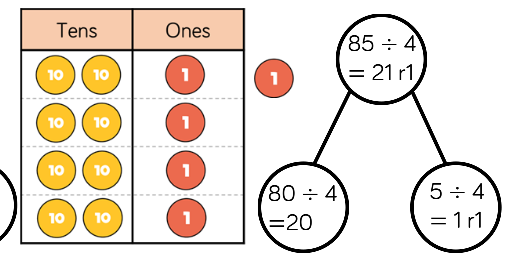
Can we make a general rule comparing our divisor (the number we are dividing by) to our remainder?

Varied Fluency

Teddy is dividing 85 by 4 using place value counters.

First, he divides the tens. Then, he divides the ones.

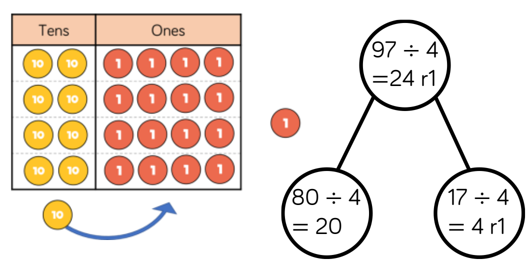




Use Teddy's method to calculate:

86 ÷ 4   87 ÷ 4   88 ÷ 4   97 ÷ 3   98 ÷ 3   99 ÷ 3

Whitney uses the same method, but some of her calculations involve an exchange.



Use Whitney's method to solve
57 ÷ 4
58 ÷ 4
58 ÷ 3

Divide 2-digits by 1-digit (2)

Reasoning and Problem Solving

Rosie writes, 85 ÷ 3 = 28 r 1 She says 85 must be 1 away from a multiple of 3 Do you agree?	I agree, remainder 1 means there is 1 left over. 85 is one more than 84 which is a multiple of 3
37 sweets are shared between 4 friends. How many sweets are left over? Four children attempt to solve this problem. • Alex says it's 1 • Mo says it's 9 • Eva says it's 9 r 1 • Jack says it's 8 r 5 Can you explain who is correct and the mistakes other people have made?	Alex is correct as there will be one remaining sweet. Mo has found how many sweets each friend will receive. Eva has written the answer to the calculation. Jack has found a remainder that is larger than the divisor so is incorrect.

Whitney is thinking of a 2-digit number that is less than 50 When it is divided by 2, there is no remainder. When it is divided by 3, there is a remainder of 1 When it is divided by 5, there is a remainder of 3 What number is Whitney thinking of?	Whitney is thinking of 28

Divide 3-digits by 1-digit

Notes and Guidance

Children apply their previous knowledge of dividing 2-digit numbers to divide a 3-digit number by a 1-digit number.

They use place value counters and part-whole models to support their understanding.

Children divide numbers with and without remainders.

Mathematical Talk

What is the same and what's different when we are dividing 3-digit number by a 1-digit number and a 2-digit number by a 1-digit number?

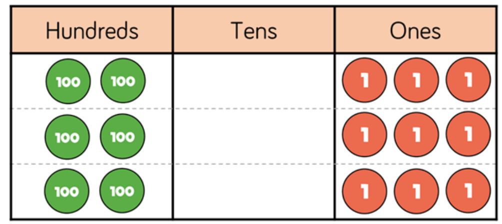
Do we need to partition 609 into three parts or could it just be partitioned into two parts?

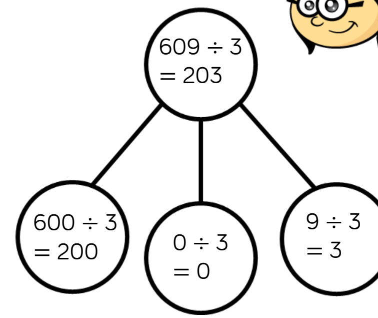
Can we partition the number in more than one way to support dividing more efficiently?

Varied Fluency

R

- Annie is dividing 609 by 3 using place value counters.

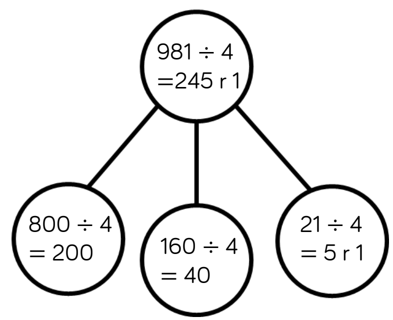


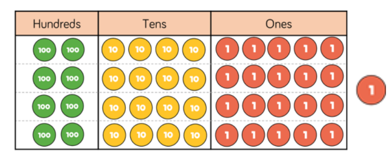


Use Annie's method to calculate the divisions.

906 ÷ 3   884 ÷ 4   884 ÷ 8   489 ÷ 2

- Rosie is using flexible partitioning to divide 3-digit numbers. She uses her place value counters to support her.



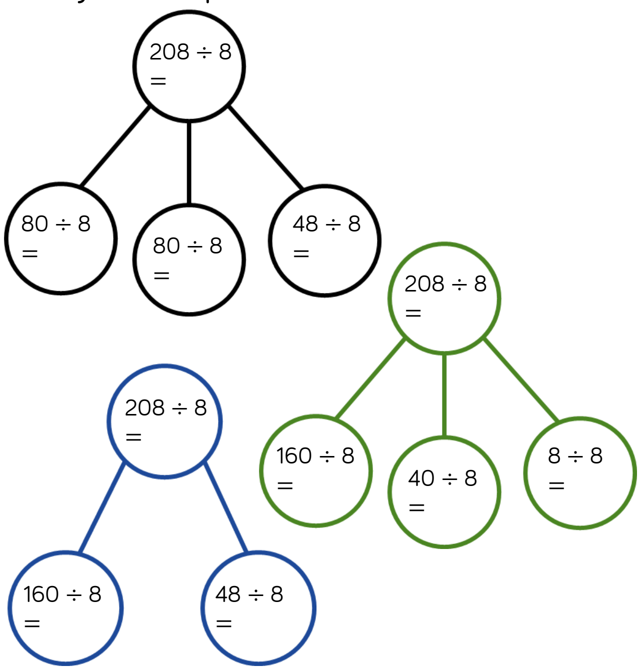


Use Rosie's method to solve:
726 ÷ 6
846 ÷ 6
846 ÷ 7

Divide 3-digits by 1-digit

Reasoning and Problem Solving

Dexter is calculating 208 ÷ 8 using part-whole models.
Can you complete each model?

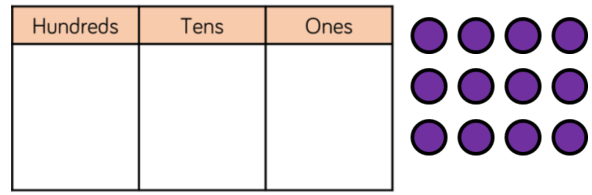


How many part-whole models can you make to calculate 132 ÷ 4?

208 ÷ 8 = 26
80 ÷ 8 = 10
48 ÷ 8 = 6
160 ÷ 8 = 20
40 ÷ 8 = 5
8 ÷ 8 = 1

Children can then make a range of part-whole models to calculate 132 ÷ 4
e.g.
100 ÷ 4 = 25
32 ÷ 4 = 8

You have 12 counters and the place value grid. You must use all 12 counters to complete the following.



Create a 3-digit number divisible by 2
Create a 3-digit number divisible by 3
Create a 3-digit number divisible by 4
Create a 3-digit number divisible by 5
Can you find a 3-digit number divisible by 6, 7, 8 or 9?

2: Any even number

3: Any 3-digit number (as the digits add up to 12, a multiple of 3)

4: A number where the last two digits are a multiple of 4

5: Any number with 0 or 5 in the ones column.

Possible answers

6: Any even number

7: 714, 8: 840

9: Impossible

Divide 4-digits by 1-digit

Notes and Guidance

Children use their knowledge from Year 4 of dividing 3-digits numbers by a 1-digit number to divide up to 4-digit numbers by a 1-digit number.

They use place value counters to partition their number and then group to develop their understanding of the short division method.

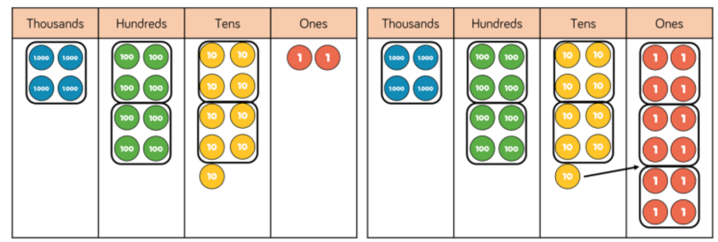
Mathematical Talk

How many groups of 4 thousands are there in 4 thousands?
How many groups of 4 hundreds are there in 8 hundreds?
How many groups of 4 tens are there in 9 tens?
What can we do with the remaining ten?
How many groups of 4 ones are there in 12 ones?

Do I need to solve both calculations to compare the divisions?

Varied Fluency

- Here is a method to calculate 4,892 divided by 4 using place value counters and short division.



	1	2	2	3
4	4	8	9	1 2

Use this method to calculate:

6,610 ÷ 5   2,472 ÷ 3   9,360 ÷ 4

- Mr Porter has saved £8,934
He shares it equally between his three grandchildren.
How much do they each receive?

- Use <, > or = to make the statements correct.

3,495 ÷ 5 ◯ 3,495 ÷ 3

8,064 ÷ 7 ◯ 9,198 ÷ 7

7,428 ÷ 4 ◯ 5,685 ÷ 5

Divide 4-digits by 1-digit

Reasoning and Problem Solving

Jack is calculating 2,240 ÷ 7

He says you can't do it because 7 is larger than all of the digits in the number.

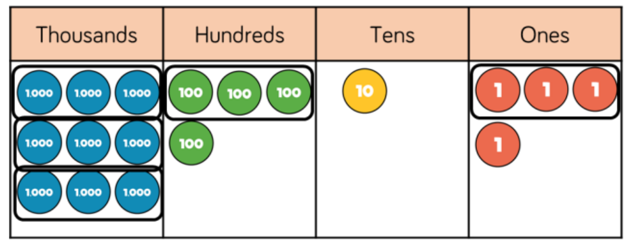
Do you agree with Jack?
Explain your answer.

Jack is incorrect.
You can exchange between columns.
You can't make a group of 7 thousands out of 2 thousand, but you can make groups of 7 hundreds out of 22 hundreds.

The answer is 320

Spot the Mistake

Explain and correct the working.



	3	1	0	1
3	9	4	1	4

There is no exchanging between columns within the calculation.
The final answer should have been 3,138

Divide with Remainders

Notes and Guidance

Children continue to use place value counters to partition and then group their number to further develop their understanding of the short division method.

They start to focus on remainders and build on their learning from Year 4 to understand remainders in context. They do not represent their remainder as a fraction at this point.

Mathematical Talk

If we can't make a group in this column, what do we do?

What happens if we can't group the ones equally?

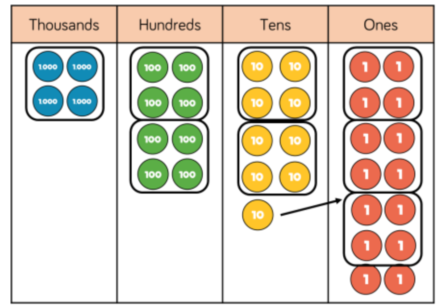
In this number story, what does the remainder mean?

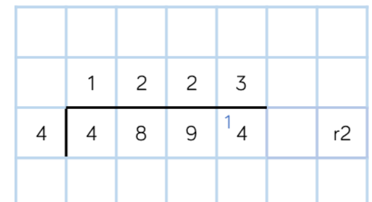
When would we round the remainder up or down?

In which context would we just focus on the remainder?

Varied Fluency

- Here is a method to solve 4,894 divided by 4 using place value counters and short division.





Use this method to calculate:

6,613 ÷ 5   2,471 ÷ 3   9,363 ÷ 4

- Muffins are packed in trays of 6 in a factory.
  In one day, the factory makes 5,623 muffins.
  How many trays do they need?
  How many trays will be full?
  Why are your answers different?

- For the calculation 8,035 ÷ 4
  - Write a number story where you round the remainder up.
  - Write a number story where you round the remainder down.
  - Write a number story where you have to find the remainder.

White Rose Maths

Divide with Remainders

Reasoning and Problem Solving

I am thinking of a 3-digit number.

When it is divided by 9, the remainder is 3

When it is divided by 2, the remainder is 1

When it is divided by 5, the remainder is 4

What is my number?

Possible answers:

129	219
309	399
489	579
669	759
849	939

Encourage children to think about the properties of numbers that work for each individual statement.
This will help decide the best starting point.

Always, Sometimes, Never?

A three-digit number made of consecutive descending digits divided by the next descending digit always has a remainder of 1

$765 \div 4 = 191$ remainder 1

How many possible examples can you find?

Sometimes

Possible answers:

$432 \div 1 = 432$ r 0
$543 \div 2 = 271$ r 1
$654 \div 3 = 218$ r 0
$765 \div 4 = 191$ r 1
$876 \div 5 = 175$ r 1
$987 \div 6 = 164$ r 3

White Rose Maths

Spring - Block 2

Fractions

Overview

Small Steps

- What is a fraction? (R)
- Equivalent fractions (1) (R)
- Equivalent fractions
- Fractions greater than 1 (R)
- Improper fractions to mixed numbers
- Mixed numbers to improper fractions
- Number sequences
- Compare and order fractions less than 1
- Compare and order fractions greater than 1
- Add and subtract fractions
- Add fractions within 1
- Add 3 or more fractions
- Add fractions

Notes for 2020/21

Children will need to look at different representations of fractions to expose any misconceptions.

They can then move onto a practical exploration of equivalent fractions by folding paper before comparing fractions with drawings and diagrams in these first recap steps.

Year 5 is the first time children explore improper fractions in depth so we have added a recap step from Year 4 where children add fractions to a total greater than one whole.

Overview

Small Steps

- Add mixed numbers
- Subtract fractions
- Subtract mixed numbers
- Subtract – breaking the whole
- Subtract 2 mixed numbers
- Multiply unit fractions by an integer
- Multiply non-unit fractions by an integer
- Multiply mixed numbers by integers
- Calculate fractions of a quantity (R)
- Fraction of an amount
- Using fractions as operators

Notes for 2020/21

As children progress through the small steps they use different representations to support their understanding of the abstract.

Before exploring fractions of an amount it may be useful to recap the Year 4 content with practical equipment and pictorial representations to help them see the relationships between the fraction and the whole.

What is a Fraction?

Notes and Guidance

Children explore fractions in different representations, for example, fractions of shapes, quantities and fractions on a number line.

They explore and recap the meaning of numerator and denominator, non-unit and unit fractions.

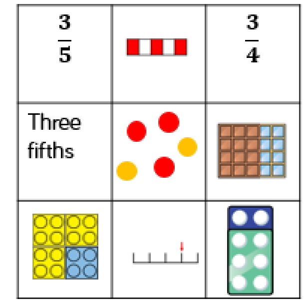
Mathematical Talk

How can we sort the fraction cards?
What fraction does each one represent?
Could some cards represent more than one fraction?
Is $\frac{1.5}{3}$ an example of a non-unit fraction? Why?
Using Cuisenaire, how many white rods are equal to an orange rod? How does this help us work out what fraction the white rod represents?

