

Autumn Block 3

**Multiplication
and division A**

Small steps

Step 1

Multiplication – equal groups

Step 2

Use arrays

Step 3

Multiples of 2

Step 4

Multiples of 5 and 10

Step 5

Sharing and grouping

Step 6

Multiply by 3

Step 7

Divide by 3

Step 8

The 3 times-table

Small steps

Step 9

Multiply by 4

Step 10

Divide by 4

Step 11

The 4 times-table

Step 12

Multiply by 8

Step 13

Divide by 8

Step 14

The 8 times-table

Step 15

The 2, 4 and 8 times-tables

Multiplication – equal groups

Notes and guidance

In Year 2, children recognised, made and added equal groups. This small step revisits and consolidates this learning in order to prepare children for the next steps.

It is important that children understand the word “equal” and the use of stem sentences can support this.

Concrete resources and images can be used to support understanding when explaining the link between repeated addition and multiplication. Ensure children are exposed to examples where groups are equal but look different, such as a series of objects that are spaced differently. The examples included in this small step refer only to the times-table facts that children will have learned in Year 2

Things to look out for

- Children may be able to recognise equal groups, but not be able to explain why a group is equal or unequal.
- Children may think that groups are unequal if they are not represented in exactly the same way.
- Children need to use the correct language of addition or multiplication to match the picture they are describing.

Key questions

- How can you tell if groups are equal?
- What does the 2 represent? What does the 8 represent?
- How can you show the groups?
- What is the same and what is different about the groups?
- How else can you show the equal groups?
- How many ways can you show this?
- Do these two groups look the same? Why or why not?

Possible sentence stems

- There are _____ equal groups with _____ in each group.
There are _____ altogether.
- The groups are equal because ...

National Curriculum links

- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

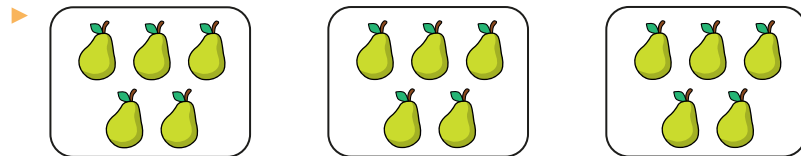
Multiplication – equal groups

Key learning

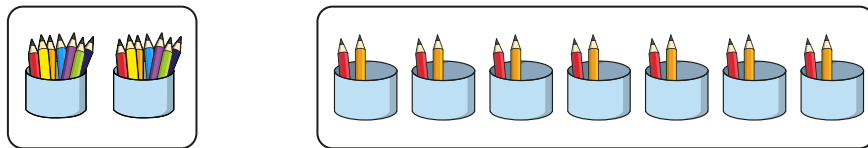
- Complete the sentences to describe the groups.

There are _____ equal groups with _____ in each group.

There are _____ altogether.



- Describe the equal groups.



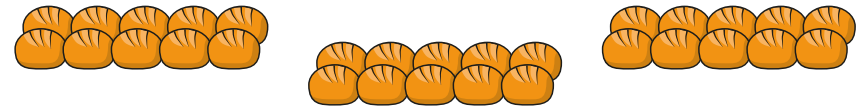
What is the same and what is different about the two groups?

- Use counters to make the groups.

3 equal groups with 5 in each group

5 groups of 3

- Complete the sentences to describe the picture.



- There are _____ equal groups with _____ in each group.

There are _____ altogether.

▶ _____ + _____ + _____ = _____

▶ _____ × _____ = _____

- Use 20 counters.

How many different ways can you make equal groups?

Multiplication – equal groups

Reasoning and problem solving

Which set of money is the odd one out?

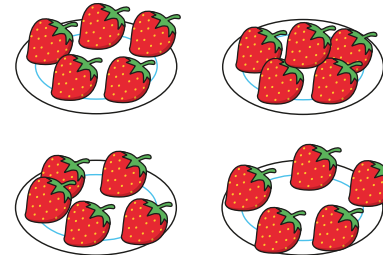


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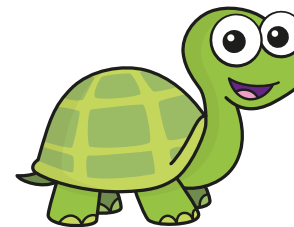
Explain your answer.



Here are some groups.



The groups are not equal because they do not look the same.



No

Do you agree with Tiny?

Explain your answer.



Use arrays

Notes and guidance

In this small step, children build and use arrays to enhance their knowledge of the link between repeated addition and multiplication and to explore commutativity. For example, they recognise that 3 lots of 5 is equal to 5 lots of 3

As this small step appears at the start of the Year 3 multiplication block, the only examples included refer to the times-table facts that children should know from Year 2, but can be revisited later in the block as children are introduced to more times-table facts.

The use of arrays will be built on in future steps to help children complete multiplications. When teaching multiplication, the multiplication symbol and language such as “lots of” and “groups of” should be used interchangeably to support children’s understanding.

Things to look out for

- Children need to ensure that the arrays are drawn or constructed accurately, using straight rows and columns to clearly show repeated addition.
- Children may not complete the rectangle when building an array. For example, when representing 4×5 they may only show the 14 counters that would form the outside of the array and not fill in the middle.

Key questions

- How many lots of 2 do you have?
- How many lots of 5 do you have?
- What does this array show?
- What number sentences can you write to describe this array?
- How does this array show repeated addition and multiplication?
- What happens if you change the order of the numbers in a multiplication?

Possible sentence stems

- There are _____ lots of _____
- _____ \times _____ = _____ \times _____

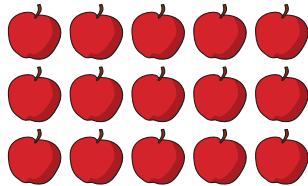
National Curriculum links

- Show that multiplication of two numbers can be done in any order (commutative) and division on one number by another cannot (Y2)
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Use arrays

Key learning

- Complete the sentences.



▶ There are _____ rows of _____ apples.

There are _____ lots of _____ apples.

_____ × _____ = _____

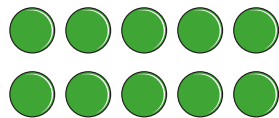
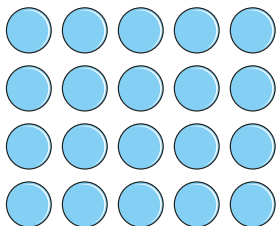
▶ There are _____ columns of _____ apples.

