White Rose Maths

Spring - Block 1

Multiplication & Division

Overview

Small Steps

- 11 and 12 times-table
- Multiply 3 numbers
- Factor pairs
- Efficient multiplication
- Written methods
- Multiply 2-digits by 1-digit
- Multiply 3-digits by 1-digit
- Divide 2-digits by 1-digit (1)
- Divide 2-digits by 1-digit (2)
- Divide 3-digits by 1-digit
- Correspondence problems

NC Objectives

Recall and use multiplication and division facts for multiplication tables up to 12 × 12.

Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers.

Recognise and use factor pairs and commutativity in mental calculations.

Multiply two-digit and three-digit numbers by a one digit number using formal written layout.

Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one-digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

11 and 12 Times-table

Notes and Guidance

Building on their knowledge of the 1, 2 and 10 times-tables, children explore the 11 and 12 times-tables through partitioning.
They use Base 10 equipment to build representations of the times-tables and use them to explore the inverse of multiplication and division statements.
Highlight the importance of commutativity as children should already know the majority of facts from other times-tables.

Mathematical Talk

Which multiplication and division facts in the 11 and 12 times-tables have not appeared before in other times-tables?

Can you partition 11 and 12 into tens and ones? What times-tables can we add together to help us multiply by 11 and 12?

If I know 11 × 10 is equal to 110, how can I use this to calculate 11 × 11?

Varied Fluency

Fill in the blanks.

2 × 10 = ____

2 × 1 = ____

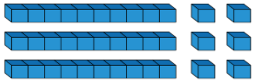
2 lots of 10 doughnuts = ____

2 lots of 1 doughnut = ____

2 lots of 11 doughnuts = ____

2 × 10 + 2 × 1 = 2 × 11 = ____

Use Base 10 to build the 12 times-table. e.g.



3 × 12 = ☐

Complete the calculations.

12 × 5 = ☐

5 × 12 = ☐

48 ÷ 12 = ☐

84 ÷ 12 = ☐

12 × ☐ = 120

12 × ☐ = 132

☐ ÷ 12 = 8

☐ = 9 × 12

There are 11 players on a football team.
7 teams take part in a tournament.
How many players are there altogether in the tournament?

11 and 12 Times-table

Reasoning and Problem Solving

Here is one batch of muffins.

Teddy bakes 11 batches of muffins.
How many muffins does he have altogether?

In each batch there are 3 strawberry, 3 vanilla, 4 chocolate and 2 toffee muffins.
How many of each type of muffin does Teddy have in 11 batches?

Teddy sells 5 batches of muffins.
How many muffins does he have left?

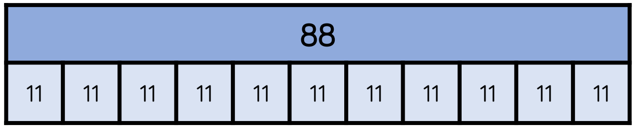
Teddy has 132 muffins altogether.

Strawberry: 33
Vanilla: 33
Chocolate: 44
Toffee: 22

132 – 55 = 77

Teddy has 77 muffins left.

Rosie uses a bar model to represent 88 divided by 11



Explain Rosie's mistake.

Can you draw a bar model to represent 88 divided by 11 correctly?

Rosie has divided by grouping in 11s but has found 11 groups of 11 which is equal to 121

To divide 88 by sharing into 11 equal groups, there would be 8 in each group.

To divide 88 by grouping in 11s, there would be 8 groups of 11

Multiply 3 Numbers

Notes and Guidance

Children are introduced to the 'Associative Law' to multiply 3 numbers. This law focuses on the idea that it doesn't matter how we group the numbers when we multiply
e.g. 4 × 5 × 2 = (4 × 5) × 2 = 20 × 2 = 40
or 4 × 5 × 2 = 4 × (5 × 2) = 4 × 10 = 40
They link this idea to commutativity and see that we can change the order of the numbers to group them more efficiently, e.g. 4 × 2 × 5 = (4 × 2) × 5 = 8 × 5 = 40

Mathematical Talk

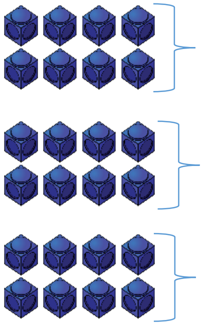
Can you use concrete materials to build the calculations?