Varied Fluency

R

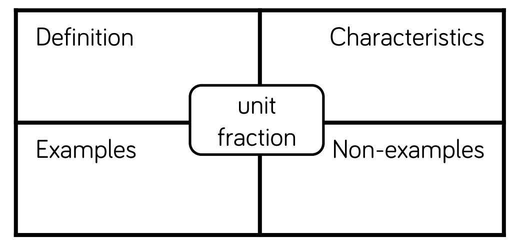
Here are 9 cards.
Sort the cards into different groups.
Can you explain how you made your decision?
Can you sort the cards in a different way?
Can you explain how your partner has sorted the cards?



Complete the Frayer model to describe a unit fraction.

Can you use the model to describe the following terms?

Non-unit fraction | Numerator | Denominator



Use Cuisenaire rods.
If the orange rod is one whole, what fraction is represented by:
- The white rod
- The red rod
- The yellow rod
- The brown rod

Choose a different rod to represent one whole; what do the other rods represent now?

What is a Fraction?

Reasoning and Problem Solving

R

Always, Sometimes, Never?

Alex says,

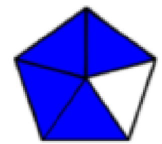
> If I split a shape into 4 parts, I have split it into quarters.

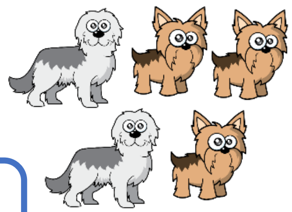
Explain your answer.

Sometimes

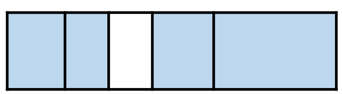
If the shape is not split equally, it will not be in quarters.

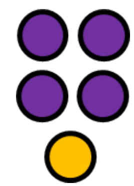
Which representations of $\frac{4}{5}$ are incorrect?





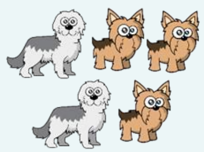
$\frac{4}{5}$





Explain how you know.

The image of the dogs could represent $\frac{2}{5}$ or $\frac{3}{5}$



The bar model is not divided into equal parts so this does not represent $\frac{4}{5}$

Equivalent Fractions (1)

Notes and Guidance

Children use strip diagrams to investigate and record equivalent fractions.

They start by comparing two fractions before moving on to finding more than one equivalent fraction on a fraction wall.

Mathematical Talk

Look at the equivalent fractions you have found.
What relationship can you see between the numerators and denominators? Are there any patterns?

Can a fraction have more than one equivalent fraction?

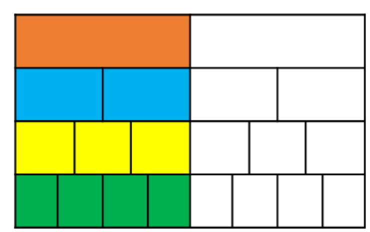
Can you use Cuisenaire rods or pattern blocks to investigate equivalent fractions?

Varied Fluency

- Use two strips of equal sized paper.
  Fold one strip into quarters and the other into eighths.
  Place the quarters on top of the eighths and lift up one quarter; how many eighths can you see?
  How many eighths are equivalent to one quarter?
  Which other equivalent fractions can you find?

- Using squared paper, investigate equivalent fractions using equal parts e.g. $\frac{2}{4} = \frac{?}{8}$
  Start by drawing a bar 8 squares long.
  Underneath, compare the same length bar split into four equal parts.

- How many fractions that are equivalent to one half can you see on the fraction wall?

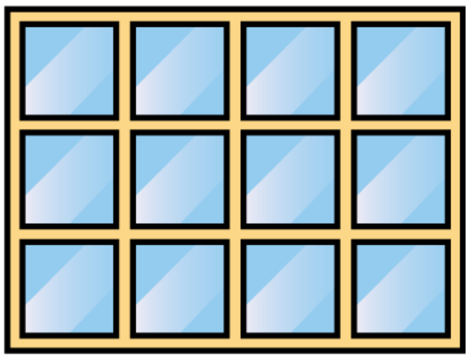


Draw extra rows to show other equivalent fractions.

Equivalent Fractions (1)

Reasoning and Problem Solving

How many equivalent fractions can you see in this picture?

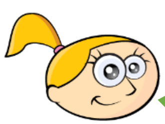


Children can give a variety of possibilities.
Examples:

$$\frac{1}{2} = \frac{6}{12} = \frac{3}{6}$$

$$\frac{1}{4} = \frac{3}{12}$$

Eva says,



> I know that $\frac{3}{4}$ is equivalent to $\frac{3}{8}$ because the numerators are the same.

Is Eva correct?
Explain why.

Eva is not correct.
$\frac{3}{4}$ is equivalent to $\frac{6}{8}$
When the numerators are the same, the larger the denominator, the smaller the fraction.

Ron has two strips of the same sized paper.
He folds the strips into different sized fractions.
He shades in three equal parts on one strip and six equal parts on the other strip.
The shaded areas are equal.

What fractions could he have folded his strips into?

Ron could have folded his strips into sixths and twelfths, quarters and eighths or any other fractions where one of the denominators is double the other.

Equivalent Fractions

Notes and Guidance

Children explore equivalent fractions using models and concrete representations.

They use models to make the link to multiplication and division. Children then apply the abstract method to find equivalent fractions.

It is important children have the conceptual understanding before moving on to just using an abstract method.

Mathematical Talk

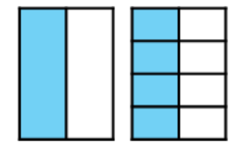
What equivalent fractions can we find by folding the paper? How can we record these?

What is the same and what is different about the numerators and denominators in the equivalent fractions?

How does multiplication and division help us find equivalent fractions? Where can we see this in our model?

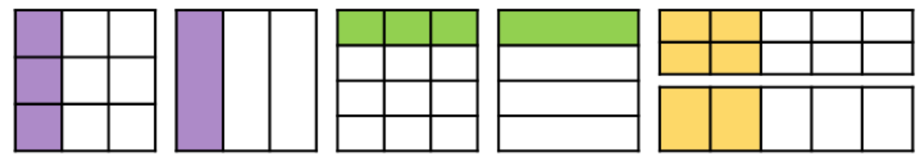
Varied Fluency

- Take two pieces of paper the same size.
  Fold one piece into two equal pieces.
  Fold the other into eight equal pieces.
  What equivalent fractions can you find?

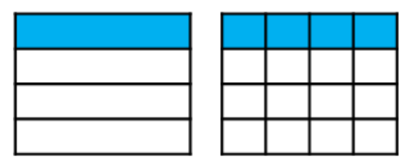


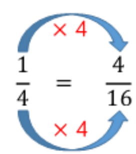
$\frac{1}{2} = \frac{4}{8}$

Use the models to write equivalent fractions.



- Eva uses the models and her multiplication and division skills to find equivalent fractions.





Use this method to find equivalent fractions to $\frac{2}{4}$, $\frac{3}{4}$ and $\frac{4}{4}$ where the denominator is 16

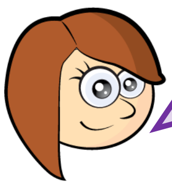
Eva uses the same approach to find equivalent fractions for these fractions. How will her method change?

$\frac{4}{12} = \frac{\square}{3}$ $\frac{6}{12} = \frac{\square}{4}$ $\frac{6}{12} = \frac{\square}{2}$

Equivalent Fractions

Reasoning and Problem Solving

Rosie says,



> To find equivalent fractions, whatever you do to the numerator, you do to the denominator.

Using her method, here are the equivalent fractions Rosie has found for $\frac{4}{8}$

$\frac{4}{8} = \frac{8}{16}$ $\frac{4}{8} = \frac{6}{10}$

$\frac{4}{8} = \frac{2}{4}$ $\frac{4}{8} = \frac{1}{5}$

Are all Rosie's fractions equivalent?
Does Rosie's method work?
Explain your reasons.

$\frac{4}{8} = \frac{1}{5}$ and $\frac{4}{8} = \frac{6}{10}$ are incorrect.

Rosie's method doesn't always work. It works when multiplying or dividing both the numerator or denominator but not when adding or subtracting the same thing to both.

Ron thinks you can only simplify even numbered fractions because you keep on halving the numerator and denominator until you get an odd number.

Do you agree?
Explain your answer.

Ron is wrong. For example $\frac{3}{9}$ can be simplified to $\frac{1}{3}$ and these are all odd numbers.

Here are some fraction cards.
All of the fractions are equivalent.

$\frac{4}{A}$ $\frac{B}{C}$ $\frac{20}{50}$

A + B = 16
Calculate the value of C.

A = 10
B = 6
C = 15

Fractions Greater than 1

Notes and Guidance

Children use manipulatives and diagrams to show that a fraction can be split into wholes and parts.

Children focus on how many equal parts make a whole dependent on the number of equal parts altogether. This learning will lead on to Year 5 where children learn about improper fractions and mixed numbers.

Mathematical Talk

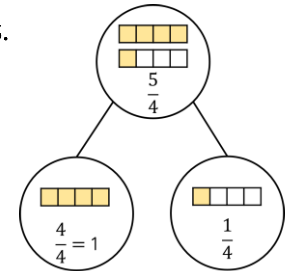
How many ____ make a whole?

If I have _____ eighths, how many more do I need to make a whole?

What do you notice about the numerator and denominator when a fraction is equivalent to a whole?

Varied Fluency

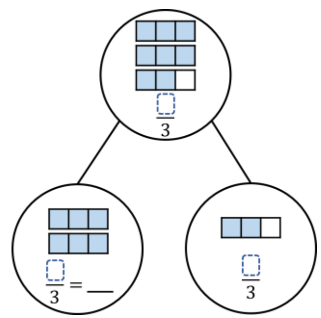
Complete the part-whole models and sentences.

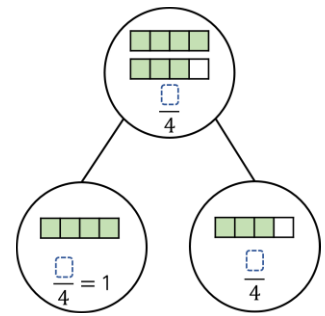


There are ____ quarters altogether.

___ quarters = ____ whole and ____ quarter.

Write sentences to describe these part-whole models.





Complete. You may use part-whole models to help you.

$$\frac{10}{3} = \frac{9}{3} + \frac{\square}{3} = 3\frac{\square}{3}$$

$$\frac{\square}{3} = \frac{6}{3} + \frac{2}{3} = \square\frac{2}{3}$$

$$\frac{\square}{8} = \frac{16}{8} + \frac{3}{8} = \square\frac{\square}{\square}$$

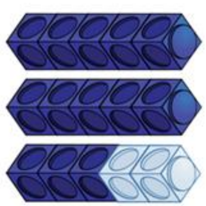
Fractions Greater than 1

Reasoning and Problem Solving

3 friends share some pizzas.
Each pizza is cut into 8 equal slices.
Altogether, they eat 25 slices.
How many whole pizzas do they eat?

They eat 3 whole pizzas and 1 more slice.

Spot the mistake.



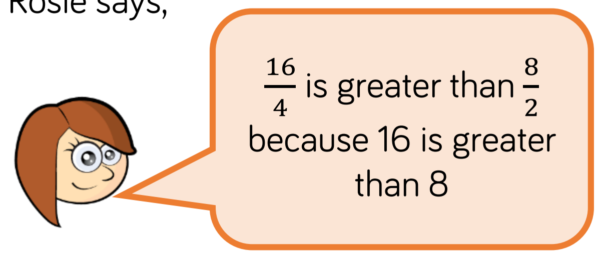
$\frac{13}{5}$ = 10 wholes and 3 fifths

There are 2 wholes not 10

$\frac{10}{5} = 2$ wholes

$\frac{13}{5} = 2$ wholes and 3 fifths

Rosie says,



Do you agree?
Explain why.

I disagree with Rosie because both fractions are equivalent to 4

Children may choose to build both fractions using cubes, or draw bar models.

Improper to Mixed Numbers

Notes and Guidance

Children convert improper fractions to mixed numbers for the first time. An improper fraction is a fraction where the numerator is greater than the denominator. A mixed number is a number consisting of an integer and a proper fraction.

It is important for children to see this process represented visually to allow them to make the connections between the concept and what happens in the abstract.

Mathematical Talk

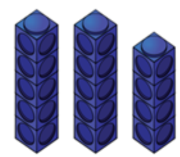
How many parts are there in a whole?

What do you notice happens to the mixed number when the denominator increases and the numerator remains the same?

What happens when the numerator is a multiple of the denominator?

Varied Fluency

- Whitney converts the improper fraction $\frac{14}{5}$ into a mixed number using cubes.
  She groups the cubes into 5s, then has 4 left over.



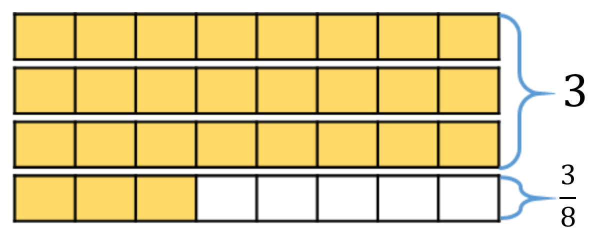
$\frac{5}{5}$ is the same as ☐ $\frac{10}{5}$ is the same as ☐

$\frac{14}{5}$ as a mixed number is ☐ $\frac{☐}{☐}$

Use Whitney's method to convert $\frac{11}{3}$, $\frac{11}{4}$, $\frac{11}{5}$ and $\frac{11}{6}$

- Tommy converts the improper fraction $\frac{27}{8}$ into a mixed number using bar models.

$\frac{27}{8}$



$3\frac{3}{8}$

Use Tommy's method to convert $\frac{25}{8}$, $\frac{27}{6}$, $\frac{18}{7}$ and $\frac{32}{4}$

Improper to Mixed Numbers

Reasoning and Problem Solving

Amir says,

$\frac{28}{3}$ is less than $\frac{37}{5}$ because 28 is less than 37

Do you agree?
Explain why.

Possible answer

I disagree because $\frac{28}{3}$ is equal to $9\frac{1}{3}$ and $\frac{37}{5}$ is equal to $7\frac{2}{5}$

$\frac{37}{5} < \frac{28}{3}$

Spot the mistake

- $\frac{27}{5} = 5\frac{1}{5}$
- $\frac{27}{3} = 8$
- $\frac{27}{4} = 5\frac{7}{4}$
- $\frac{27}{10} = 20\frac{7}{10}$

What mistakes have been made?

Can you find the correct answers?

Correct answers

- $5\frac{2}{5}$ (incorrect number of fifths)
- 9 (incorrect whole)
- $6\frac{3}{4}$ (still have an improper fraction)
- $2\frac{7}{10}$ (incorrect number of wholes)

Mixed Numbers to Improper

Notes and Guidance

Children now convert from mixed numbers to improper fractions using concrete and pictorial methods to understand the abstract method.

Ensure children always write their working alongside the concrete and pictorial representations so they can see the clear links to the abstract.

Mathematical Talk

How many quarters/halves/eighths/fifths are there in a whole?

How does multiplication support us in converting from mixed numbers to improper fractions?

Can you explain the steps in converting an improper fraction to a mixed number? Use the vocabulary: numerator, denominator, multiply, add

How could we use the previous bar model to help?