There are _____ lots of _____ apples.

_____ × _____ = _____

Write two addition sentences to describe the array.

- Write two additions and two multiplications for each array.



- Match the multiplications, additions and arrays.

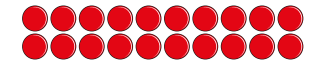
2×10

$10 + 10 + 10$



7×2

$5 + 5 + 5$



3×10

$7 + 7$



5×3

$10 + 10$



- Make and draw arrays to match the statements.

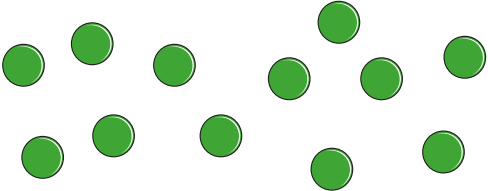
$4 \times 5 = 5 \times 4$

6 lots of 2 = 2 lots of 6

Use arrays

Reasoning and problem solving

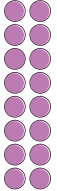
How many different arrays can you make with 12 counters?



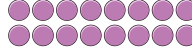
- 1×12
- 12×1
- 2×6
- 6×2
- 3×4
- 4×3

Tommy and Sam are making an array to show 8×2

Tommy



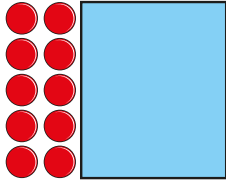
Sam



Who is correct?

Tommy and Sam are both correct.

Part of this array is hidden.




There are fewer than 35 counters in total.

What could the array be?


- 3×5
- 4×5
- 5×5
- 6×5

Which array is the odd one out?


A



B



C



Explain your reasoning.

multiple possible answers, e.g.

array A, because B and C each have a total of 12 counters

array B, because A and C have rows of 6 counters

Multiples of 2

Notes and guidance

In Year 2, children explored the link between counting in 2s and the 2 times-table. This small step provides the opportunity to revisit and consolidate this learning while focusing on multiples of 2

Children should be able to identify whether or not a number is a multiple of 2. They should understand that, by definition, multiples of 2 are numbers that can be divided into two equal groups.

Children use their knowledge of multiples of 2 to decide if a number is even or odd. They learn to recognise that a whole number is even if it has an even number of ones, regardless of whether the tens and hundreds digits are odd. For example, 576 is even because there are 6 ones and 6 is even.

Things to look out for

- Children may not be confident with the 2 times-table facts.
- Children may not just focus on the ones digit when identifying if a number is odd or even.
- Children may need reminding what the term “multiple” means.

Key questions

- What is the next multiple of 2?
- What is the multiple of 2 before _____?
- How do you know that all multiples of 2 are even?
- What do you notice when you add two even numbers together? Is this always true?
- What do you notice when you add two odd numbers together? Is this always true?

Possible sentence stems

- The next multiple of 2 is _____
- The previous multiple of 2 is _____
- I know _____ is even because ...

National Curriculum links

- Count in steps of 2, 3 and 5 from 0, and in 10s from any number, forward and backward (Y2)
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers (Y2)

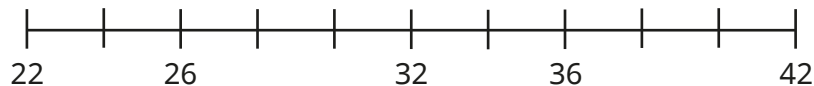
Multiples of 2

Key learning

- Complete the number tracks.

2	4		8		12			
16	18		22		26			
32		28			22			

- Complete the number line.

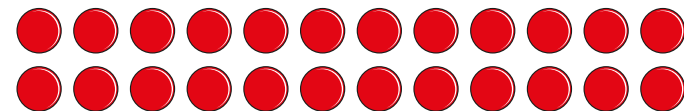


- Colour the multiples of 2 in the grid.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

What do you notice?

- Here is an array made of 24 counters.



How does the array show that 24 is a multiple of 2?

Is 24 an even number? How do you know?

- Use arrays to decide whether 21 is a multiple of 2

Explain your answer to a partner.

- Write three multiples of 2 that are between 40 and 50

Write three multiples of 2 that are between 100 and 200

Write three multiples of 2 that are greater than 500

- Decide whether each number is odd or even.

730

661

502

225

Explain your answers to a partner.

Multiples of 2

Reasoning and problem solving

Here are some number cards.



Find a reason why each number could be the odd one out.

682: all even digits

176: only number without an 8 in the tens column

88: only 2-digit number

185: only odd number



If I add two odd numbers together, the total is a multiple of 2

Is this always true, sometimes true or never true?

How do you know?

always true

Without working out each side, write $<$, $>$ or $=$ to compare the statements.

$$3 \times 2 \bigcirc 7 \times 2$$

$$5 \times 2 + 3 \times 2 \bigcirc 8 \times 2$$

$$9 \times 2 \bigcirc 2 \times 2 + 6 \times 2$$

$<$

$=$

$>$

Explain your reasoning.

Multiples of 5 and 10

Notes and guidance

In Year 2, children counted in 5s and 10s and looked at these multiplication times-tables. In this small step, they revisit and consolidate this learning by focusing on multiples of 5 and 10 and the connections between them.

Children should recognise that a whole number is a multiple of 5 if the ones digit is either 5 or 0. Similarly, they should recognise that a whole number is a multiple of 10 if the ones digit is 0

Children could use arrays or hundred squares to help them if needed, but they should be moving towards fluency with the facts in these times-tables.

Things to look out for

- When counting in 5s, children may miss numbers out, particularly with numbers over 50
- Children may need reminding what the term “multiple” means.
- Children may think that because all multiples of 10 are multiples of 5, then all multiples of 5 are also multiples of 10

Key questions

- What is the next multiple of 5/10?
- What is the multiple of 5/10 before _____?
- What do you notice about the multiples of 5 and 10?
- When is a multiple of 5 also a multiple of 10?
- Is _____ a multiple of 5/10? How can you tell?
- Are all multiples of 10 even? How do you know?

Possible sentence stems

- The next multiple of 5/10 is _____
- The previous multiple of 5/10 is _____
- I know _____ is a multiple of 5/10 because ...

National Curriculum links

- Count in steps of 2, 3 and 5 from 0, and in 10s from any number, forward and backward (Y2)
- Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers (Y2)

Multiples of 5 and 10

Key learning

- Complete the number tracks.