How will you decide which order to do the multiplication in?

What's the same and what's different about the arrays?
Which order do you find easier to calculate efficiently?

Varied Fluency

- Complete the calculations.

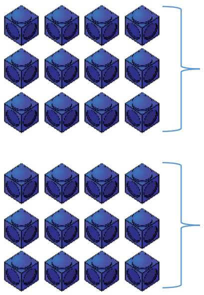


2 × 4 = ____

2 × 4 = ____

2 × 4 = ____

3 × 2 × 4 = 3 × 8 = ____



☐ × ☐ = ☐

☐ × ☐ = ☐

☐ × ☐ × ☐ = ☐ × ☐ = ☐

- Use counters or cubes to represent the calculations.
Choose which order you will complete the multiplication.
5 × 2 × 6   8 × 4 × 5   2 × 8 × 6

Multiply 3 Numbers

Reasoning and Problem Solving

Choose three digit cards.
Arrange them in the calculation.

$$\square \times \square \times \square = \square$$

How many different calculations can you make using your three digit cards?
Which order do you find it the most efficient to calculate the product?
How have you grouped the numbers?

Possible answers using 3, 4 and 7:

$7 \times 3 \times 4 = 84$
$7 \times 4 \times 3 = 84$
$4 \times 3 \times 7 = 84$
$4 \times 7 \times 3 = 84$
$3 \times 4 \times 7 = 84$
$3 \times 7 \times 4 = 84$

Children may find it easier to calculate 7 × 3 first and then multiply it by 4 as 21 multiplied by 4 has no exchanges.

Make the target number of 84 using three of the digits below.

7	5	3	4	6	2

$$\square \times \square \times \square = 84$$

Multiply the remaining three digits together, what is the product of the three numbers?

Is the product smaller or larger than 84?

Can you complete this problem in more than one way?

Possible answers:

$7 \times 2 \times 6 = 84$

$4 \times 3 \times 5 = 60$

60 is smaller than 84

$7 \times 3 \times 4 = 84$

$2 \times 6 \times 5 = 60$

60 is smaller than 84

Children may also show the numbers in a different order.

Factor Pairs

Notes and Guidance

Children learn that a factor is a whole number that multiplies by another number to make a product e.g. 3 × 5 = 15, factor × factor = product.
They develop their understanding of factor pairs using concrete resources to work systematically, e.g. factor pairs for 12 – begin with 1 × 12, 2 × 6, 3 × 4. At this stage, children recognise that they have already used 4 in the previous calculation therefore all factor pairs have been identified.

Mathematical Talk

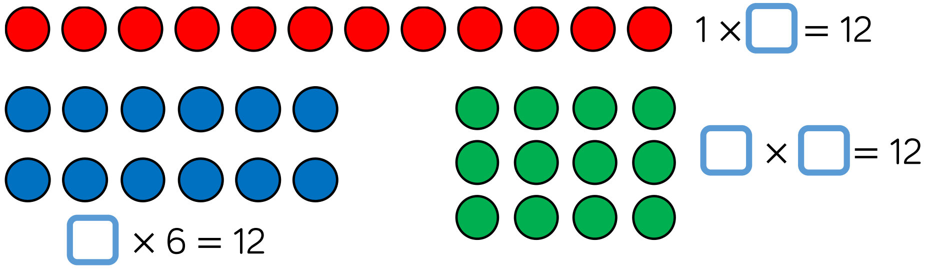
Which number is a factor of every whole number?

Do factors always come in pairs?
Do whole numbers always have an even number of factors?

How do arrays support in finding factors of a number?
How do arrays support us in seeing when a number is not a factor of another number?