Varied Fluency

Whitney converts $3\frac{2}{5}$ into an improper fraction using cubes.

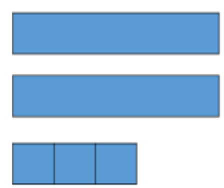
1 whole is equal to ☐ fifths.

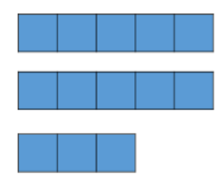
3 wholes are equal to ☐ fifths.

☐ fifths + two fifths = ☐ fifths

Use Whitney's method to convert $2\frac{2}{3}$, $2\frac{2}{4}$, $2\frac{2}{5}$ and $2\frac{2}{6}$

Jack uses bar models to convert a mixed number into an improper fraction.





$2\frac{3}{5}$ = ☐ wholes + ☐ fifths

2 wholes = ☐ fifths
☐ fifths + ☐ fifths = ☐ fifths

Use Jack's method to convert $2\frac{1}{6}$, $4\frac{1}{6}$, $4\frac{1}{3}$ and $8\frac{2}{3}$

Mixed Numbers to Improper

Reasoning and Problem Solving

Three children have incorrectly converted $3\frac{2}{5}$ into an improper fraction.

Annie

$3\frac{2}{5} = \frac{6}{15}$

Mo

$3\frac{2}{5} = \frac{15}{5}$

Dexter

$3\frac{2}{5} = \frac{32}{5}$

What mistake has each child made?

Annie has multiplied the numerator and denominator by 3

Mo has multiplied the correctly but then forgotten to add on the extra 2 parts.

Dexter has just placed 3 in front of the numerator.

Fill in the missing numbers.

How many different possibilities can you find for each equation?

$$2\frac{\square}{8} = \frac{\square}{8}$$

$$2\frac{\square}{5} = \frac{\square}{5}$$

Compare the number of possibilities you found.

$2\frac{1}{8} = \frac{17}{8}$ $2\frac{2}{8} = \frac{18}{8}$

$2\frac{3}{8} = \frac{19}{8}$ $2\frac{4}{8} = \frac{20}{8}$

$2\frac{5}{8} = \frac{21}{8}$ $2\frac{6}{8} = \frac{22}{8}$

$2\frac{7}{8} = \frac{23}{8}$

There will be 4 solutions for fifths.

Teacher notes: Encourage children to make generalisations that the number of solutions is one less than the denominator.

Number Sequences

Notes and Guidance

Children count up and down in a given fraction. They continue to use visual representations to help them explore number sequences.

Children also find missing fractions in a sequence and determine whether the sequence is increasing or decreasing and by how much.

Mathematical Talk

What are the intervals between the fractions?

Are the fractions increasing or decreasing?
How much are they increasing or decreasing by?

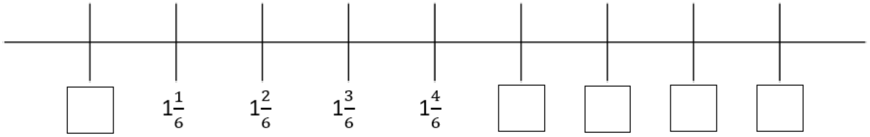
Can you convert the mixed numbers to improper fractions?
Does this make it easier to continue the sequence?

Varied Fluency

- Use the counting stick to count up and down in these fractions.

  - Start at 0 and count up in steps of $\frac{1}{4}$
  - Start at 4 and count down in steps of $\frac{1}{3}$
  - Start at 1 and count up in steps of $\frac{2}{3}$

- Complete the missing values on the number line.



- Complete the sequences.

$\frac{3}{4}, \frac{\square}{\square}, 1\frac{3}{4}, 2\frac{1}{4}$

$\frac{\square}{\square}, 3\frac{1}{3}, \frac{\square}{\square}, 2\frac{2}{3}$

$\frac{\square}{\square}, 5\frac{1}{2}, 5\frac{7}{10}, 5\frac{9}{10}$

$\frac{3}{5}, \frac{\square}{\square}, \frac{\square}{\square}, 3$

Number Sequences

Reasoning and Problem Solving

Three children are counting in quarters.

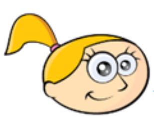
Whitney

$\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{5}{4}, \frac{6}{4}, \frac{7}{4}$

Teddy

$\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, 1\frac{1}{2}, 1\frac{3}{4}$

Eva



$\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1, 1\frac{1}{4}, 1\frac{2}{4}, 1\frac{3}{4}$

Who is counting correctly?
Explain your reasons.

They are all correct, they are all counting in quarter.
Teddy has simplified all answers and Eva has converted improper fractions to mixed numbers.

Play the fraction game for four players.
Place the four fraction cards on the floor.
Each player stands in front of a fraction.
We are going to count up in tenths starting at 0
When you say a fraction, place your foot on your fraction.

$\frac{1}{10}$ $\frac{1}{5}$

$\frac{3}{10}$ $\frac{1}{2}$

How can we make 4 tenths?
What is the highest fraction we can count to?
How about if we used two feet?

Children can make four tenths by stepping on one tenth and three tenths at the same time.
With one foot, they can count up to 11 tenths or one and one tenth.
With two feet they can count up to 22 tenths.

Compare & Order (Less than 1)

Notes and Guidance

Children build on their equivalent fraction knowledge to compare and order fractions less than 1 where the denominators are multiples of the same number.

Children compare the fractions by finding a common denominator or a common numerator. They use bar models to support their understanding.

Mathematical Talk

How does a bar model help us to visualise the fractions?

Should both of our bars be the same size? Why? What does this show us?

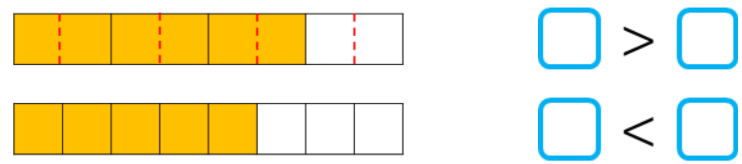
If the numerators are the same, how can we compare our fractions?

If the denominators are the same, how can we compare our fractions?

Do we always have to find a common denominator? Can we find a common numerator?

Varied Fluency

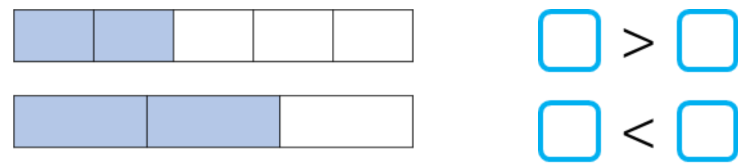
- Use bar models to compare $\frac{5}{8}$ and $\frac{3}{4}$



Use this method to help you compare:

$\frac{5}{6}$ and $\frac{2}{3}$ $\frac{2}{3}$ and $\frac{5}{9}$ $\frac{7}{16}$ and $\frac{3}{8}$

- Use common numerators to help you compare $\frac{2}{5}$ and $\frac{2}{3}$



Use this method to help you compare:

$\frac{6}{7}$ and $\frac{6}{8}$ $\frac{4}{9}$ and $\frac{4}{5}$ $\frac{4}{11}$ and $\frac{2}{5}$

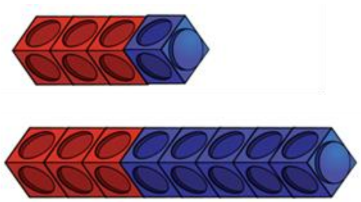
- Order the fractions from greatest to smallest:

$\frac{3}{7}, \frac{3}{5}$ and $\frac{3}{8}$ $\frac{2}{3}, \frac{5}{6}$ and $\frac{7}{12}$ $\frac{6}{11}, \frac{3}{5}$ and $\frac{2}{3}$

Compare & Order (Less than 1)

Reasoning and Problem Solving

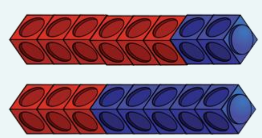
Ron makes $\frac{3}{4}$ and $\frac{3}{8}$ out of cubes.

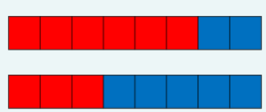


He thinks that $\frac{3}{8}$ is equal to $\frac{3}{4}$

Do you agree?
Explain your answer.

Possible answer:
I disagree with Ron because the two wholes are not equal. He could have compared using numerators or converted $\frac{3}{4}$ to $\frac{6}{8}$ If he does this he will see that $\frac{3}{4}$ is greater. Children may use bar models or cubes to show this.





Always, sometimes, never?

If one denominator is a multiple of the other you can simplify the fraction with the larger denominator to make the denominators the same.

Example:

Could $\frac{?}{4}$ and $\frac{?}{12}$ be simplified to $\frac{?}{4}$ and $\frac{?}{4}$?

Prove it.

Sometimes

It does not work for some fractions e.g. $\frac{8}{15}$ and $\frac{3}{5}$

But does work for others e.g. $\frac{1}{4}$ and $\frac{9}{12}$

Compare & Order (More than 1)

Notes and Guidance

Children use their knowledge of ordering fractions less than 1 to help them compare and order fractions greater than 1

They use their knowledge of common denominators to help them.

Children will compare both improper fractions and mixed numbers during this step.

Mathematical Talk

How can we represent the fractions?

How does the bar help us see which fraction is the greatest?

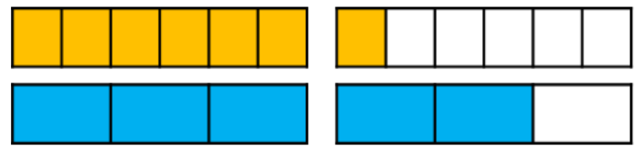
Can we use our knowledge of multiples to help us?

Can you predict which fractions will be greatest? Explain how you know.

Is it more efficient to compare using numerators or denominators?

Varied Fluency

- Use bar models to compare $\frac{7}{6}$ and $\frac{5}{3}$



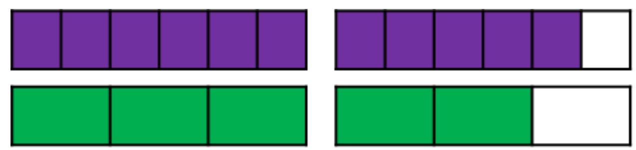
☐ > ☐

☐ < ☐

Use this method to help you compare:

$\frac{5}{2}$ and $\frac{9}{4}$ $\frac{11}{6}$ and $\frac{5}{3}$ $\frac{9}{4}$ and $\frac{17}{8}$

- Use a bar model to compare $1\frac{2}{3}$ and $1\frac{5}{6}$



☐ > ☐

☐ < ☐

Use this method to help you compare:

$1\frac{3}{4}$ and $1\frac{3}{8}$ $1\frac{5}{8}$ and $1\frac{1}{2}$ $2\frac{3}{7}$ and $2\frac{9}{14}$

- Order the fractions from greatest to smallest using common denominators:

$\frac{8}{5}$, $\frac{11}{10}$ and $\frac{17}{20}$

$\frac{?}{20}$, $\frac{?}{20}$ and $\frac{?}{20}$

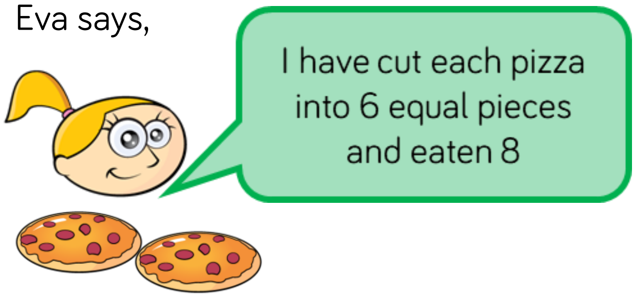
$1\frac{2}{3}$, $1\frac{7}{24}$ and $\frac{11}{12}$

Compare & Order (More than 1)

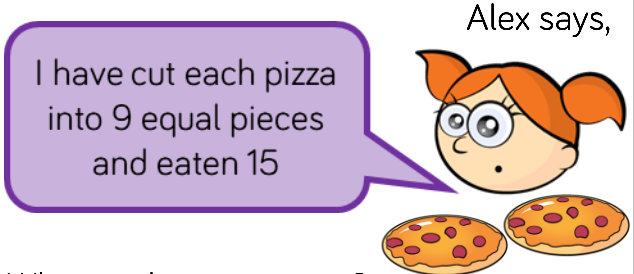
Reasoning and Problem Solving

Eva and Alex each have two identical pizzas.

Eva says,



Alex says,



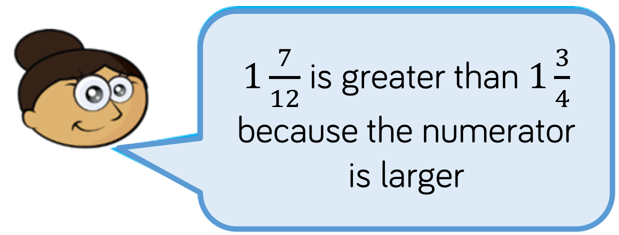
Who ate the most pizza?

Use a drawing to support your answer.

Alex ate the most pizza because $\frac{15}{9}$ is greater than $\frac{8}{6}$

Dora looks at the fractions $1\frac{7}{12}$ and $1\frac{3}{4}$

She says,



Do you agree?

Explain why using a model.

Possible answer:
I do not agree because $1\frac{3}{4}$ is equivalent to $1\frac{9}{12}$ and this is greater than $1\frac{7}{12}$

Add & Subtract Fractions

Notes and Guidance

Children recap their Year 4 understanding of adding and subtracting fractions with the same denominator.

They use bar models to support understanding of adding and subtracting fractions.

Mathematical Talk

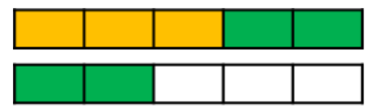
How many equal parts do I need to split my bar into?

Can you convert the improper fraction into a mixed number?

How can a bar model help you balance both sides of the equals sign?

Varied Fluency

- Here is a bar model to calculate $\frac{3}{5} + \frac{4}{5}$

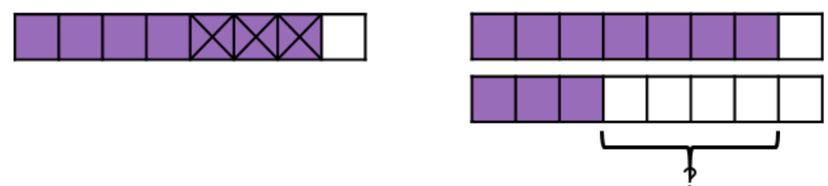


$\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$

Use a bar model to solve the calculations:

$\frac{3}{8} + \frac{3}{8}$ $\qquad$ $\frac{5}{6} + \frac{1}{6}$ $\qquad$ $\frac{5}{3} + \frac{5}{3}$

- Here are two bar models to calculate $\frac{7}{8} - \frac{3}{8}$



What is the difference between the two methods?
Use your preferred method to calculate:

$\frac{5}{8} - \frac{1}{8}$ $\qquad$ $\frac{9}{7} - \frac{4}{7}$ $\qquad$ $\frac{5}{3} - \frac{5}{3}$ $\qquad$ $1 - \frac{2}{5}$

- Calculate:

$\frac{3}{7} + \frac{5}{7} = \frac{\square}{\square} + \frac{4}{7}$ $\qquad$ $\frac{9}{5} - \frac{5}{5} = \frac{6}{5} - \frac{\square}{\square}$ $\qquad$ $\frac{2}{3} + \frac{\square}{\square} = \frac{11}{3} - \frac{4}{3}$

Add & Subtract Fractions

Reasoning and Problem Solving

How many different ways can you balance the equation?

$$\frac{5}{9} + \frac{\square}{9} = \frac{8}{9} + \frac{\square}{9}$$

Possible answers:

$$\frac{5}{9} + \frac{3}{9} = \frac{8}{9} + \frac{0}{9}$$

$$\frac{5}{9} + \frac{4}{9} = \frac{8}{9} + \frac{1}{9}$$

$$\frac{5}{9} + \frac{5}{9} = \frac{8}{9} + \frac{2}{9}$$

Any combination of fractions where the numerators add up to the same total on each side of the equals sign.