0	5		15		25			
60	55		45					
110		90		70				

- Here is a hundred square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Circle the multiples of 5

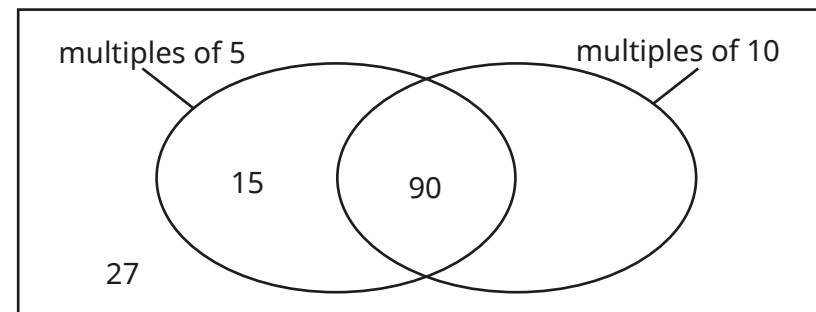
Colour the multiples of 10

What do you notice?

- Sort the numbers into the diagram.

15 90 27 95 105 40
700 740 57 605 406 50

The first three have been done for you.



What do you notice?

- Annie and Teddy each have some money.

▶ Annie has eight £5 notes.

How much money does Annie have?

▶ Teddy has four £10 notes.

How much money does Teddy have?

What do you notice?



Multiples of 5 and 10

Reasoning and problem solving

Is the statement always true, sometimes true or never true?

A multiple of 5 is a multiple of 10

Explain your answer.

sometimes true

Tiny thinks of a number.

My number is less than 9 lots of 5
It is greater than 4 lots of 10
It is a multiple of 2

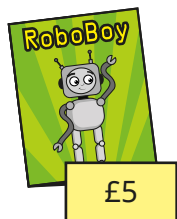


42 or 44

What number could Tiny be thinking of?

Dani buys three books and two teddies.

How much does she spend?



£35

Is the statement true or false?

A multiple of 2 cannot be a multiple of 5

Explain your answer.

False

Sharing and grouping

Notes and guidance

In Year 2, children experienced division as both sharing and grouping. For example, they shared 10 counters equally into 2 groups, but also grouped 10 counters into 2s. In this step, children revisit and consolidate their understanding of these key skills.

Children identify whether the question involves sharing or grouping and use appropriate concrete manipulatives or pictorial representations to support their understanding. A bar model is a particularly useful pictorial representation when sharing and grouping and can help children make sense of what the question is asking, as well as what the answer represents.

The examples in this small step use the 2, 5 and 10 times-tables, as the children should be familiar with these from Year 2

Things to look out for

- Children may not understand the difference between sharing and grouping.
- Support may be needed so that children use the correct language of sharing or grouping to match the picture they are describing.
- Children may not be able to correctly interpret their answers in the context of the question.

Key questions

- How can you share _____ into _____ equal groups?
- How can you put the number of _____ into equal groups of _____?
- What is the difference between sharing and grouping?
- Is the question asking you to share or group?
How do you know?
- What does your answer mean?

Possible sentence stems

- _____ has been shared equally into _____ equal groups.
- There are _____ groups of _____ in _____
- This question is sharing/grouping because ...

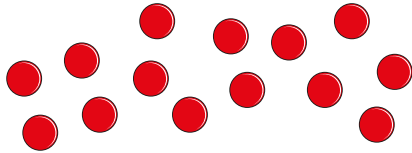
National Curriculum links

- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Sharing and grouping

Key learning

- Here are 14 counters.



- ▶ Share the counters equally into 2 groups.

Complete the sentences.

There are _____ counters altogether.

There are _____ groups.

There are _____ counters in each group.

$$14 \div \underline{\quad} = \underline{\quad}$$

- ▶ Put the counters into groups of 2

Complete the sentences.

There are _____ counters altogether.

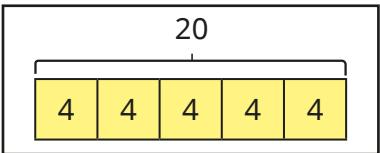
There are _____ groups of 2 in 14

$$14 \div \underline{\quad} = \underline{\quad}$$

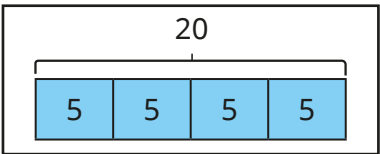
What is the same? What is different?

- Match the statements to the bar models.

20 pencils are shared equally between 5 people.



20 pencils are grouped into packs of 5

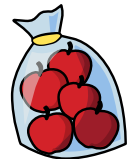


- Eva puts 30 apples into bags.

Each bag has 5 apples in it.

How many bags are there?

Draw a bar model to show this problem.



- Ms Rose has 60 balloons.

She shares them equally between 10 classrooms.

How many balloons are in each classroom?

Draw a bar model to represent this problem.



Sharing and grouping

Reasoning and problem solving

Are the statements about sharing or grouping?



Teddy puts pencils into pots.
He has 25 pencils and puts 5 pencils in each pot.

Filip has 15 books.
He gives each of his friends an equal number of books.

Annie has 12 sweets.
She puts the same number of sweets in each party bag.

grouping

sharing

sharing

Explain your reasoning.



$$15 \div 5 = 3$$



Write two number stories to show this division.

One should be about sharing and the other should be about grouping.

Draw pictures to match your stories.

Sharing number story	Drawing to show sharing
Grouping number story	Drawing to show grouping

Compare answers as a class and discuss why they are sharing or grouping.

Multiply by 3

Notes and guidance

Children use their knowledge of counting in 3s from Year 2 to make the link between repeated addition and multiplication and begin to calculate multiples of 3

They apply their knowledge of equal groups and use a range of concrete and pictorial representations to deepen their understanding of multiplying by 3. Initially, this is through counting in multiples of 3. They then draw on ideas from previous steps to explore flexible partitioning to show, for example, $7 \times 3 = 5 \times 3 + 2 \times 3$

Things to look out for

- Some children may not understand commutativity for multiplication, for example that 3 groups of 7 are equal to 7 groups of 3
- Children may need support with partitioning to aid their understanding of multiplication. For example, children may know $5 \times 3 = 15$ but not realise that to find 6×3 they can just add 3 to 15
- Some children find all multiplication facts by reciting their times-table facts from 1×3 . Encourage them to use facts they know to find the facts they do not know.