Varied Fluency

Complete the factor pairs for 12



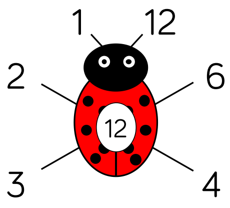
1 × ☐ = 12

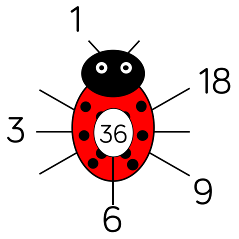
☐ × 6 = 12

☐ × ☐ = 12

12 has ____ factor pairs. 12 has ____ factors altogether.
Use counters to create arrays for 24
How many factor pairs can you find?

Here is an example of a factor bug for 12
Complete the factor bug for 36



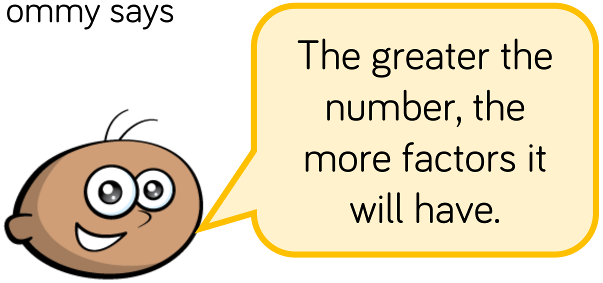


Are all the factors in pairs?
Draw your own factor bugs for 16, 48, 56 and 35

Factor Pairs

Reasoning and Problem Solving

Tommy says



Is Tommy correct?

Use arrays to explain your answer.

Tommy is incorrect.
Children explain by showing an example of two numbers where the greater number has less factors.
For example, 15 has 4 factors 1, 3, 5 and 15
17 has 2 factors 1 and 17

Some numbers are equal to the sum of all their factors (not including the number itself).
e.g. 6
6 has 4 factors, 1, 2, 3 and 6
Add up all the factors not including 6 itself.
$1 + 2 + 3 = 6$
6 is equal to the sum of its factors (not including the number itself)

How many other numbers can you find that are equal to the sum of their factors?
Which numbers are less than the sum of their factors?
Which numbers are greater than the sum of their factors?

Possible answers

$28 = 1 + 2 + 4 + 7 + 14$

28 is equal to the sum of its factors.

$12 < 1 + 2 + 3 + 4 + 6$

12 is less than the sum of its factors.

$8 > 1 + 2 + 4$

8 is greater than the sum of its factors.

Efficient Multiplication

Notes and Guidance

Children develop their mental multiplication by exploring different ways to calculate.
They partition two-digit numbers into tens and ones or into factor pairs in order to multiply one and two-digit numbers.
By sharing mental methods, children can learn to be more flexible and efficient.

Mathematical Talk

Which method do you find the most efficient?

Can you see why another method has worked? Can you explain someone else's method?

Can you think of an efficient way to multiply by 99?

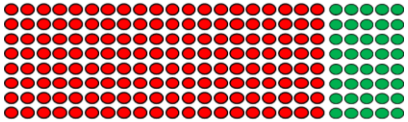
Varied Fluency

Class 4 are calculating 25 × 8 mentally.
Can you complete the calculations in each of the methods?