A chocolate bar has 12 equal pieces.

Amir eats $\frac{5}{12}$ more of the bar than Whitney.

There is one twelfth of the bar remaining.

What fraction of the bar does Amir eat?

What fraction of the bar does Whitney eat?

Amir eats $\frac{8}{12}$ of the chocolate bar and Whitney eats $\frac{3}{12}$ of the chocolate bar.

Add Fractions within 1

Notes and Guidance

Children add fractions with different denominators for the first time where one denominator is a multiple of the other.

They use pictorial representations to convert the fractions so they have the same denominator.

Ensure children always write their working alongside the pictorial representations so they see the clear links.

Mathematical Talk

Can you find a common denominator? Do you need to convert both fractions or just one?

Can you explain Mo and Rosie's methods to a partner? Which method do you prefer?

How do Mo and Rosie's methods support finding a common denominator?

Varied Fluency

Mo is calculating $\frac{1}{2} + \frac{1}{8}$

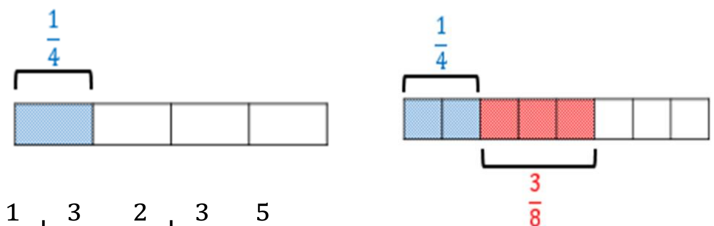
He uses a diagram to represent the sum.

$\frac{1}{2} + \frac{1}{8} = \frac{4}{8} + \frac{1}{8} = \frac{5}{8}$

Use Mo's method to solve :

$\frac{1}{2} + \frac{3}{8}$ $\quad$ $\frac{1}{4} + \frac{3}{8}$ $\quad$ $\frac{7}{10} + \frac{1}{5}$

Rosie is using a bar model to solve $\frac{1}{4} + \frac{3}{8}$



$\frac{1}{4} + \frac{3}{8} = \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

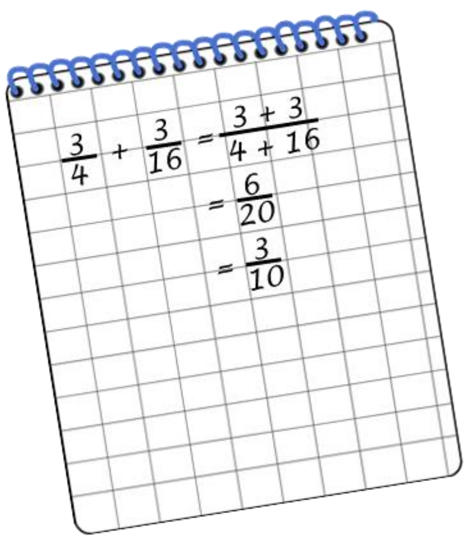
Use a bar model to solve:

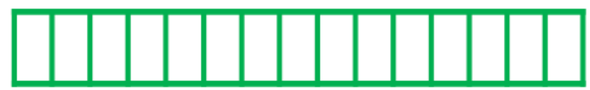
$\frac{1}{6} + \frac{5}{12}$ $\quad$ $\frac{2}{9} + \frac{1}{3}$ $\quad$ $\frac{1}{3} + \frac{4}{15}$

White Rose Maths

Add Fractions within 1

Reasoning and Problem Solving

$\frac{5}{16} + \frac{\square}{8} = \frac{15}{16}$ $\frac{\square}{20} + \frac{7}{10} = \frac{17}{20}$	5 3
Annie solved this calculation.  Can you spot and explain her mistake?	Annie is wrong because she has just added the numerators and the denominators. When adding fractions with different denominators you need to find a common denominator.

Two children are solving $\frac{1}{3} + \frac{4}{15}$ Eva starts by drawing this model:  Alex starts by drawing this model:  Can you explain each person's method and how they would complete the question? Which method do you prefer and why?	Possible answer: Each child may have started with a different fraction in the calculation. e.g. Eva has started by shading a third. She now needs to divide each third into five equal parts so there are fifteen equal parts altogether. Eva will then shade $\frac{4}{15}$ and will have $\frac{9}{15}$ altogether.

Add 3 or More Fractions

Notes and Guidance

Children add more than 2 fractions where two denominators are a multiple of the other.

They use a bar model to continue exploring this.

Ensure children always write their working alongside the pictorial representations so they see the clear links.

Mathematical Talk

Can you find a common denominator? Do you need to convert both fractions or just one?

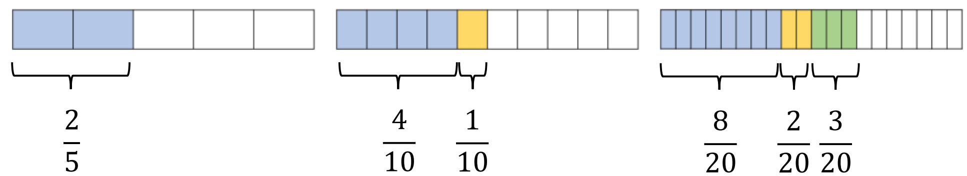
Can you explain Ron's method to a partner? How does Ron's method support finding a common denominator?

Can you draw what Farmer Staneff's field could look like? What fractions could you divide your field into?

Why would a bar model not be efficient for this question?

Varied Fluency

Ron uses a bar model to calculate $\frac{2}{5} + \frac{1}{10} + \frac{3}{20}$



Use a bar model to solve:

$\frac{1}{4} + \frac{3}{8} + \frac{5}{16}$ $\frac{1}{2} + \frac{1}{6} + \frac{1}{12}$

Farmer Staneff owns a field.

He plants carrots on $\frac{1}{3}$ of the field.

He plants potatoes on $\frac{2}{9}$ of the field.

He plants onions on $\frac{5}{18}$ of the field.

What fraction of the field is covered altogether?

Complete the fractions.

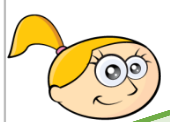
$\frac{1}{5} + \frac{\square}{10} + \frac{8}{20} = 1$ $\frac{1}{5} + \frac{\square}{15} + \frac{1}{30} = 1$

Add 3 or More Fractions

Reasoning and Problem Solving

Eva is attempting to answer:

$$\frac{3}{5}+\frac{1}{10}+\frac{3}{20}$$

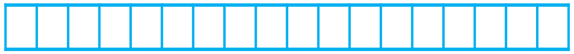


$$\frac{3}{5}+\frac{1}{10}+\frac{3}{20}=\frac{7}{35}$$

Do you agree with Eva?
Explain why.

Eva is wrong because she has added the numerators and denominators together and hasn't found a common denominator. The correct answer is $\frac{17}{20}$

Jack has added 3 fractions together to get an answer of $\frac{17}{18}$



What 3 fractions could he have added?

Can you find more than one answer?

Possible answers:

$$\frac{1}{18}+\frac{4}{18}+\frac{13}{18}$$

$$\frac{1}{9}+\frac{5}{9}+\frac{5}{18}$$

$$\frac{1}{6}+\frac{5}{9}+\frac{2}{9}$$

$$\frac{1}{18}+\frac{1}{6}+\frac{13}{18}$$

$$\frac{1}{3}+\frac{1}{6}+\frac{4}{9}$$

Add Fractions

Notes and Guidance

Children continue to represent adding fractions using pictorial methods to explore adding two or more proper fractions where the total is greater than 1

Children can record their totals as an improper fraction but will then convert this to a mixed number using their prior knowledge.

Mathematical Talk

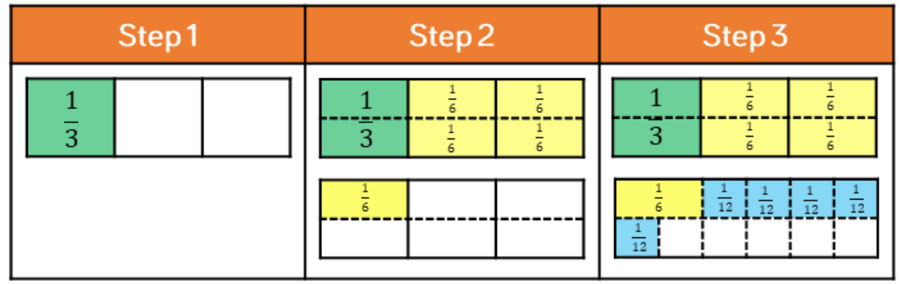
How does the pictorial method support me to add the fractions?

Which common denominator will we use?

How do my times-tables support me to add fractions?

Which representation do you prefer? Why?

Varied Fluency



$\frac{1}{3} + \frac{5}{6} + \frac{5}{12} = 1\frac{7}{12}$

Explain each step of the calculation.
Use this method to help you add the fractions.
Give your answer as a mixed number.

$\frac{2}{3} + \frac{1}{6} + \frac{7}{12}$ $\frac{1}{4} + \frac{7}{8} + \frac{3}{16}$ $\frac{1}{2} + \frac{5}{6} + \frac{5}{12}$

Use the bar model to add the fractions. Record your answer as a mixed number.

$\frac{3}{4} + \frac{3}{8} + \frac{1}{2} =$

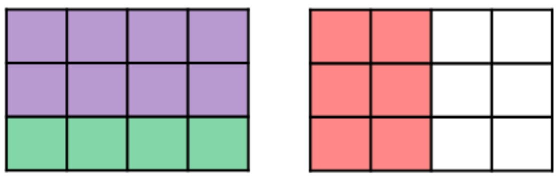
Draw your own models to solve:

$\frac{5}{12} + \frac{1}{6} + \frac{1}{2}$ $\frac{11}{20} + \frac{3}{5} + \frac{1}{10}$ $\frac{3}{4} + \frac{5}{12} + \frac{1}{2}$

Add Fractions

Reasoning and Problem Solving

Annie is adding three fractions.
She uses the model to help her.



What could her three fractions be?

How many different combinations can you find?

Can you write a number story to represent your calculation?

Possible answer:

$\frac{2}{3} + \frac{4}{12} + \frac{1}{2} = 1\frac{1}{2}$

Other equivalent fractions may be used.

Example story:
Some children are eating pizzas. Jack eats two thirds, Amir eats four twelfths and Dexter eats half a pizza. How much pizza did they eat altogether?

The sum of three fractions is $2\frac{1}{8}$

The fractions have different denominators.

All of the fractions are greater than or equal to a half.

None of the fractions are improper fractions.

All of the denominators are factors of 8

What could the fractions be?

$\frac{1}{2} + \frac{3}{4} + \frac{7}{8}$

Children could be given less clues and explore other possible solutions.

White Rose Maths

Add Mixed Numbers

Notes and Guidance

Children move on to adding two fractions where one or both are mixed numbers or improper fractions.

They will use a method of adding the wholes and then adding the parts. Children will record their answer in its simplest form.

Children can still draw models to represent adding fractions.

Mathematical Talk

How can we partition these mixed numbers into whole numbers and fractions?

What will the wholes total? Can I add the fractions straight away?

What will these mixed numbers be as improper fractions?

If I have an improper fraction in the question, should I change it to a mixed number first? Why?

Varied Fluency

- $1\frac{1}{3} + 2\frac{1}{6} = 3 + \frac{3}{6} = 3\frac{3}{6}$ or $3\frac{1}{2}$

  $1 + 2 = 3$

  $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$

  Add the fractions by adding the whole first and then the fractions. Give your answer in its simplest form.

  $3\frac{1}{4} + 2\frac{3}{8}$ $\quad$ $4\frac{1}{9} + 3\frac{2}{3}$ $\quad$ $2\frac{5}{12} + 2\frac{1}{3}$

- $1\frac{3}{4} + 2\frac{1}{8} = \frac{7}{4} + \frac{17}{8} = \frac{14}{8} + \frac{17}{8} = \frac{31}{8} = 3\frac{7}{8}$

  Add the fractions by converting them to improper fractions.

  $1\frac{1}{4} + 2\frac{5}{12}$ $\quad$ $2\frac{1}{9} + 1\frac{1}{3}$ $\quad$ $2\frac{1}{6} + 2\frac{2}{3}$

- Add these fractions.

  $4\frac{7}{9} + 2\frac{1}{3}$ $\quad$ $\frac{17}{6} + 1\frac{1}{3}$ $\quad$ $\frac{15}{8} + 2\frac{1}{4}$

  How do they differ from previous examples?

Add Mixed Numbers

Reasoning and Problem Solving

Jack and Whitney have some juice. Jack drinks $2\frac{1}{4}$ litres and Whitney drinks $2\frac{5}{12}$ litres. How much do they drink altogether? Complete this using two different methods. Which method do you think is more efficient? Why?	They drink $4\frac{2}{3}$ litres altogether. Encourage children to justify which method they prefer and why. Ensure children discuss which method is more or less efficient.

Fill in the missing numbers. $4\frac{5}{6} + \square\frac{\square}{\square} = 10\frac{1}{3}$	$5\frac{3}{6}$ or $5\frac{1}{2}$

Subtract Fractions

Notes and Guidance

Children subtract fractions with different denominators for the first time, where one denominator is a multiple of the other.

It is important that subtraction is explored as both take away and finding the difference.

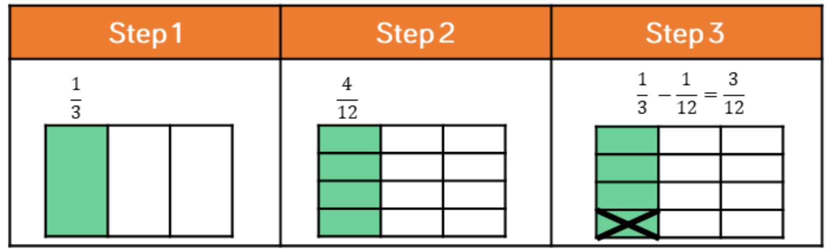
Mathematical Talk

What could the common denominator be?

Can you draw a model to help you solve the problem?

Is it easier to use a take away bar model (single bar model) or a bar model to find the difference (comparison model)?

Varied Fluency

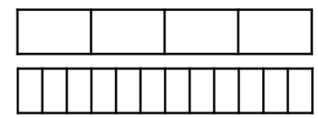


Explain each step of the calculation.

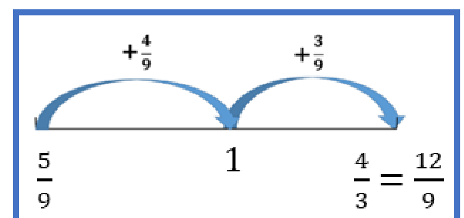
Use this method to help you solve $\frac{5}{6} - \frac{1}{3}$ and $\frac{7}{8} - \frac{5}{16}$

Tommy and Teddy both have the same sized chocolate bar. Tommy has $\frac{3}{4}$ left, Teddy has $\frac{5}{12}$ left.