Key questions

- How many equal groups are there?
- How many are in each group?
- How could you show this multiplication using a bar model?
- How could you use counters to explore the problem?
- How many lots/groups of 3 do you have?

Possible sentence stems

- There are _____ groups.
- There are _____ in each group.
- There are _____ altogether.
- $_ \times 3 = _ \times 3 + _ \times 3$

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

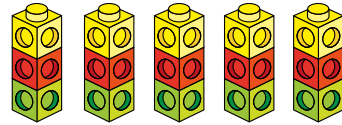
Multiply by 3

Key learning

- There are 5 towers.

Each tower has 3 cubes.

Complete the sentences.



There are _____ equal groups with _____ in each group.

There are _____ altogether.

_____ + _____ + _____ + _____ + _____ = _____

_____ × _____ = _____

- There are 3 vases.

There are 9 flowers in each vase.



How many flowers are there in total?

Draw a bar model to show your answer.

Write an addition and multiplication sentence to match your bar model.

- Tiny has 7 bags of apples.

Each bag has 3 apples.

How many apples does Tiny have?



Eva has 3 bags of apples.

Each bag has 7 apples.

How many apples does Eva have?



What do you notice?

- Whitney and Tommy are working out 6×3



Whitney

I can find the answer by counting in 3s.



Tommy

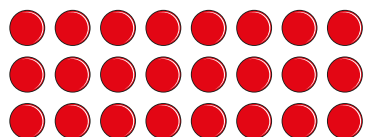
I know that $5 \times 3 = 15$, so I can count on 3 more.

Whose method is more efficient?

Explain your answer.

Multiply by 3

Reasoning and problem solving



I can see 5 groups of 3 and 3 groups of 3

Mo



I can see 4 groups of 3 and 4 more groups of 3

Rosie

Show a partner the groups that Mo and Rosie can see.

Use counters to make arrays for

4×3 5×3 6×3 7×3 9×3

How can you partition each array to find different groups of 3?



Children should explore this question practically.

$$5 \times 3 = 15$$

Which calculations find the answer to 6×3 ?

$$5 \times 3 + 6$$

$$5 \times 3 + 3$$

$$15 + 3$$

$$15 + 6$$

$$3 \times 6$$

$$5 \times 3 + 3$$

$$15 + 3$$

$$3 \times 6$$

Use counters to show your answer.



Divide by 3

Notes and guidance

Building on the previous small step, children explore dividing by 3 through sharing into 3 equal groups and by grouping into 3s.

Using learning from previous steps, children identify whether a question involves sharing or grouping and use appropriate concrete manipulatives or pictorial representations to support their understanding. Encourage children to check their answers using inverse operations.

This small step will help children to become more familiar with the numbers that are multiples of 3

Things to look out for

- Children may not recognise that groups have to be equal.
- Children may not recognise the difference between dividing by sharing and dividing by grouping.
- Children may not be able to identify which number in a number sentence corresponds with which number in a context.
- Children may not be able to correctly interpret their answers in the context of the question.

Key questions

- How many will go into each group?
- How many groups of 3 can you make?
- How can you show me sharing?
- How can you show me grouping?
- Is the question sharing or grouping?
How do you know?

Possible sentence stems

- There are _____ groups.
- There are _____ in each group.
- _____ has been shared equally into _____ equal groups.
- There are _____ groups of _____ in _____

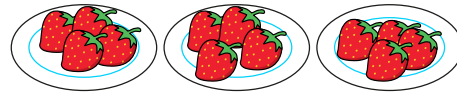
National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Divide by 3

Key learning

- Here are some strawberries.



Complete the sentences.

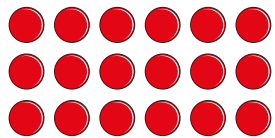
There are _____ strawberries altogether.

There are _____ plates.

There are _____ strawberries on each plate.

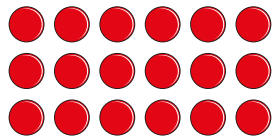
_____ \div 3 = _____

- Arrange the counters in groups of 3 and complete the division.



_____ \div 3 = _____

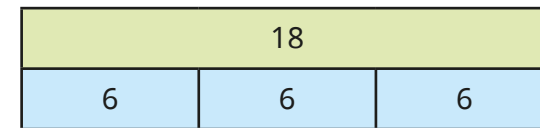
Arrange the counters in 3 equal groups and complete the division.



_____ \div 3 = _____

What is the same and what is different about the way you arranged the counters?

- Tiny has drawn a bar model to show $18 \div 3 = 6$



Draw bar models to show these divisions.

$27 \div 3 = 9$	$36 \div 3 = 12$	$15 \div 5 = 3$	$21 \div 7 = 3$
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- Aisha is putting balloons into bunches of 3 for a birthday party. She has 24 balloons altogether.

How many bunches of balloons can she make?

Draw a picture to show Aisha's balloons.

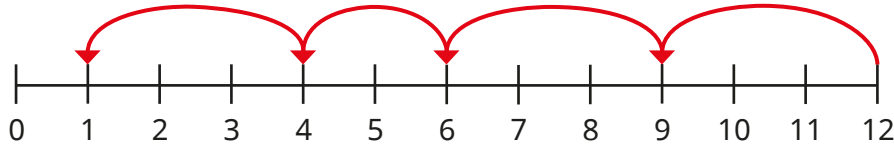


- Hair bands come in packs of 3. There are 21 hair bands altogether. How many packs of hair bands are there?
- 33 grapes are shared equally between 3 children. How many grapes does each child get?

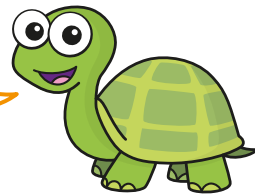
Divide by 3

Reasoning and problem solving

Tiny has drawn jumps on the number line to work out 12 divided by 3



12 is not a multiple of 3 because I did not get to 0



Do you agree with Tiny?

Explain your answer.

Use a number line to show that 15 is a multiple of 3

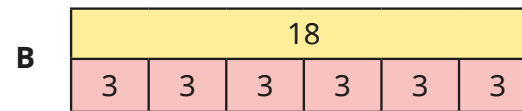
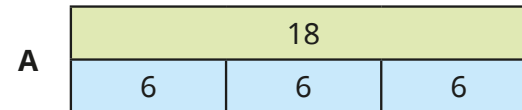
No

$$15 \div 3 = 5$$

Brett has 18 seeds and some plant pots.