Method 1

$25 \times 8 = 20 \times 8 + 5 \times 8$

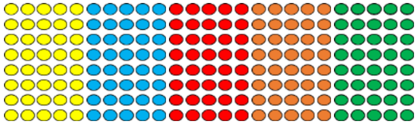
$= 160 + \boxed{} = \boxed{}$



Method 2

$25 \times 8 = 5 \times 5 \times 8$

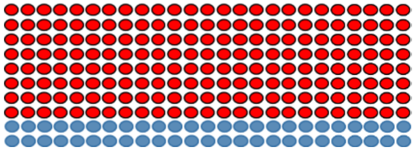
$= 5 \times \boxed{} = \boxed{}$



Method 3

$25 \times 8 = 25 \times 10 - 25 \times 2$

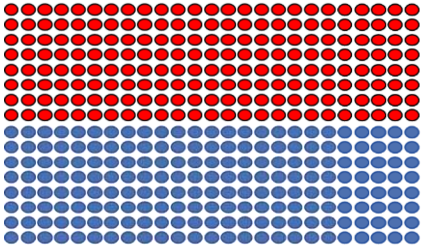
$= \boxed{} - \boxed{} = \boxed{}$



Method 4

$25 \times 8 = 50 \times 8 \div 2$

$= \boxed{} \div \boxed{} = \boxed{}$

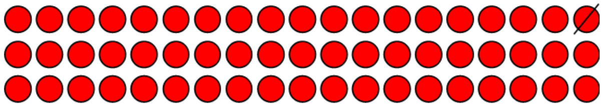


Can you think of any other ways to mentally calculate 25 × 8?
Which do you think is the most efficient?
How would you calculate 228 × 5 mentally?

Efficient Multiplication

Reasoning and Problem Solving

Teddy has calculated 19 × 3



20 × 3 = 60
60 – 1 = 59
19 × 3 = 59

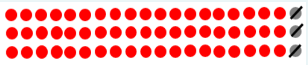
Can you explain his mistake and correct the diagram?

Teddy has subtracted one, rather than one group of 3

He should have calculated,

20 × 3 = 60

60 – 1 × 3 = 57



Here are three number cards.

21 | 42 | 38

Dora, Annie and Eva choose one of the number cards each.
They multiply their number by 5

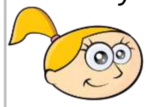
Dora says,

I did 40 × 5 and then subtracted 2 lots of five.

Annie says,

I multiplied my number by 10 and then divided 210 by 2

Eva says,



I halved my 2-digit number and doubled 5 so I calculated 21 × 10

Which number card did each child have?
Would you have used a different method to multiply the numbers by 5?

Dora has 38

Annie has 21

Eva has 42

Children can then discuss the methods they would have used and why.

Written Methods

Notes and Guidance

Children use a variety of informal written methods to multiply a two-digit and a one-digit number.
It is important to emphasise when it would be more efficient to use a mental method to multiply and when we need to represent our thinking by showing working.

Mathematical Talk

Why are there not 26 jumps of 8 on the number line?

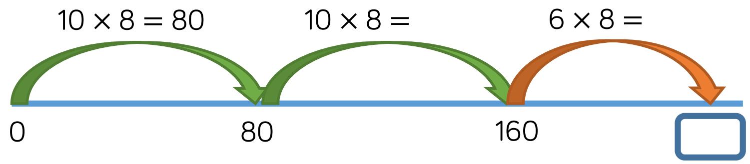
Could you find a more efficient method?

Can you calculate the multiplication mentally or do you need to write down your method?

Can you partition your number into more than two parts?

Varied Fluency

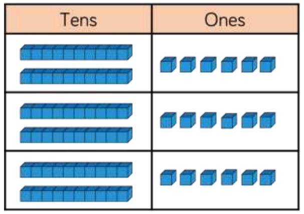
There are 8 classes in a school.
Each class has 26 children.
How many children are there altogether?
Complete the number line to solve the problem.

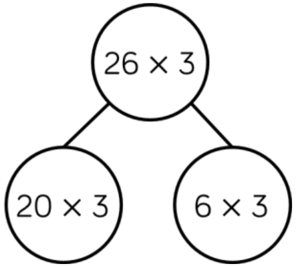


Use this method to work out the multiplications.

16 × 7 34 × 6 27 × 4

Rosie uses Base 10 and a part-whole model to calculate 26 × 3
Complete Rosie's calculations.





Use Rosie's method to work out:
36 × 3
24 × 6
45 × 4

Written Methods

Reasoning and Problem Solving

Here are 6 multiplications.

43 × 5	54 × 6	38 × 6
33 × 2	19 × 7	84 × 5

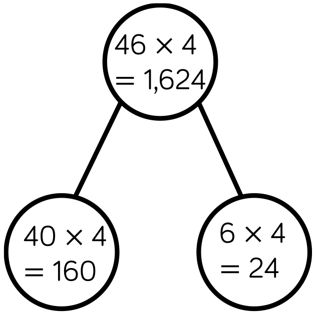
Which of the multiplications would you calculate mentally?
Which of the multiplications would you use a written method for?