How much more does Tommy have?



Amir uses a number line to find the difference between $\frac{5}{9}$ and $\frac{4}{3}$



Use this method to find the difference between:

$\frac{3}{4}$ and $\frac{5}{12}$ $\frac{19}{15}$ and $\frac{3}{5}$ $\frac{20}{9}$ and $\frac{4}{3}$

Subtract Fractions

Reasoning and Problem Solving

Which subtraction is the odd one out?

A $\frac{13}{4} - \frac{3}{8}$

B $\frac{10}{3} - \frac{2}{9}$

C $\frac{23}{7} - \frac{1}{3}$

Explain why.

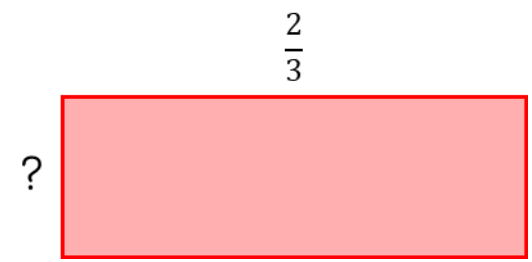
Possible answers:

C is the odd one out because the denominators aren't multiples of each other.

A is the odd one out because the denominators are even.

B is the odd one out because it is the only answer above 3

The perimeter of the rectangle is $\frac{16}{9}$



Work out the missing length.

The missing length is $\frac{2}{9}$

Subtract Mixed Numbers (1)

Notes and Guidance

Children apply their understanding of subtracting fractions where one denominator is a multiple of the other to subtract proper fractions from mixed numbers.

They continue to use models and number lines to support their understanding.

Mathematical Talk

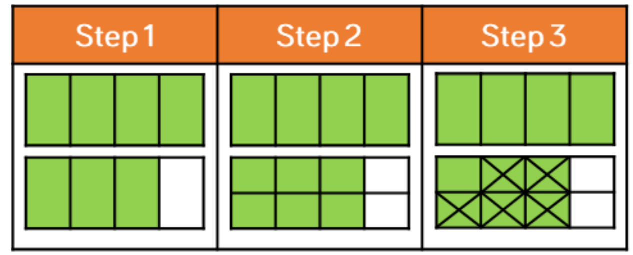
Which fraction is the greatest? How do you know?

If the denominators are different, what can we do?

Can you simplify your answer?

Which method do you prefer when subtracting fractions: taking away or finding the difference?

Varied Fluency



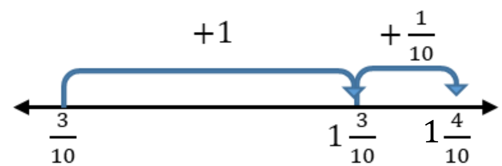
$1\frac{3}{4} - \frac{5}{8} = 1\frac{1}{8}$

Use this method to help you solve:

$2\frac{3}{5} - \frac{3}{10}$ $\quad 1\frac{2}{3} - \frac{1}{6}$ $\quad 1\frac{5}{6} - \frac{7}{12}$

Use a number line to find the difference between $1\frac{2}{5}$ and $\frac{3}{10}$

$1\frac{2}{5} = 1\frac{4}{10}$



Use a number line to find the difference between:

$3\frac{5}{6}$ and $\frac{1}{12}$ $\quad 5\frac{5}{7}$ and $\frac{3}{14}$ $\quad 2\frac{7}{9}$ and $\frac{11}{18}$

Solve:

$1\frac{2}{3} - \frac{5}{6}$ $\quad 1\frac{3}{4} - \frac{7}{8}$ $\quad 2\frac{3}{8} - \frac{11}{16}$

Subtract Mixed Numbers (1)

Reasoning and Problem Solving

Amir is attempting to solve $2\frac{5}{14} - \frac{2}{7}$

Here is his working out:

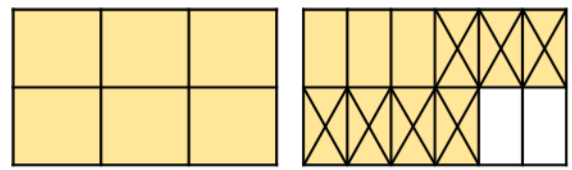
$$2\frac{5}{14} - \frac{2}{7} = 2\frac{3}{7}$$

Do you agree with Amir?
Explain your answer.

Possible answer:

Amir is wrong because he hasn't found a common denominator when subtracting the fractions he has just subtracted the numerators and the denominators. The correct answer is $2\frac{1}{14}$

Here is Rosie's method.
What is the calculation?



Can you find more than one answer?
Why is there more than one answer?

The calculation could be $1\frac{5}{6} - \frac{7}{12}$ or $1\frac{10}{12} - \frac{7}{12}$

There is more than one answer because five sixths and ten twelfths are equivalent. Children should be encouraged to write the question as $1\frac{5}{6} - \frac{7}{12}$ so that all fractions are in their simplest form.

Subtract Mixed Numbers (2)

Notes and Guidance

Children use prior knowledge of fractions to subtract two fractions where one is a mixed number and you need to break one of the wholes up.

They use the method of flexible partitioning to create a new mixed number so they can complete the calculation.

Mathematical Talk

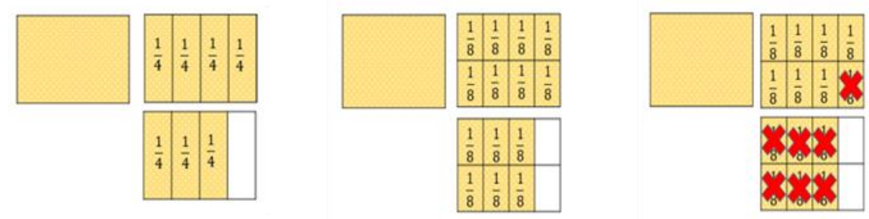
Is flexible partitioning easier than converting the mixed number to an improper fraction?

Do we always have to partition the mixed number?

When can we subtract a fraction without partitioning the mixed number in a different way?

Varied Fluency

- We can work out $2\frac{3}{4} - \frac{7}{8}$ using this method.



Use this method to calculate:

$3\frac{1}{3} - \frac{5}{6}$ $4\frac{1}{5} - \frac{7}{10}$ $5\frac{2}{3} - \frac{4}{9}$

- Use flexible partitioning to solve $7\frac{1}{3} - \frac{5}{6}$

$$7\frac{1}{3} - \frac{5}{6} = 6 + 1\frac{1}{3} - \frac{5}{6} = 6 + 1\frac{2}{6} - \frac{5}{6} = 6\frac{3}{6} = 6\frac{1}{2}$$

Use this method to calculate:

$4\frac{2}{3} - \frac{5}{6}$ $4\frac{1}{5} - \frac{7}{15}$ $5\frac{1}{4} - \frac{7}{8}$

- Mr Brown has $3\frac{1}{4}$ bags of flour. He uses $\frac{7}{8}$ of a bag. How much flour does he have left?

Subtract Mixed Numbers (2)

Reasoning and Problem Solving

Place 2, 3 and 4 in the boxes to make the calculation correct.

$$27\frac{1}{\square} - \frac{\square}{6} = 26\frac{\square}{3}$$

$27\frac{1}{3} - \frac{4}{6} = 26\frac{2}{3}$

3 children are working out $6\frac{2}{3} - \frac{5}{6}$

They partition the mixed number in the following ways to help them.

Dora: $5 + 1\frac{2}{3} - \frac{5}{6}$

Alex: $5 + 1\frac{4}{6} - \frac{5}{6}$

Jack: $5 + \frac{10}{6} - \frac{5}{6}$

Are they all correct?
Which method do you prefer?
Explain why.

All three children are correct.

$1\frac{2}{3}$, $1\frac{4}{6}$ and $\frac{10}{6}$ are all equivalent therefore all three methods will help children to correctly calculate the answer.

Subtract 2 Mixed Numbers

Notes and Guidance

Children use different strategies to subtract two mixed numbers.

Building on learning in previous steps, they look at partitioning the mixed numbers into wholes and parts and build on their understanding of flexible partitioning as well as converting to improper fractions when an exchange is involved.

Mathematical Talk

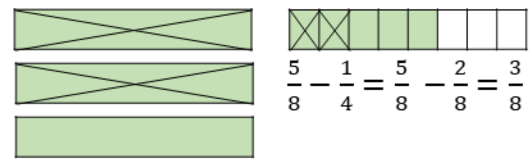
Why is subtracting the wholes and parts separately easier with some fractions than others?

Can you show the subtraction as a difference on a number line? Bar model? How are these different to taking away?

Does making the whole numbers larger make the subtraction any more difficult? Explain why.

Varied Fluency

- Here is a bar model to calculate $3\frac{5}{8} - 2\frac{1}{4}$



$3 - 2 = 1$

$\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

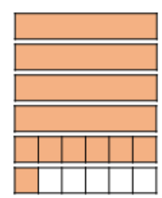
$3\frac{5}{8} - 2\frac{1}{4} = 1\frac{3}{8}$

Use this method to calculate:

$3\frac{7}{8} - 2\frac{3}{4}$ $\quad$ $5\frac{5}{6} - 2\frac{1}{3}$ $\quad$ $3\frac{8}{9} - 2\frac{5}{27}$

Why does this method not work effectively for $5\frac{1}{6} - 2\frac{1}{3}$?

- Here is a method to calculate $5\frac{1}{6} - 2\frac{1}{3}$



$5\frac{1}{6} - 2\frac{1}{3} = 4\frac{7}{6} - 2\frac{1}{3} = 4\frac{7}{6} - 2\frac{2}{6} = 2\frac{5}{6}$

Use this method to calculate:

$3\frac{1}{4} - 2\frac{5}{8}$ $\quad$ $5\frac{1}{3} - 2\frac{7}{12}$ $\quad$ $27\frac{1}{3} - 14\frac{7}{15}$

Subtract 2 Mixed Numbers

Reasoning and Problem Solving

There are three colours of dog biscuits in a bag of dog food: red, brown and orange.

The total mass of the dog food is 7 kg.

The mass of red biscuits is $3\frac{3}{4}$ kg and the mass of the brown biscuits is $1\frac{7}{16}$ kg.

What is the mass of orange biscuits?

$3\frac{3}{4} + 1\frac{7}{16} = 5\frac{3}{16}$

$7 - 5\frac{3}{16} = 1\frac{13}{16}$

The mass of orange biscuits is $1\frac{13}{16}$ kg.

Rosie has $20\frac{3}{4}$ cm of ribbon.

Annie has $6\frac{7}{8}$ cm less ribbon than Rosie.

How much ribbon does Annie have?

How much ribbon do they have altogether?

Annie has $13\frac{7}{8}$ cm of ribbon.

Altogether they have $34\frac{5}{8}$ cm of ribbon.

Multiply by an Integer (1)

Notes and Guidance

Children are introduced to multiplying fractions by a whole number for the first time. They link this to repeated addition and see that the denominator remains the same, whilst the numerator is multiplied by the integer.
This is shown clearly through the range of models to build the children's conceptual understanding of multiplying fractions.
Children should be encouraged to simplify fractions where possible.

Mathematical Talk

How is multiplying fractions similar to adding fractions?

What is the same/different between: $\frac{3}{4} \times 2$ and $2 \times \frac{3}{4}$?

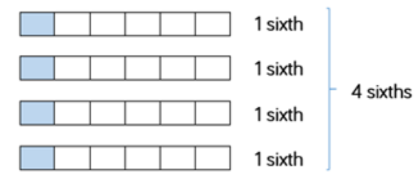
Which bar model do you find the most useful?

Which bar model helps us to convert from an improper fraction to a mixed number most effectively?

What has happened to the numerator/denominator?

Varied Fluency

- Work out $\frac{1}{6} \times 4$ by counting in sixths.

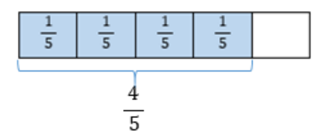


$$\frac{1}{6} \times 4 = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$$

Use this method to work out:

$2 \times \frac{1}{3}$ $\qquad \frac{1}{5} \times 3$ $\qquad 6 \times \frac{1}{10}$

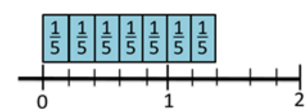
- Mo uses a single bar model to work out: $\frac{1}{5} \times 4 = \frac{4}{5}$



Use this method to work out:

$\frac{1}{4} \times 3$ $\qquad 6 \times \frac{1}{8}$ $\qquad \frac{1}{10} \times 8$

- Eva uses a number line and repeated addition to work out $\frac{1}{5} \times 7 = \frac{7}{5} = 1\frac{2}{5}$



Use this method to work out:

$5 \times \frac{1}{8}$ $\qquad \frac{1}{3} \times 3$ $\qquad \frac{1}{4} \times 7$

Multiply by an Integer (1)

Reasoning and Problem Solving

Amir is multiplying fractions by a whole number.

$\frac{1}{5} \times 5 = \frac{5}{25}$

Can you explain his mistake?

Amir has multiplied both the numerator and the denominator so he has found an equivalent fraction. Encourage children to draw models to represent this correctly.

Always, sometimes, never?

When you multiply a unit fraction by the same number as it's denominator the answer will be one whole.

Always - because the numerator was 1 it will always be the same as your denominator when multiplied which means that it is a whole.

e.g. $\frac{1}{3} \times 3 = \frac{3}{3} = 1$

I am thinking of a unit fraction.

When I multiply it by 4 it will be equivalent to $\frac{1}{2}$

When I multiply it by 2 it will be equivalent to $\frac{1}{4}$

What is my fraction?

What do I need to multiply my fraction by so that my answer is equivalent to $\frac{3}{4}$?

Can you create your own version of this problem?

$\frac{1}{8}$ because

$4 \times \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$

and

$2 \times \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$

6 because

$6 \times \frac{1}{8} = \frac{6}{8} = \frac{3}{4}$

Multiply by an Integer (2)

Notes and Guidance

Children apply prior knowledge of multiplying a unit fraction by a whole number to multiplying a non-unit fraction by a whole number.
They use similar models and discuss which method will be the most efficient depending on the questions asked.
Reinforce the concept of commutativity by showing examples of the fraction first and the integer first in the multiplication.

Mathematical Talk

Can you show me 3 lots of $\frac{3}{10}$ on a bar model?

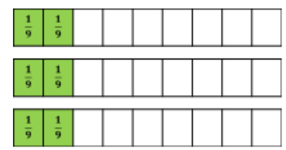
How many tenths do we have altogether?

How does repeated addition help us with this multiplication?

How does a number line help us see the multiplication?