He plants 3 seeds in each pot.

Which bar model shows this?



B

Children's word problems will vary, but should represent $18 \div 3$

Write a word problem to match the other bar model.

Compare answers with a partner.

What is the same?

What is different?

The 3 times-table

Notes and guidance

In this small step, children bring together their knowledge of multiplying and dividing by 3 in order to become more fluent in the 3 times-table.

They construct fact families and use manipulatives and pictorial representations to make links between multiplication and division. It is important that children understand the structure of the times-table and can derive unknown facts from known facts by using strategies such as doubling/halving and partitioning, as well as using commutativity and the inverse operation. Examples focus on number facts up to 3×12 , although this may be extended to other 2-digit numbers, such as 3×17 , when exploring strategies, if appropriate.

Things to look out for

- Children may not know how to use the multiplication facts that they know well to find the ones they do not know as well.
- When judging inequalities, such as deciding which is greater, 5×3 or 7×3 , children may try to calculate each separately and then compare, rather than recognising how many groups of 3 there are.

Key questions

- How can you show this using an array?
- What would one more lot be?
- What would double the number of lots be?
- If you know this, what else do you know?
- How could you partition the array to show different groups of 3?

Possible sentence stems

- There are _____ lots of 3
- There are _____ altogether.
- _____ lots of 3 is equal to _____
- If I know _____ \times 3 is _____, then I can find _____ \times 3 by ...

National Curriculum links

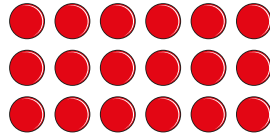
- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

The 3 times-table

Key learning

- Complete the sentences.

- ▶ There are 3 rows of 6 counters.
There are 18 counters altogether.



_____ × _____ = _____

- ▶ There are _____ columns of _____ counters.

There are _____ counters altogether.

_____ × _____ = _____

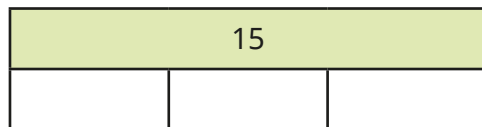
- ▶ _____ counters are arranged in _____ columns of _____ counters.

_____ ÷ _____ = _____

- ▶ _____ counters are arranged in _____ rows of _____ counters.

_____ ÷ _____ = _____

- Complete the bar model.



- Complete the number sentences.

▶ $1 \times 3 = \underline{\quad}$

▶ $9 \times 3 = \underline{\quad}$

▶ $2 \times \underline{\quad} = 6$

▶ $24 = \underline{\quad} \times 8$

▶ $\underline{\quad} = 5 \times 3$

▶ $\underline{\quad} \times 3 = 21$

- Match the statements.

5×3

$4 \times 3 + 2 \times 3$

3×8

$3 \times 4 \times 2$

6×3

$6 \times 3 + 3$

7×3

half of 10×3

- Write $<$, $>$ or $=$ to complete the statements.

9×3 ○ 2×3

6×3 ○ $5 \times 3 + 1 \times 3$

$5 \times 3 + 2 \times 3$ ○ $7 \times 3 + 1 \times 3$

The 3 times-table

Reasoning and problem solving

Start at box A: $18 - 3$

The answer gives you the starting number of the card that should come next.

Work out the order of the cards.

A $18 - 3$	D $21 \div 3$	G $15 \div 3$	J $8 - 5$
B 5×2	E 10×2	H $20 + 1$	K 4×2
C $14 - 2$	F $12 \div 3$	I 3×6	L 7×2

A, G, B, E, H, D, L, C, F, K, J, I

Start this rhythm.

clap	clap	click	clap	clap	click
1st	2nd	3rd	4th	5th	6th

Continue the rhythm.

What will you do on the 15th beat?

What will you do on the 20th beat?

Explain your answer.

15th beat: click 20th beat: clap

How many ways can you find the product of 15 and 3?

Compare answers with a partner.

multiple possible answers

Multiply by 4

Notes and guidance

In this small step, children build on their knowledge of the 2 times-table to multiply by 4. They draw arrays to recognise that multiplying by 4 is the same as doubling then doubling again. They could also use arrays to make links between the 4 times-table and the 5 times-table, recognising that, for example, 4 lots of 7 is 5 lots of 7 minus 7

Throughout this step, children apply their knowledge of equal groups and use concrete manipulatives and pictorial representations to explain the link between counting in 4s and multiplying by 4. They also explore the commutativity of multiplication, understanding, for example, that 4 groups of 6 is equal to 6 groups of 4

Things to look out for

- Children should use the correct language of addition and multiplication to match the picture they are describing.
- Children need to use a range of terminology to describe multiplication such as “equal groups”, “lots of”, “times”, “multiples” and so on.
- When counting in 4s, children may miscount.

Key questions

- How many equal groups are there?
- How many are in each group?
- How can you write a number sentence to show this?
- How many lots of 4 do you have?
- How can you show why multiplying by 4 is the same as multiplying by 2 and then by 2 again?

Possible sentence stems

- There are _____ equal groups with _____ in each group.
- There are _____ altogether.
- Double _____ is _____ and double _____ is _____, so 4 lots of _____ is _____

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Multiply by 4

Key learning

- Complete the sentences.



There are _____ pots with _____ pencils in each pot.

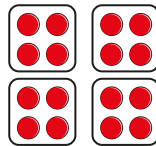
There are _____ pencils altogether.

_____ + _____ + _____ + _____ + _____ = _____

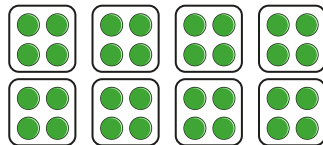
_____ × _____ = _____

- Match the multiplications to the pictures.

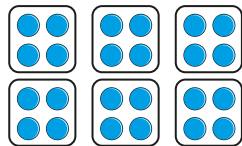
4×4



4×6

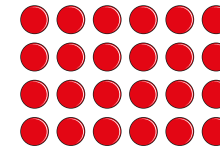


8×4



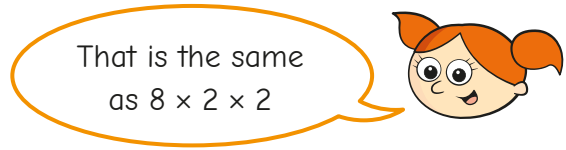
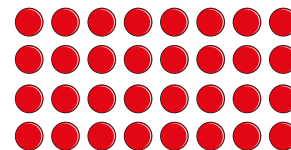
- There are 4 pens in a pack.
How many pens are there in 7 packs?
Draw a picture to show the problem.