Explain your choices to a partner.
Did your partner choose the same methods as you?

Children will sort the multiplications in different ways.

It is important that teachers discuss with the children why they have made the choices and refer back to the efficient multiplication step to remind children of efficient ways to multiply mentally.

Ron is calculating 46 multiplied by 4 using the part-whole model.



Can you explain Ron's mistake?

Ron has multiplied the parts correctly, but added them up incorrectly.
160 + 24 = 184

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

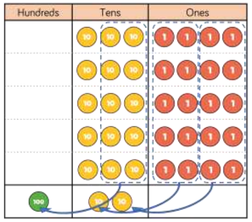
Which column should we start with, the ones or the tens?

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

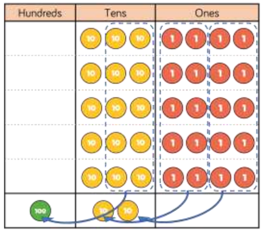
- Whitney uses place value counters to calculate 5 × 34



	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

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.

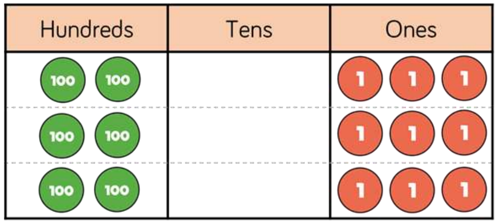
Mathematical Talk

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

Complete the calculation.

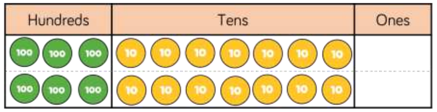


	H	T	O
	2	0	3
×			3

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

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

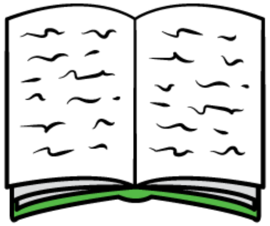
	H	T	O
	2	3	4
×			6
1	4	0	4
	2	2	

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

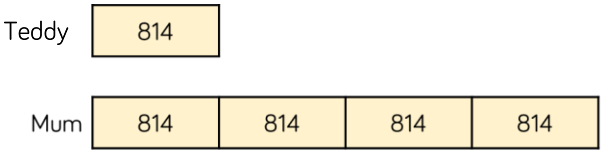
Dexter has the correct answer.

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.



814 × 5 = 4,070

They read 4,070 pages altogether.

814 × 3 = 2,442

Teddy read 2,442 fewer pages than his mum.

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?

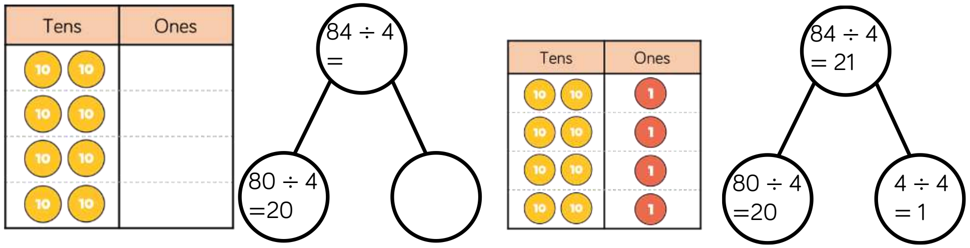
If I cannot share the tens equally, what do I need to do?
How many ones will I have after exchanging the tens?

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

Varied Fluency

Jack is dividing 84 by 4 using place value counters.

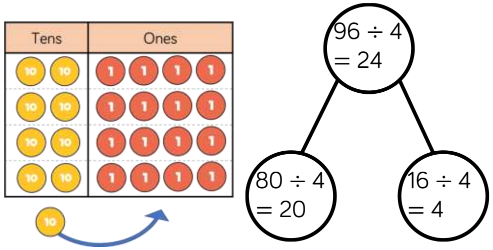
First, he divides the tens. Then, he divides the ones.



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?