Varied Fluency

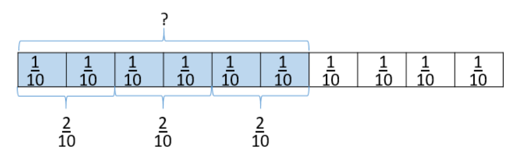
- Count the number of ninths to work $3 \times \frac{2}{9}$



Use this method to work out:

$\frac{3}{8} \times 2$ $\frac{5}{16} \times 3$ $4 \times \frac{2}{11}$

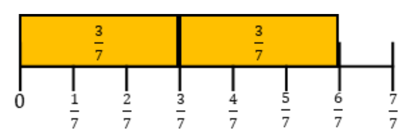
- Use the model to help you solve $3 \times \frac{2}{10}$



Use this method to work out:

$\frac{2}{7} \times 3$ $\frac{3}{16} \times 4$ $4 \times \frac{5}{12}$

- Use the number line to help you solve $2 \times \frac{3}{7}$



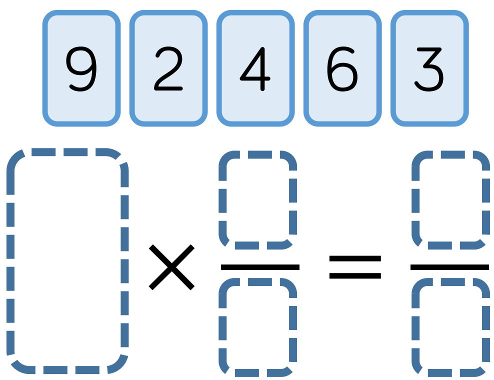
Use this method to work out:

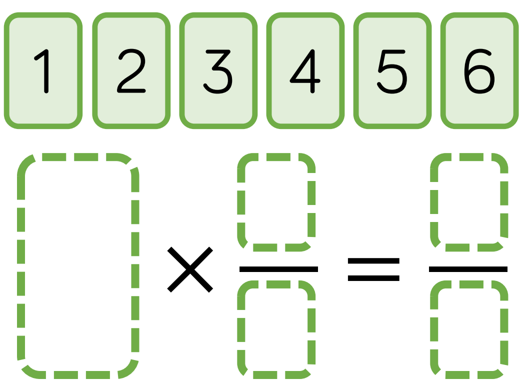
$\frac{3}{10} \times 3$ $\frac{2}{7} \times 2$ $4 \times \frac{3}{20}$

Multiply by an Integer (2)

Reasoning and Problem Solving

Use the digit cards only once to complete these multiplications.





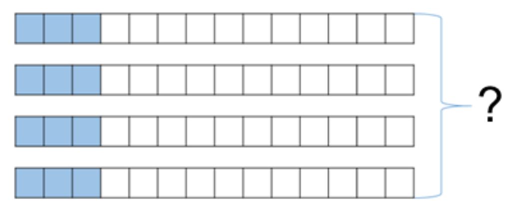
$2 \times \frac{3}{4} = \frac{9}{6}$

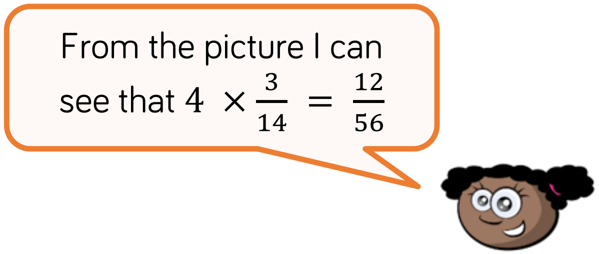
Possible answers:

$2 \times \frac{1}{3} = \frac{4}{6}$

$2 \times \frac{1}{4} = \frac{3}{6}$

Whitney has calculated $4 \times \frac{3}{14}$





Do you agree?

Explain why.

Possible answer:

I disagree. Whitney has shaded 12 fourteenths. She has counted all of the boxes to give her the denominator when it is not needed. The answer should be $\frac{12}{14}$ or $\frac{6}{7}$

Multiply by an Integer (3)

Notes and Guidance

Children use their knowledge of fractions to multiply a mixed number by a whole number.

They use the method of repeated addition, multiplying the whole and part separately and the method of converting to an improper fraction then multiplying.

Continue to explore visual representations such as the bar model.

Mathematical Talk

How could you represent this mixed number?

What is the denominator? How do you know?

How many wholes are there? How many parts are there?

What is multiplying fractions similar to? (repeated addition)

What representation could you use to convert a mixed number to an improper fraction?

Varied Fluency

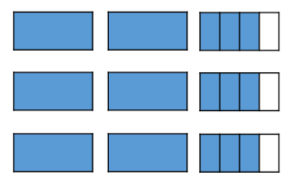
- Use repeated addition to work out $2\frac{2}{3} \times 4$

$$2\frac{2}{3} \times 4 = 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} + 2\frac{2}{3} = 8\frac{8}{3} = 10\frac{2}{3}$$

Use this method to solve:

$2\frac{1}{6} \times 3$ $\quad 1\frac{3}{7} \times 2$ $\quad 3\frac{1}{3} \times 4$

- Partition your fraction to help you solve $2\frac{3}{4} \times 3$



$2 \times 3 = 6$

$\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$

$6 + 2\frac{1}{4} = 8\frac{1}{4}$

Use this method to answer:

$2\frac{5}{6} \times 3$ $\quad 3\frac{4}{7} \times 2$ $\quad 2\frac{1}{3} \times 5$

$$1\frac{5}{6} \times 3 = \frac{11}{6} \times 3 = \frac{33}{6} = 5\frac{3}{6} = 5\frac{1}{2}$$

- Convert to an improper fraction to calculate:

$3\frac{2}{7} \times 4$ $\quad 2\frac{4}{9} \times 2$ $\quad 4 \times 3\frac{3}{5}$

Multiply by an Integer (3)

Reasoning and Problem Solving

Jack runs $2\frac{2}{3}$ miles three times per week. Dexter runs $3\frac{3}{4}$ miles twice a week. Who runs the furthest during the week? Explain your answer.	Jack runs $2\frac{2}{3} \times 3 = 8$ miles. Dexter runs $3\frac{3}{4} \times 2 = 7\frac{1}{2}$ miles. Jack runs further by half a mile.

Work out the missing numbers. $2\frac{\square}{8} \times \square = 7\frac{7}{8}$ Explain how you worked it out.	Possible answer: $2\frac{5}{8} \times 3 = 7\frac{7}{8}$ I knew that the multiplier could not be 4 because that would give an answer of at least 8. So the multiplier had to be 3. That meant that the missing numerator had to give a product of 15. I knew that 5 multiplied by 3 would give 15

Fractions of a Quantity

Notes and Guidance

Children use their knowledge of finding unit fractions of a quantity, to find non-unit fractions of a quantity.

They use concrete and pictorial representations to support their understanding. Children link bar modelling to the abstract method in order to understand why the method works.

Mathematical Talk

What is the whole? What fraction of the whole are we finding? How many equal parts will I divide the whole into?

What's the same and what's different about the calculations? Can you notice a pattern?

What fraction of her chocolate bar does Whitney have left? How many grams does she have left? Can you represent this on a bar model?

Varied Fluency

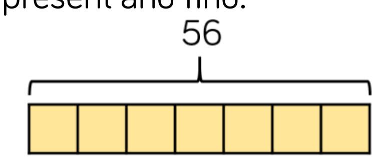
- Mo has 12 apples.
  Use counters to represent his apples and find:
  $\frac{1}{2}$ of 12 $\frac{1}{4}$ of 12 $\frac{1}{3}$ of 12 $\frac{1}{6}$ of 12

  Now calculate:
  $\frac{2}{2}$ of 12 $\frac{3}{4}$ of 12 $\frac{2}{3}$ of 12 $\frac{5}{6}$ of 12

  What do you notice? What's the same and what's different?

- Use a bar model to help you represent and find:

  $\frac{1}{7}$ of 56 = 56 ÷ $\square$

  $\frac{2}{7}$ of 56 $\frac{3}{7}$ of 56 $\frac{4}{7}$ of 56 $\frac{4}{7}$ of 28 $\frac{7}{7}$ of 28

- Whitney eats $\frac{3}{8}$ of 240 g bar of chocolate.
  How many grams of chocolate has she eaten?

Fractions of a Quantity

Reasoning and Problem Solving

R

True or False?

To find $\frac{3}{8}$ of a number, divide by 3 and multiply by 8

Convince me.

False.
Divide the whole by 8 to find one eighth and then multiply by three to find three eighths of a number.

Ron gives $\frac{2}{9}$ of a bag of 54 marbles to Alex.

Teddy gives $\frac{3}{4}$ of a bag of marbles to Alex.

Ron gives Alex more marbles than Teddy.

How many marbles could Teddy have to begin with?

$$\frac{2}{9} \text{ of } 54 > \frac{3}{4} \text{ of } \square$$

Teddy could have 16, 12, 8 or 4 marbles to begin with.

Fraction of an Amount

Notes and Guidance

Children recap previous learning surrounding finding unit and non-unit fractions of amounts, quantities and measures.

It is important that the concept is explored pictorially through bar models to support children to make sense of the abstract.

Mathematical Talk

How many equal groups have you shared 49 into? Why?

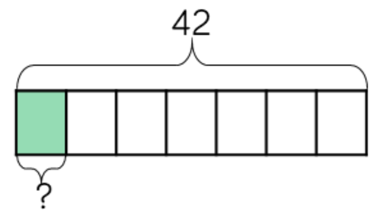
What does each equal part represent as a fraction and an amount?

What could you do to 1 metre to make the calculation easier?

1 litre = ____ ml   1 kg = _____ g

Varied Fluency

- Find $\frac{1}{7}$ of 42

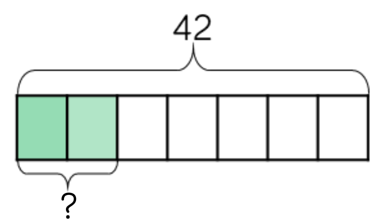


$42 \div 7 = 6$
$\frac{1}{7}$ of 42 is 6

Use this method to find:

$\frac{1}{8}$ of 56 $\frac{1}{6}$ of 480 $\frac{1}{9}$ of 81 m

- Find $\frac{2}{7}$ of 42



$42 \div 7 = 6$
$6 \times 2 = 12$
$\frac{2}{7}$ of 42 is 12

Use this method to find:

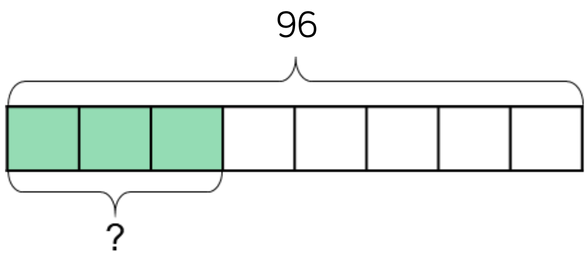
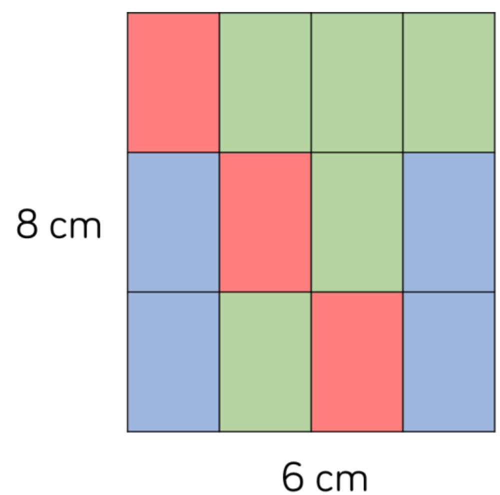
$\frac{3}{8}$ of 56 $\frac{5}{6}$ of 480 $\frac{4}{9}$ of 81 m

- Draw a bar model to help you calculate:

$\frac{4}{5}$ of 1 m $\frac{5}{12}$ of 1.44 litres $\frac{3}{7}$ of 21 kg

Fraction of an Amount

Reasoning and Problem Solving

Write a problem that matches the bar model.  What other questions could you ask from this model?	Possible response: There are 96 cars in a car park. $\frac{3}{8}$ of them are red. How many cars are red? How many were not red? etc.
$\frac{7}{16}$ of a class are boys. There are 18 girls in the class. How many children are in the class?	There are 32 children in the class.
Find the area of each colour in the rectangle.  What would happen if one of the red or green rectangles was changed to a blue?	Area of rectangle: $6 \times 8 = 48$ cm^2 Blue $\frac{4}{12}$ of $48 = 16$ cm^2 Red $\frac{3}{12}$ of $48 = 12$ cm^2 Green $\frac{5}{12}$ of $48 = 20$ cm^2 Children need to show that this would impact both the blue and the other colour.

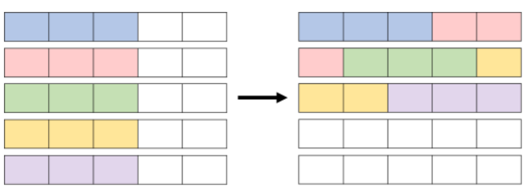
Fractions as Operators

Notes and Guidance

Children link their understanding of fractions of amounts and multiplying fractions to use fractions as operators.

They use their knowledge of commutativity to help them understand that you can change the order of multiplication without changing the product.

Mathematical Talk



What is the same and different about these bar models?

Is it easier to multiply a fraction or find a fraction of an amount?

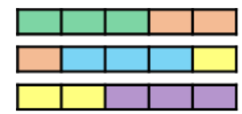
Does it depend on the whole number you are multiplying by?

Can you see the link between the numbers?

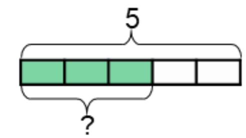
Varied Fluency

Tommy has calculated and drawn a bar model for two calculations.

$5 \times \frac{3}{5} = \frac{15}{5} = 3$



$\frac{3}{5}$ of $5 = 3$



What's the same and what's different about Tommy's calculations?

Complete:

2 lots of $\frac{1}{10}$ = □ $\frac{1}{10}$ of 2 = □

6 lots of □ = 3 □ of 6 = 3

8 lots of $\frac{1}{4}$ = □ $\frac{1}{4}$ of 8 = □

Which calculation on each row is easier? Why?

Use this to complete:

$20 \times \frac{4}{5} = \frac{□}{□}$ of 20 = □

□ $\times \frac{2}{3} = \frac{□}{□}$ of 18 = 12

□ $\times \frac{1}{3} = \frac{1}{3}$ of □ = 20

White Rose Maths

Fractions as Operators

Reasoning and Problem Solving

Which method would you use to complete these calculations: multiply the fractions or find the fraction of an amount? Explain your choice for each one. Compare your method to your partner. $25 \times \frac{3}{5}$ or $\frac{3}{5}$ of 25 $6 \times \frac{2}{3}$ or $\frac{2}{3}$ of 6 $5 \times \frac{3}{8}$ or $\frac{3}{8}$ of 5	Possible response: 1. Children may find it easier to find 3 fifths of 25 rather than multiply 25 by 3 2. Children may choose either as they are of similar efficiency. 3. Children will probably find it more efficient to multiply than divide 5 by 8
Dexter and Jack are thinking of a two-digit number between 20 and 30 Dexter finds two thirds of the number. Jack multiplies the number by $\frac{2}{3}$ Their new two-digit number has a digit total that is one more than that of their original number. What number did they start with? Show each step of their calculation.	They started with 24 Dexter: $24 \div 3 = 8$ $8 \times 2 = 16$ Jack: $24 \times 2 = 48$ $48 \div 3 = 16$

White Rose Maths

Spring - Block 3

Decimals & Percentages

Overview

Small Steps

- Decimals up to 2 d.p.
- Decimals as fractions (1)
- Decimals as fractions (2)
- Understand thousandths
- Thousandths as decimals
- Rounding decimals
- Order and compare decimals
- Understand percentages
- Percentages as fractions and decimals
- Equivalent F.D.P.