- Write two additions and two multiplications for the array.



What do you notice?

- Alex is working out 8×4
She has made arrays to help her.



Use Alex's method to work out the multiplications.

5×4

9×4

12×4

Multiply by 4

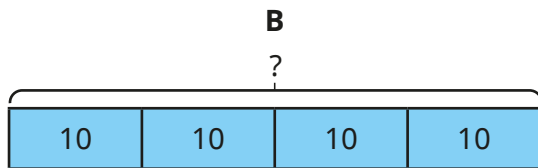
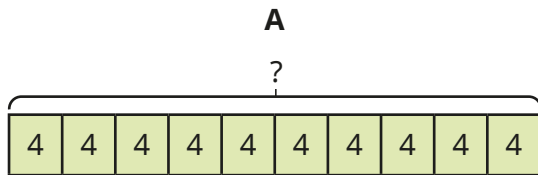
Reasoning and problem solving

There are 10 pencils in a pack.

Jack has 4 packs.

Which bar model matches the statements?

How do you know?



Think of a problem to match the other bar model.



B
Jack has 4 equal groups (packs) with 10 pencils in each pack.

Use counters to help you show that

$$7 \times 4 = 7 \times 2 \times 2$$



Children should use counters to show this.

Which part does not show counting in 4s?



$4 + 4 + 4 + 4$	

place value counters

Explain your answer.



Divide by 4

Notes and guidance

From previous steps, children should be confident with the understanding of division as sharing and grouping. In this small step, they apply this knowledge and explore dividing by 4 through sharing into 4 equal groups and grouping into 4s.

Children identify whether the question involves sharing or grouping and use appropriate concrete manipulatives or pictorial representations to support their understanding. Encourage children to explain what their answer represents to support understanding of the differences between sharing and grouping.

Children build on their knowledge from the previous step and recognise that if multiplying by 4 is the same as doubling the number and then doubling again, then dividing by 4 is the same as halving the number and halving it again.

Things to look out for

- Children may need support using a range of terminology to describe division, such as “sharing”, “grouping”, “equal groups”, “divide” and so on.
- Children may not use the correct language of sharing or grouping to match the picture they are describing.

Key questions

- How can you share _____ into 4 equal groups?
- How can you put _____ into equal groups of 4?
- What is the difference between sharing and grouping?
- Is this question asking you to share the _____ or group them? How do you know?
- How can you show that dividing by 4 is the same as dividing by 2 and then by 2 again?
- What does your answer represent?

Possible sentence stems

- _____ has been shared into _____ equal groups.
- There are _____ groups of _____ in _____

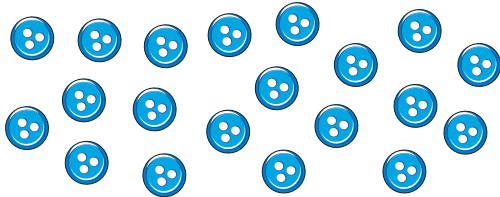
National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Divide by 4

Key learning

- Here are 20 buttons.



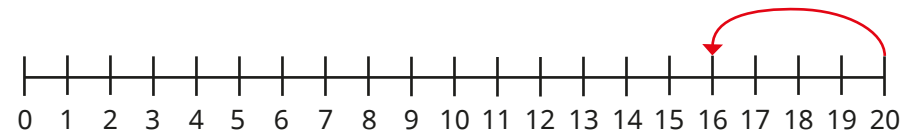
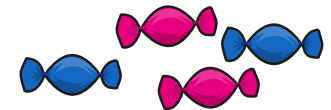
- ▶ Share the buttons into 4 equal groups and complete the sentence.
20 shared into _____ equal groups is _____
- ▶ Circle groups of 4 buttons and complete the sentence.
There are _____ groups of 4 in 20

What is the same? What is different?

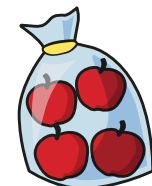
- 28 children are put into 4 equal teams.
How many children are in each team?
28 children are put into teams of 4
How many teams are there?
What is the same about the questions?
What is different?

- There are some cars in a car park.
Each car has 4 wheels.
In the car park, there are 32 wheels altogether.
How many cars are there?

- Scott has 20 sweets and some bags.
He puts 4 sweets in each bag.
Use the number line to help you work out how many bags Scott can fill.



- A shop sells apples in bags of 4
Each bag of apples costs £2
Rosie buys 36 apples.
How much does Rosie spend?

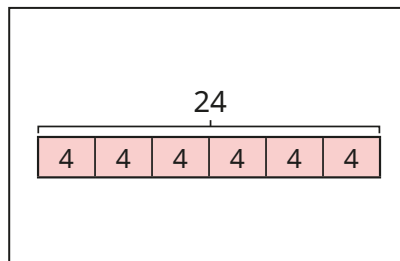


Divide by 4

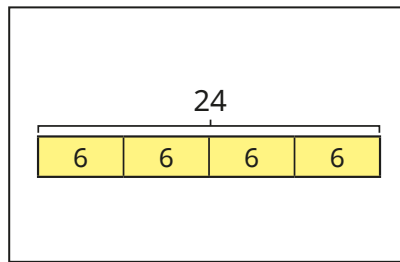
Reasoning and problem solving

Match the word problems to the bar models.

Amir has 24 biscuits.
He shares them equally
into 4 boxes.
How many biscuits are
in each box?



Amir has 24 biscuits.
He puts them into boxes
with 4 biscuits in each box.
How many boxes will
he need?



Explain your thinking.

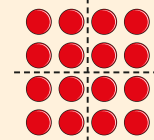


The first problem goes with the second bar model, and the second problem with the first bar model.

Use counters to help you
show that



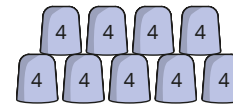
$$16 \div 4 = 16 \div 2 \div 2$$



Four children are playing a game.



They score 4 points for every cup they
knock down.



Here are their scores.

Huan	16
Nijah	28
Kim	12
Tom	32

How many cups did they each
knock down?