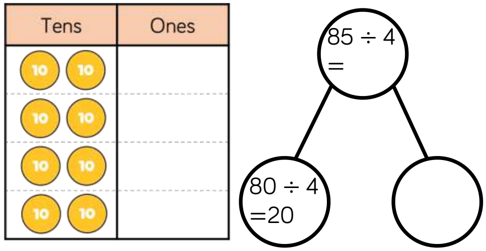
If we are dividing by 4, what is the highest remainder we can have?

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

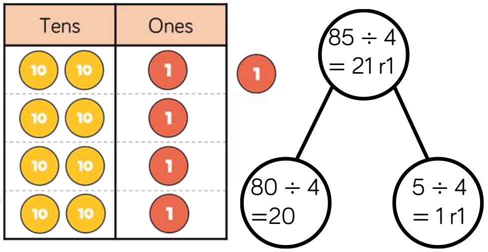
Varied Fluency

- Teddy is dividing 85 by 4 using place value counters.

First, he divides the tens.



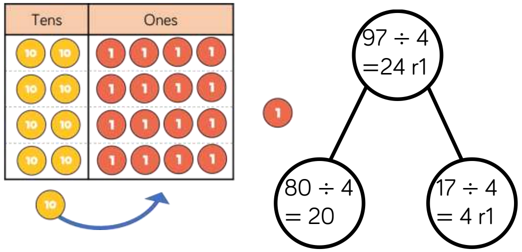
Then, he divides the ones.



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

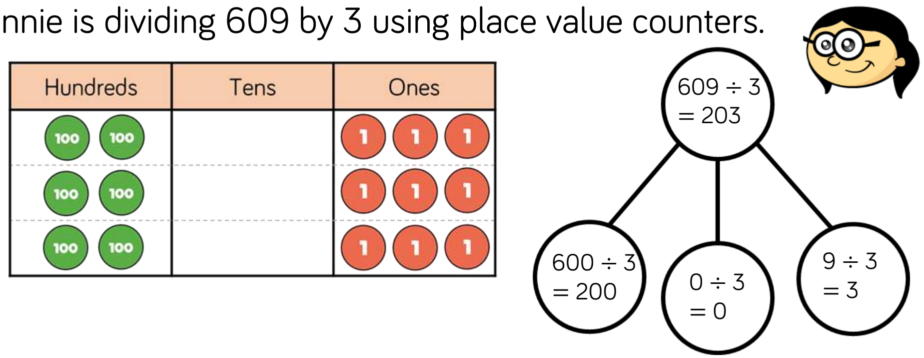
What is the same and what's different when we are dividing 3-digit number by a 1-digit number and a 2-digit number by a 1-digit number?

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

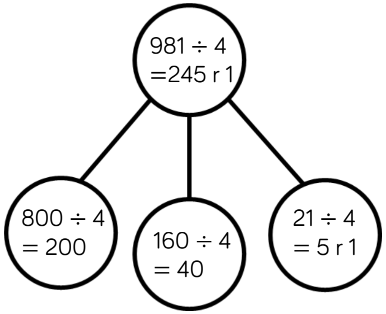
Annie is dividing 609 by 3 using place value counters.

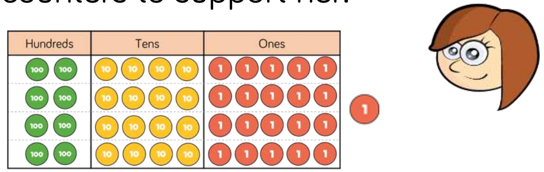


Use Annie's method to calculate the divisions.

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.