Notes for 2020/21

There are no recap steps here as this is all new learning for Year 5, building on the fractions block.

Children learn that both proper fractions and decimals can be used to represent values between whole numbers.

Rounding builds on earlier work on place value and explores different contexts, including measures.

White Rose Maths

Decimals up to 2 d.p.

Notes and Guidance

Children use place value counters and a place value grid to make numbers with up to two decimal places.

They read and write decimal numbers and understand the value of each digit.

They show their understanding of place value by partitioning decimal numbers in different ways.

Mathematical Talk

How many ones/tenths/hundredths are in the number?
How do we write this as a decimal? Why?

What is the value of the ____ in the number ______?

When do we need to use zero as a place holder?

How can we partition decimal numbers in different ways?

Varied Fluency

Which number is represented on the place value chart?

Ones	Tenths	Hundredths
	0.1	0.01 0.01
0	1	2

There are ____ ones, ____ tenths and ____ hundredths.

The number is ____

Represent the numbers on a place value chart and complete the stem sentences.

0.28 | 0.65 | 0.07 | 1.26

Make the numbers with place value counters and write down the value of the underlined digit.

2.45 | 3.04 | 4.44 | 43.34

0.76 = 0.7 + 0.06 = 7 tenths and 6 hundredths.
Fill in the missing numbers.

0.83 = _____ + 0.03 = _____________ and 3 hundredths.

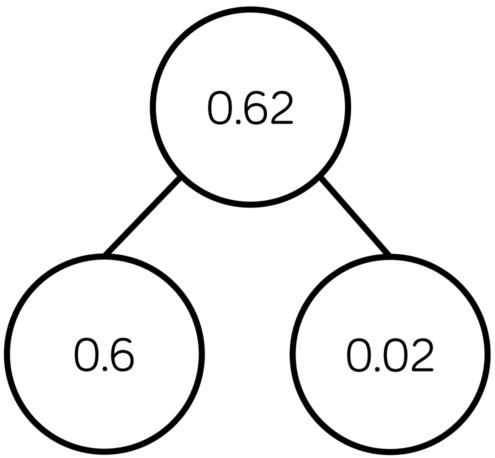
0.83 = 0.7 + _____ = 7 tenths and _____________

How many other ways can you partition 0.83?

Decimals up to 2 d.p.

Reasoning and Problem Solving

Dexter says there is only one way to partition 0.62



Prove Dexter is incorrect by finding at least three different ways of partitioning 0.62

0.62 = 0.12 + 0.5

0.62 = 0.4 + 0.22

0.62 = 0.3 + 0.32

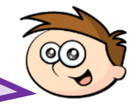
0.62 = 0.42 + 0.2

0.62 = 0.1 + 0.52

0.62 = 0.03 + 0.59

etc.

Match each description to the correct number.

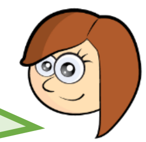


My number has the same amount of tens and tenths.

Teddy

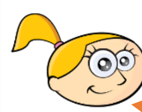
Amir

My number has one decimal place.



My number has two hundredths.

Rosie



Eva

My number has six tenths.

46.2 | 2.64 | 46.02 | 40.46

Teddy – 40.46
Amir – 46.2
Rosie – 46.02
Eva – 2.64

Decimals as Fractions (1)

Notes and Guidance

Children explore the relationship between decimals and fractions. They start with a fraction (including concrete and pictorial representations of fractions) convert it into a decimal and as they progress, children will see the direct link between fractions and decimals.

Children use their previous knowledge of fractions to aid this process.

Mathematical Talk

What does the whole grid represent?

What can we use to describe the equal parts of the grid (fractions and decimals)?

How would you convert a fraction to a decimal?

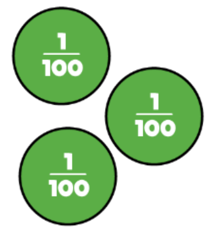
What does the decimal point mean?

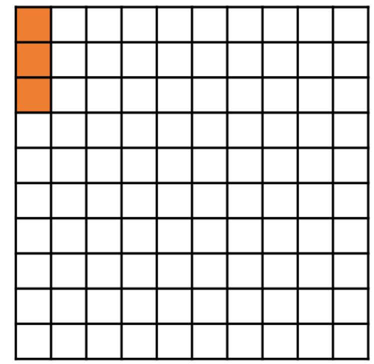
Can the fraction be simplified?

How can you prove that the decimal ____ and the fraction ____ are the same?

Varied Fluency

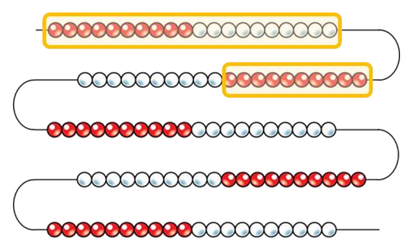
- What fraction is shown in both representations? Can you convert this in to a decimal?





The fraction $\frac{\square}{\square}$ is the same as the decimal ______

- If the whole bead string represents one whole, what decimal is represented by the highlighted part? Can you represent this on a 100 square?



Decimals as Fractions (1)

Reasoning and Problem Solving

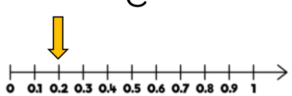
Odd one out

Which of the images below is the odd one out?

A

B

C



D

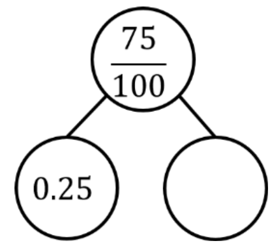
Explain why.

Possible answer:

B is the odd one out because it shows $\frac{2}{5}$, which is $\frac{4}{10}$ or 0.4

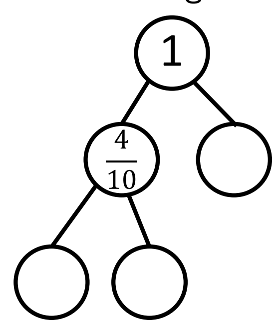
The other images show $\frac{2}{10}$ or 0.2

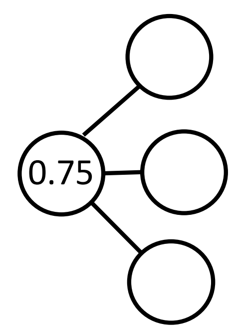
How many different ways can you complete the part-whole model using fractions and decimals?



Create another part-whole model like the one above for your partner to complete.

Now complete the following part-whole models using fractions and decimals.





Possible answers:

$\frac{50}{100}$

$\frac{1}{2}$

0.5

There are various possible answers when completing the part-whole models. Ensure both fractions and decimals are represented.

White Rose Maths

Decimals as Fractions (2)

Notes and Guidance

Children concentrate on more complex decimals numbers (e.g. 0.96, 0.03, 0.27) and numbers greater than 1 (e.g. 1.2, 2.7, 4.01).

They represent them as fractions and as decimals.

Children record the number in multiple representations, including expanded form and in words.

Mathematical Talk

In the number 1.34 what does the 1 represent, what does the 3 represent, what does the 4 represent?

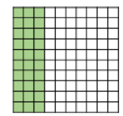
Can we represent this number in a different way, and another, and another?

On the number line, where can we see tenths? Where can we see hundredths?

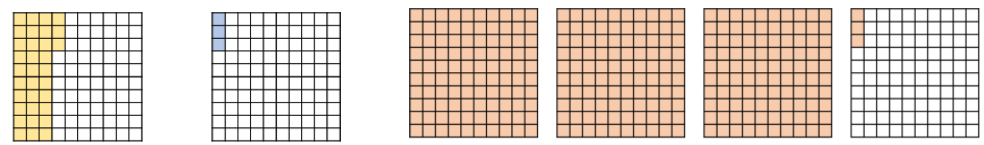
On the number line, tell me another number that is between c and d. Now give your answer as a fraction. Tell me a number that is not between c and d.

Varied Fluency

- Use the models to record equivalent decimals and fractions.



$0.3 = \frac{3}{10} = \frac{30}{100}$



- Write down the value of a, b, c and d as a decimal and a fraction.

- Complete the table.

Concrete	Decimal	Decimal – expanded form	Fraction	Fraction – expanded form	In words
	3.24	3 + 0.2 + 0.04	$3\frac{24}{100}$	$3 + \frac{2}{10} + \frac{4}{100}$	Three ones, two tenths and four hundredths.
	3.01		$3\frac{1}{100}$		
				$3 + \frac{4}{10} + \frac{2}{100}$	
					Two ones, three tenths and two hundredths.

Decimals as Fractions (2)

Reasoning and Problem Solving

2.25 = 2 ones, 2 tenths and 5 hundredths. Can you write the following numbers in at least three different ways? 23.7 2.37 9.08 0.98	Possible answer: Children may represent it in words, decimals, fractions, expanded form but also by partitioning the number in different ways.
Amir says, "To convert a fraction to a decimal, take the numerator and put it after the decimal point. E.g. $\frac{21}{100} = 0.21$"  Write two examples of converting fractions to decimals to prove this does not always work.	Possible answers could include $\frac{1}{100}$ is not equal to 0.1

Use the digits 3, 4 and 5 to complete the decimal number. ☐ 0 . ☐ ☐ List all the possible numbers you can make.	30.45, 30.54, 40.35, 40.53, 50.43, 50.34
Write these decimals as mixed numbers. Choose three of the numbers and write them in words.	$30\frac{45}{100}$, $30\frac{54}{100}$, $40\frac{35}{100}$, $40\frac{53}{100}$, $50\frac{43}{100}$, $50\frac{34}{100}$

Understand Thousandths

Notes and Guidance

Children build on previous learning of tenths and hundredths and apply this to understanding thousandths.
Opportunities to develop understanding of thousandths through the use of concrete and pictorial representations need to be incorporated.
When exploring the relationships between tenths, hundredths and thousandths, consider decimal and mixed number equivalences.

Mathematical Talk

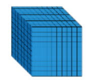
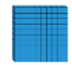
If 4 tenths = 0.4, 4 hundredths = 0.04, what is 4 thousandths equal to?

Using the place value charts:

- How many tenths are in a whole?
- How many hundredths are there in 1 tenth?
- Using place value counters complete the final chart.
- How many thousandths in 1 hundredth?

Varied Fluency

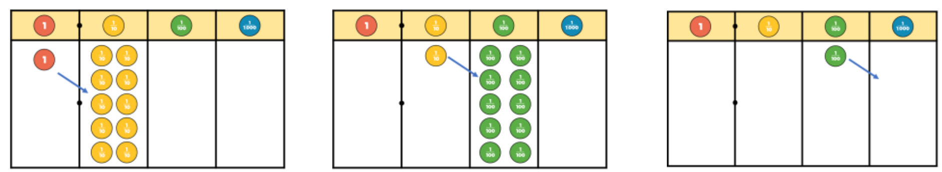
Eva is using Base 10 to represent decimals.

 = 1 whole  = 1 tenth = 1 hundredth  = 1 thousandth

Use Base 10 to build:

- 4 wholes, 4 tenths, 4 hundredths, 4 thousandths
- 5 tenths, 7 hundredths and 5 thousandths
- 2.357

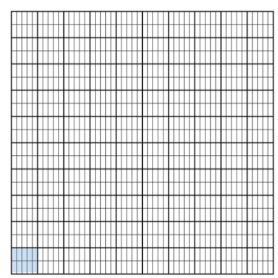
Use the place value counters to help you fill in the final chart.



= ___ tenths 

= ___hundredths 

= ___ thousandths

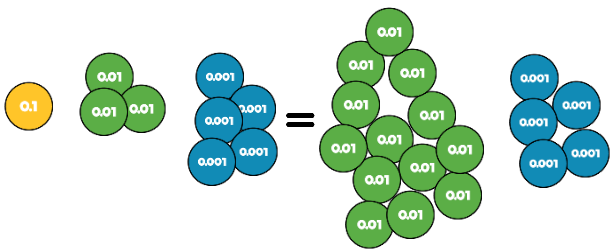


What has this hundred square been divided up into?
How many thousandths are there in one hundredth?
How many thousandths are in one tenth?

Understand Thousandths

Reasoning and Problem Solving

Rosie thinks the 2 values are equal.



Do you agree?
Explain your thinking.

Can you write this amount as a decimal and as a fraction?

Agree.

We can exchange ten hundredth counters for one tenth counter.

$0.135 = \frac{135}{1000}$

0.394

$= 3$ tenths, 9 hundredths and 4 thousandths

$= \frac{3}{10} + \frac{9}{100} + \frac{4}{1000}$

$= 0.3 + 0.09 + 0.004$

Write these numbers in three different ways:

0.472 0.529 0.307

0.472 = 4 tenths, seven hundredths and 2 thousandths $= \frac{4}{10} + \frac{7}{100} + \frac{2}{1000} = 0.4 + 0.07 + 0.002$

0.529 = 5 tenths, two hundredths and 9 thousandths $= \frac{5}{10} + \frac{2}{100} + \frac{9}{1000} = 0.5 + 0.02 + 0.009$

0.307 = 3 tenths and 7 thousandths $= \frac{3}{10} + \frac{7}{1000} = 0.3 + 0.007$

Thousandths as Decimals

Notes and Guidance

Children build on their understanding of decimals and further explore the link between tenths, hundredths and thousandths.

They represent decimals in different ways and also explore deeper connections such as $\frac{100}{1000}$ is the same as $\frac{1}{10}$

Mathematical Talk

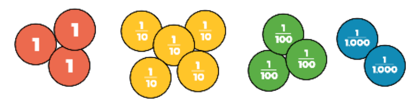
What number is represented? How will we show this on the place value chart? How many ones/tenths/hundredths/thousandths do I have?

Where would 2.015 be positioned on the number line? How many thousandths do I have? How do I record this as a mixed number?

Varied Fluency

Use the place value chart and counters to represent these numbers.
Write down the numbers as a decimal.

a)

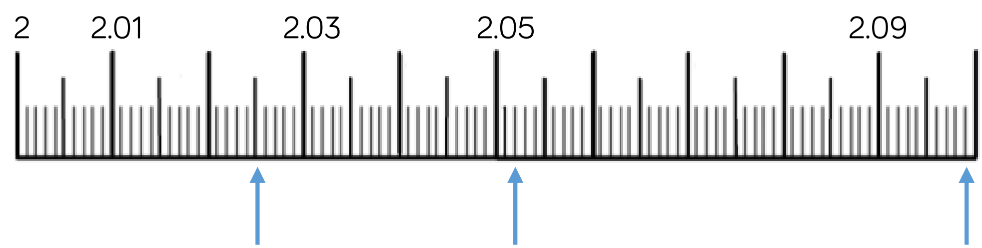


1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

b) 4 ones, 6 tenths, 0 hundredths and 2 thousandths

c) $3\frac{34}{1000}$

The arrows are pointing to different numbers.
Write each number as a decimal and then as a mixed number.



White Rose Maths

Thousandths as Decimals

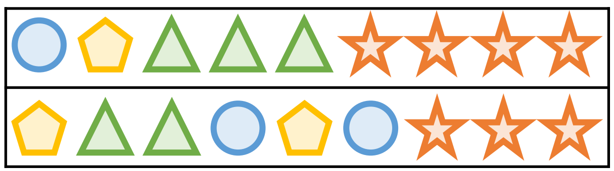
Reasoning and Problem Solving

Ron has 8 counters. He makes numbers using the place value chart.
At least 3 columns have counters in.
What is the largest and the smallest number he can make with 8 counters?