Huan: 4 cups
Nijah: 7 cups
Kim: 3 cups
Tom: 8 cups

The 4 times-table

Notes and guidance

In this small step, children draw together their knowledge of multiplying and dividing by 4 in order to deepen their understanding of the 4 times-table.

Children continue to use concrete manipulatives and pictorial representations within this step. They use arrays to support their understanding of partitioning, for example $13 \times 4 = 10 \times 4 + 3 \times 4$. Children continue to explore the commutativity of multiplication: if $3 \times 4 = 12$, then $4 \times 3 = 12$

As in earlier steps, links could be made between the 4 times-table and the 5 times-table. Children should recognise that multiplying a number by 4 is the same as multiplying that number by 5 and then subtracting 1 lot of it.

Things to look out for

- Children may need support using a range of terminology to describe multiplication such as “equal groups”, “lots of”, “times”, “multiples” and so on.
- Children may need support using a range of terminology to describe division such as “sharing”, “grouping”, “equal groups”, “divide” and so on.
- Some children may be over-reliant on inefficient methods for multiplying.

Key questions

- How many equal groups are there?
- How many lots of 4 do you have?
- What can you partition _____ into to help you multiply _____ by 4?
- What strategy can you use when multiplying by 4?
- What strategy can you use when dividing by 4?

Possible sentence stems

- There are _____ groups of 4 in _____
- There are 4 groups of _____ in _____
- _____ \times 4 = _____ \times 4 + _____ \times 4

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

The 4 times-table

Key learning

- Colour the multiples of 4

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

What do you notice?

- Complete the number sentences.

- ▶ $1 \times 4 = \underline{\quad}$
- ▶ $2 \times \underline{\quad} = 8$
- ▶ $\underline{\quad} = 5 \times 4$
- ▶ $9 \times 4 = \underline{\quad}$
- ▶ $32 = \underline{\quad} \times 4$
- ▶ $\underline{\quad} \times 4 = 48$

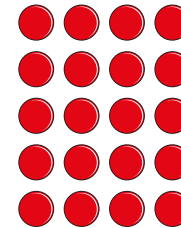
- 8 children go to the cinema.

One ticket costs £4

How much does it cost altogether?

- What multiplications and divisions does the array show?

Complete the number sentences.



- $\underline{\quad} \times \underline{\quad} = \underline{\quad}$
- $\underline{\quad} \times \underline{\quad} = \underline{\quad}$
- $\underline{\quad} \div \underline{\quad} = \underline{\quad}$
- $\underline{\quad} \div \underline{\quad} = \underline{\quad}$

- Write $<$, $>$ or $=$ to compare the statements.

- 6×4 ○ $40 \div 4$
- $8 \div 4$ ○ 8×4
- 9×4 ○ 4×9

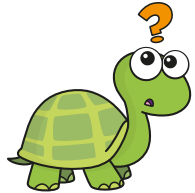
- Complete the number sentences.

- ▶ $4 \times 9 = 5 \times 9 - \underline{\quad} \times 9$
- ▶ $4 \times 9 = 2 \times 9 + \underline{\quad} \times 9$
- ▶ $4 \times 9 = \underline{\quad} \times 2 \times 9$

The 4 times-table

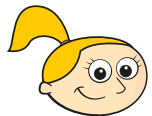
Reasoning and problem solving

Tiny and Eva are working on the 4 times-table.



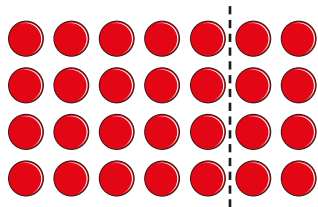
I have forgotten what 7×4 is.

Tiny



You can do $5 \times 4 + 2 \times 4$, Tiny!

Eva



Use counters to explore other methods that Tiny can use.

multiple possible answers, e.g.

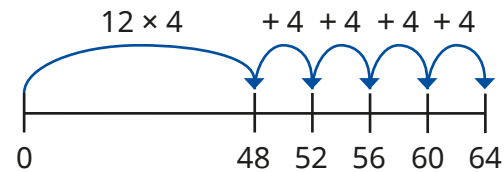
$$7 \times 2 \times 2$$

$$4 \times 4 + 3 \times 4$$

Amir is working out 16×4



He starts from 12×4 and counts up four more 4s.



How many different methods can you think of to calculate 16×4 ?

multiple possible answers, e.g.

$$10 \times 4 \text{ and } 6 \times 4 \text{ to make } 64$$

$$16 \times 2 \times 2 = 64$$

Esther buys 8 toy cars and 4 packs of stickers.



How much does she spend in total?



£40

Multiply by 8

Notes and guidance

In this small step, children build on their knowledge of the 4 times-table to multiply by 8

Children apply their knowledge of equal groups and use concrete manipulatives and pictorial representations to explain the link between counting in 8s and multiplying by 8

Through this, children should recognise that each multiple of 8 is double its equivalent multiple of 4, and may take this further to realise that multiplying by 8 is the same as doubling three times. Children may also recognise that calculating 8 lots of a number is the same as calculating 10 lots of the same number and subtracting 2 lots of it. Children also explore the commutativity of multiplication. For example, they should have an understanding that 8 groups of 6 is equal to 6 groups of 8

Things to look out for

- Children may not use the correct language of addition and multiplication to match the picture they are describing.
- Children may need support using a range of terminology to describe multiplication such as “equal groups”, “lots of”, “times”, “multiples” and so on.
- When counting in 8s, children may miscount.

Key questions

- How many equal groups are there?
- How many are in each group?
- How can you write a number sentence to show this?
- How many lots of 8 do you have?
- What is the relationship between multiplying by 4 and multiplying by 8?

Possible sentence stems

- There are _____ equal groups with _____ in each group.
- There are _____ altogether.
- If _____ \times 4 = _____, then _____ \times 8 = _____

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Multiply by 8

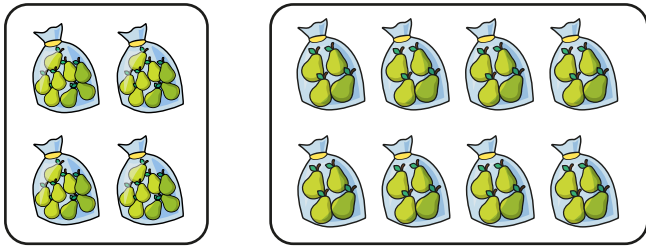
Key learning

- Complete the sentences to describe each picture.