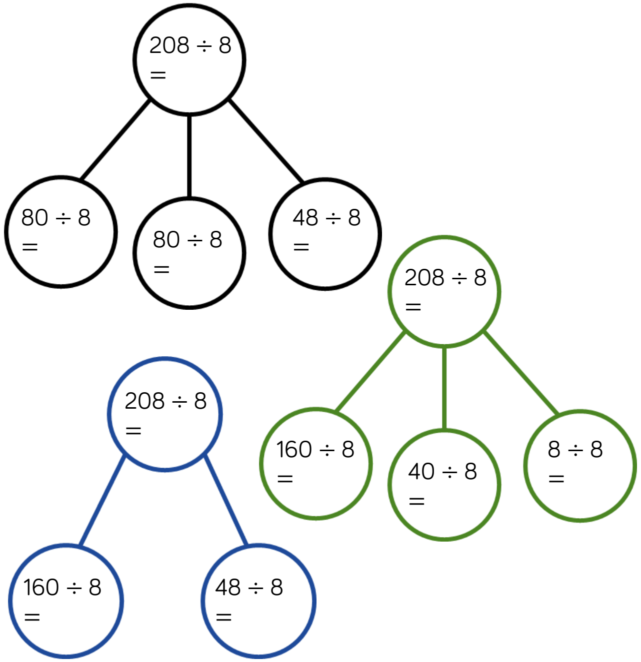


Use Rosie's method to solve:
726 ÷ 6
846 ÷ 6
846 ÷ 7

Divide 3-digits by 1-digit

Reasoning and Problem Solving

Dexter is calculating 184 ÷ 8 using part-whole models.
Can you complete each model?

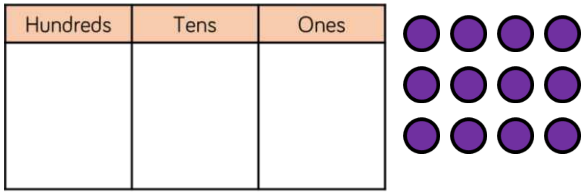


How many part-whole models can you make to calculate 132 ÷ 4?

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

Correspondence Problems

Notes and Guidance

Children solve more complex problems building on their understanding from Year 3 of when *n* objects relate to *m* objects.

They find all solutions and notice how to use multiplication facts to solve problems.

Mathematical Talk

Can you use a table to support you to find all the combinations?

Can you use a code to help you find the combinations? e.g. VS meaning Vanilla and Sauce

Can you use coins to support you to make all the possible combinations?

Varied Fluency

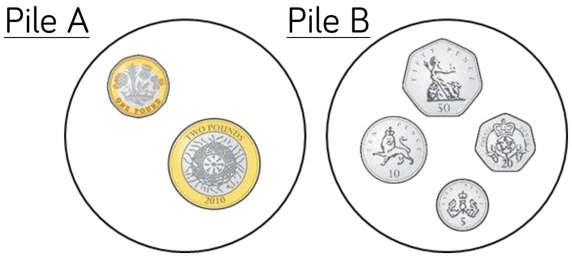
- An ice-cream van has 4 flavours of ice-cream and 2 choices of toppings.

Ice-cream flavour	Toppings
Vanilla Chocolate Strawberry Banana	Sauce Flake

How many different combinations of ice-cream and toppings can be made?
Complete the multiplication to represent the combinations.

___ × ___ = ____ There are ____ combinations.

- Jack has two piles of coins.
He chooses one coin from each pile.



What are all the possible combinations of coins Jack can choose?
What are all the possible totals he can make?

Correspondence Problems

Reasoning and Problem Solving

Here are the meal choices in the school canteen. There are 2 choices of starter, 4 choices of main and 3 choices of dessert. How many meal combinations can you find? Can you use a systematic approach? Can you represent the combinations in a multiplication? If there were 20 meal combinations, how many starters, mains and desserts might there be?	There are 24 meal combinations altogether. $2 \times 4 \times 3 = 24$ 20 combinations $1 \times 1 \times 20$ $1 \times 2 \times 10$ $1 \times 4 \times 5$ $2 \times 2 \times 5$ Accept all other variations of these four multiplications e.g. $1 \times 20 \times 1$
Alex has 6 T-shirts and 4 pairs of shorts. Dexter has 12 T-shirts and 2 pairs of shorts. Who has the most combinations of T-shirts and shorts? Explain your answer.	Alex and Dexter have the same number of combinations of T-shirts and shorts.

Starter	Main	Dessert
Soup Garlic Bread	Pasta Chicken Beef Salad	Cake Ice-cream Fruit Salad