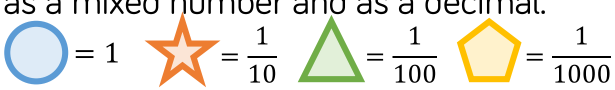
1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$

Can you record the numbers in different ways?

Smallest: 0.116
Largest: 6.11



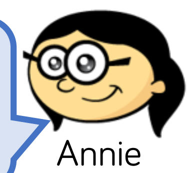
In this problem symbols have been used to represent two different numbers. Write down the value of each, as a mixed number and as a decimal.



1.431

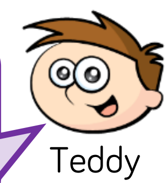
2.322

Three children are representing the number 0.504



$0.504 = \frac{504}{1000}$

$0.504 = \frac{3}{10} + \frac{2}{10} + \frac{4}{1000}$



$0.504 = \frac{5}{10} + \frac{4}{1000}$

Who is correct?
Explain why.

Possible answer:

They are all correct. Annie has recorded it as a fraction. Alex and Teddy have partitioned it differently.

Rounding Decimals

Notes and Guidance

Children develop their understanding of rounding to the nearest whole number and to the nearest tenth.

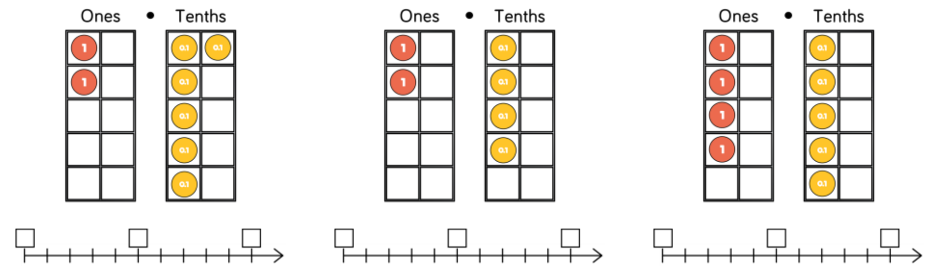
Number lines support children to understand where numbers appear in relation to other numbers and are important in developing conceptual understanding of rounding.

Mathematical Talk

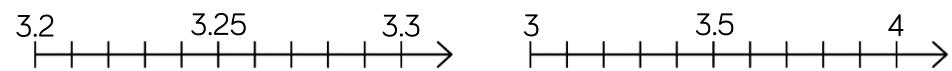
What number do the ones and tenths counters represent?
How many decimal places does it have?
When rounding to the nearest one decimal place, how many digits will there be after the decimal point?
Where would 3.25 appear on both number lines?
What is the same and what is different about the two number lines?

Varied Fluency

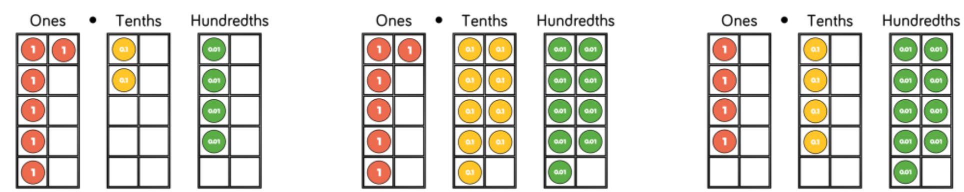
- Complete the number lines and round the representations to the nearest whole number:



- Use the number lines to round 3.24 to the nearest tenth and the nearest whole number.



- Round each number to the nearest tenth and nearest whole number. Use number lines to help you.



Round Decimals

Reasoning and Problem Solving

Dexter is measuring a box of chocolates with a ruler that measures in centimetres and millimetres.  He measures it to the nearest cm and writes the answer 28 cm. What is the smallest length the box of chocolates could be?	Smallest: 27.5 cm
Whitney is thinking of a number.  Rounded to the nearest whole her number is 4 Rounded to the nearest tenth her number is 3.8 Write down at least 4 different numbers that she could be thinking of.	Possible answers: 3.84 3.83 3.82 etc. Some children might include answers such as 3.845

A number between 11 and 20 with 2 decimal places rounds to the same number when rounded to one decimal place and when rounded to the nearest whole number? What could this be? Is there more than one option? Explain why.	The whole number can range from 11 to 19 and the decimal places can range from ___.95 to ___.99 Can children explain why this works?

Order & Compare Decimals

Notes and Guidance

Children order and compare numbers with up to three decimal places.

They use place value counters to represent the numbers they are comparing.

Number lines support children to understand where numbers appear in relation to other numbers.

Mathematical Talk

What number is represented by the place value counters?

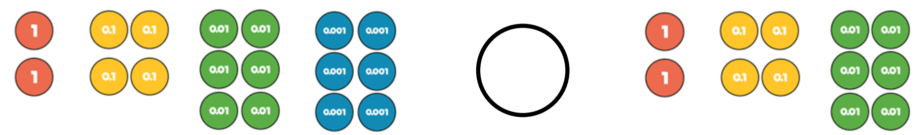
______ is greater/less than ______ because…

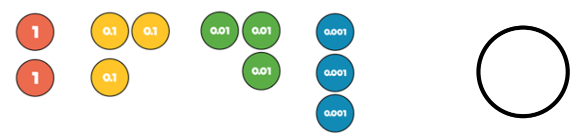
Explain how you know.

Can you build the numbers using place value counters? How can you use these concrete representations to compare sizes?

Varied Fluency

Use <, > or = to make the statements correct.

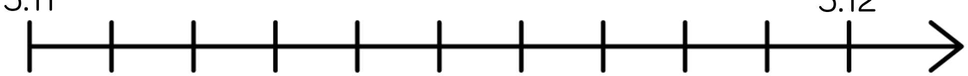




13.33 ÷ 10

Place the numbers in ascending order on the number line.

3.115	$3\frac{113}{1000}$	Three and 11 hundredths



Place in descending order.

- 0.123   0.321   0.231   0.103
- 3.2 km   3.21 km   3.212 km   3202 m
- 65.394   65.309   63.999   65.493

Check your answers using place value chart.

Order & Compare Decimals

Reasoning and Problem Solving

Alex says,

3.105 is greater than 3.2 because 105 is greater than 2

Do you agree?
Explain your answer.

Alex is wrong because 2 tenths is larger than 105 thousandths.

Tommy says,

I have put some numbers into ascending order:

3.015

$3\frac{51}{1000}$

3.105

$3\frac{51}{100}$

Tommy has missed one number out.
It should go in the middle of this list.
What could his number be?
What can't his number be?

Could be:
3.052
3.053
3.054
3.104 etc.

It can't be a number below 3.051 or above 3.105

Understand Percentages

Notes and Guidance

Children are introduced to 'per cent' for the first time and will understand that 'per cent' relates to 'number of parts per hundred'.

They will explore this through different representations which show different parts of a hundred. Children will use 'number of parts per hundred' alongside the % symbol.

Mathematical Talk

How many parts is the square split in to?

How many parts per hundred are shaded/not shaded?

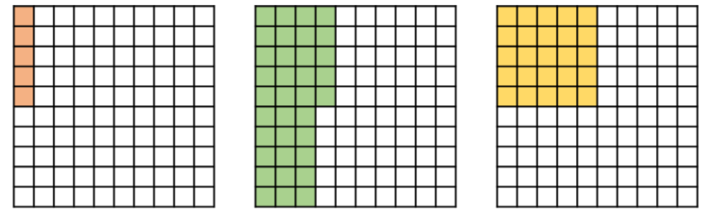
Can we represent this percentage differently?

Look at the bar model, how many parts is it split into?

If the bar is worth 100%, what is each part worth?

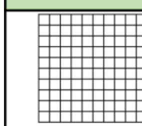
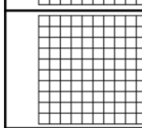
Varied Fluency

Complete the sentence stem for each diagram.

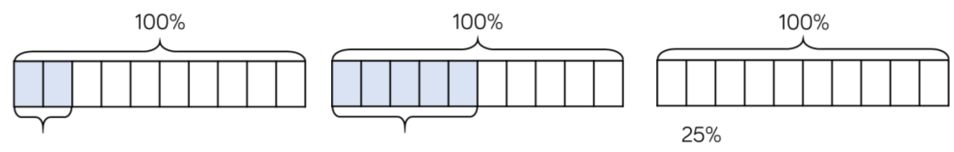


There are ____ parts per hundred shaded. This is ____%

Complete the table.

Pictorial	Parts per hundred	Percentage
	There are 51 parts per hundred.	
		75%

Complete the bar models.

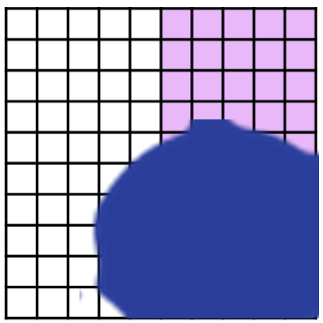


White Rose Maths

Understand Percentages

Reasoning and Problem Solving

Oh no! Dexter has spilt ink on his hundred square.



Complete the sentence stems to describe what percentage is shaded.

It could be…

It must be…

It can't be…

Some possible answers:

It could be 25%

It must be less than 70%

It can't be 100%

Mo, Annie and Tommy all did a test with 100 questions. Tommy got 6 fewer questions correct than Mo.

Name	Score	Percentage
Mo	56 out of 100	
Annie		65%
Tommy		

Complete the table.
How many more marks did each child need to score 100%?

56%
65 out of 100
50 out of 100
50%

Mo needs 44
Annie needs 35
Tommy needs 50

Dora and Amir each have 100 sweets. Dora eats 65% of hers. Amir has 35 sweets left.
Who has more sweets left?

Neither. They both have an equal number of sweets remaining.

Percentages as Fractions & Decimals

Notes and Guidance

Children represent percentages as fractions using the denominator 100 and make the connection to decimals and hundredths.

Children will recognise percentages, decimals and fractions are different ways of expressing proportions.

Mathematical Talk

What do you notice about the percentages and the decimals?

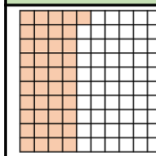
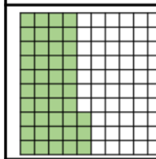
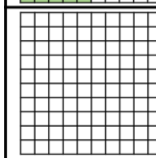
What's the same and what's different about percentages, decimals and fractions?

How can we record the proportion of pages Alex has read as a fraction? How can we turn it into a percentage?

Can you convert any percentage into a decimal and a fraction?

Varied Fluency

Complete the table.

Pictorial	Percentage	Fraction	Decimal
	41 parts per hundred 41%	41 out of 100 $\frac{41}{100}$	41 hundredths 0.41
			
	7 parts per hundred 7%		

Alex has read 93 pages of her book. Her book has 300 pages. What proportion of her book has she read? Give your answer as a percentage and a decimal.

$$\frac{93}{300} = \frac{?}{100} = \_\_\_\_\_ \% = \_\_\_\_\_$$

Record the fractions as decimals and percentages.

$$\frac{120}{300} \qquad \frac{320}{400} \qquad \frac{20}{200} \qquad \frac{12}{50}$$

Percentages as Fractions & Decimals

Reasoning and Problem Solving

Teddy says,  To convert a fraction to a percentage, you just need to put a percent sign next to the numerator. Is Teddy correct? Explain your answer.	Teddy is incorrect, this only works when the denominator is 100 because percent means parts per hundred.
At a cinema, $\frac{4}{10}$ of the audience are adults. The rest of the audience is made up of boys and girls. There are twice as many girls as boys. What percentage of the audience are girls?	60% are children, so 40% are girls and 20% boys. Children may use a bar model to represent this problem.

Three children have each read 360 pages of their own book. Ron's book has 500 pages. Dora's book has 400 pages. Eva's book has 600 pages. What fraction of their books have they each read? What percentage of their books have they read? How much of their books have they each read as a decimal? Who has read the most of their book?	Ron has read $\frac{360}{500}$, 72% or 0.72 Dora has read $\frac{360}{400}$, 90% or 0.9 Eva has read $\frac{360}{600}$, 60% or 0.6 Dora has read the most of her book.

Equivalent F.D.P.

Notes and Guidance

Children recognise simple equivalent fractions and represent them as decimals and percentages.

When children are secure with the percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}$, they then consider denominators of a multiple of 10 or 25

Use bar models and hundred squares to support understanding and show equivalence.

Mathematical Talk

How many hundredths is each bead worth? How does this help you convert the decimals to fractions and percentages?

How many hundredths is the same as 0.1?

What fractions does the bar model show? How does this help to convert them to percentages?

Which is closer to 100%, $\frac{4}{5}$ or 50%? How do you know?

Varied Fluency

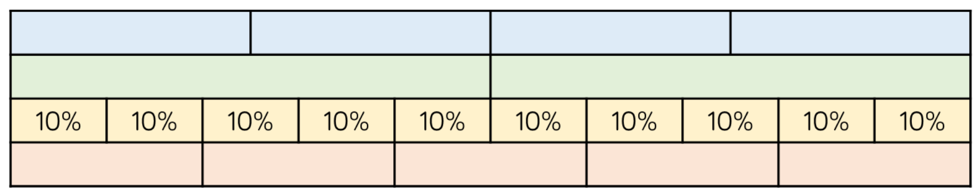
- Use a bead string to show me:

  0.25 0.3 0.2 0.5

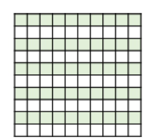
  What are these decimals as a percentage?
  What are they as a fraction? Can you simplify the fraction?

- Use the bar model to convert the fractions into a percentages and decimals.

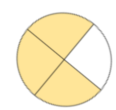
  $\frac{1}{2}$ $\frac{1}{4}$ $\frac{3}{10}$ $\frac{1}{5}$



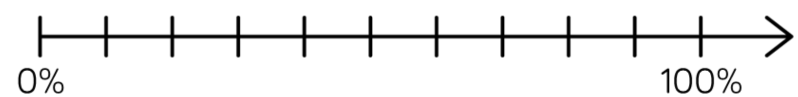
- Draw arrows to show the position of each representation on the number line.



40%



$\frac{4}{5}$



White Rose Maths

Equivalent F.D.P.

Reasoning and Problem Solving

Sort the fractions, decimals and percentages into the correct column.

50%	100%	$\frac{30}{60}$
Seven tenths	60%	0.25
70 hundredths	$\frac{1}{4}$	7%

Less than $\frac{1}{2}$	Equal to $\frac{1}{2}$	Greater than $\frac{1}{2}$

Less than $\frac{1}{2}$:
$\frac{1}{4}$, 0.25, 7%

Equal to $\frac{1}{2}$:
50% and $\frac{30}{60}$

Greater than $\frac{1}{2}$:
Seven tenths, 70 hundredths, 60% and 100%

Jack has £55
He spends $\frac{3}{5}$ of his money on a coat and 30% on shoes.
How much does he have left?

£5.50

Tommy is playing a maths game.
Here are his scores at three different levels.

Level A – 440 points out of 550

Level B – 210 points out of 300

Level C – 45 points out of 90

At which level did he have a higher success rate?

Level A: 80%
Level B: 70%
Level C: 50%

Tommy had a higher success rate on level A.

Children may wish to compare using decimals instead.