There are _____ bags of pears.

There are _____ pears in each bag.

There are _____ pears in total.



What is the same about your answers? What is different?

-

Complete the sentences.

How many legs do 5 spiders have altogether?

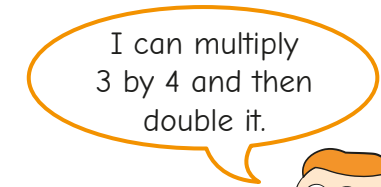
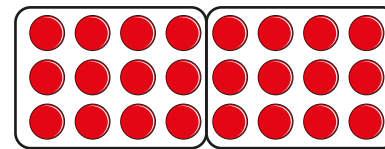
There are _____ legs on each spider.

_____ + _____ + _____ + _____ + _____ = _____

_____ × 8 = _____

_____ spiders have _____ legs altogether.

- Ron has drawn an array to help him work out 3×8



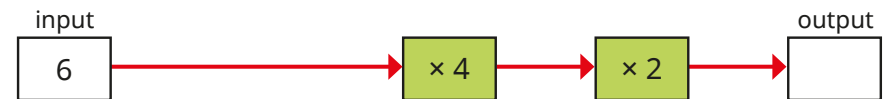
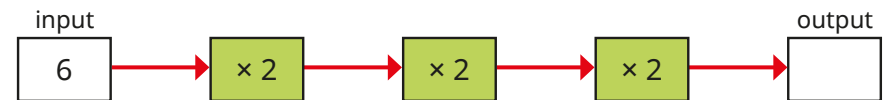
Use Ron's method to work out the multiplications.

5×8

9×8

7×8

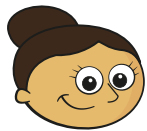
- Complete the function machines.



What do you notice about each output?

Multiply by 8

Reasoning and problem solving



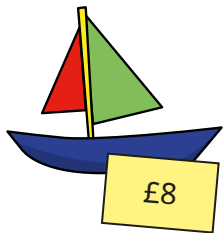
All the numbers in the 8 times-table are even.

Explain why Dora is correct.

Numbers in the 8 times-table are all multiples of 2 and all multiples of 2 are even.

Jack buys 6 toy boats and 8 sticker books.

How much does he spend in total?

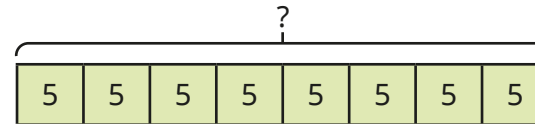


£80

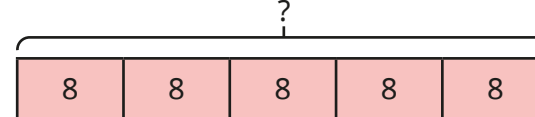
Rosie has 8 packs of crayons.
There are 5 crayons in a pack.
Which bar model matches the statements?



A



B



A

How do you know?

Write a problem to match the other bar model.



Divide by 8

Notes and guidance

From previous steps, children will be confident with the understanding of division as sharing and grouping. In this small step, children apply this knowledge and explore dividing by 8 through sharing into 8 equal groups and grouping into 8s.

Children identify whether the question involves sharing or grouping and use appropriate concrete manipulatives or pictorial representations to support their understanding. Encourage children to discuss what their answers represent and to interpret them in context.

Children build on their knowledge from previous steps and recognise that dividing by 8 is the same as dividing by 2 three times, or halving three times.

Things to look out for

- Children may need support using a range of terminology to describe division such as “sharing”, “grouping”, “equal groups”, “divide” and so on.
- Children may not use the correct language of sharing and grouping to match the picture they are describing.
- Children may think that to divide by 8 they can divide by 4 twice.

Key questions

- How can you share _____ into 8 equal groups?
- How can you put _____ into equal groups of 8?
- What is the difference between sharing and grouping?
- Is this question asking you to share the _____ or group them? How do you know?
- How can you show that dividing by 8 is the same as dividing by 2 three times?

Possible sentence stems

- _____ has been shared into _____ equal groups.
- There are _____ groups of _____ in _____

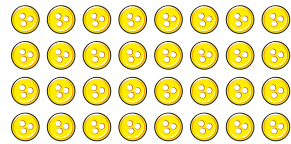
National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

Divide by 8

Key learning

- Here are 32 buttons.



- Share the buttons into 8 equal groups and complete the sentence.

32 shared into _____ equal groups is _____

- Circle groups of 8 buttons and complete the sentence.

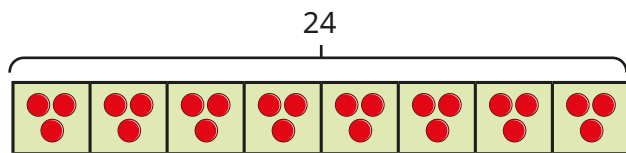
There are _____ groups of 8 in 32

What is the same? What is different?

- 24 sweets are shared equally into 8 bags.

Dani is working out how many sweets there will be in each bag.

She uses a bar model and counters to share 24 into 8 equal groups.



Use Dani's method to work out $16 \div 8$

- 48 children are eating lunch in the school hall. Each table can seat 8 children.

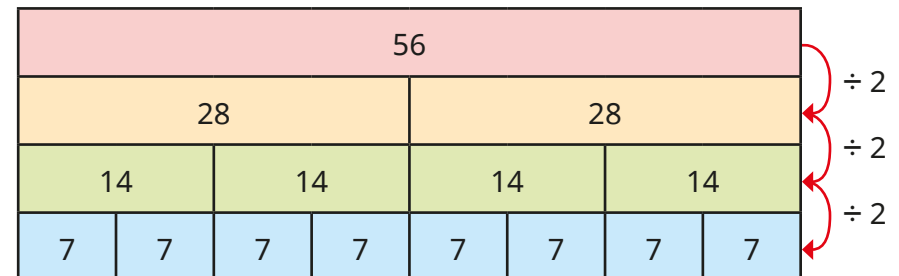
How many tables are needed?

Use a number line to help you work out the answer.

- Dexter is working out $56 \div 8$



To divide a number by 8, I can halve it, halve it again and then halve it once more.



Use Dexter's method to work out the divisions.

- $88 \div 8$
- $72 \div 8$
- $96 \div 8$
- $200 \div 8$

Divide by 8

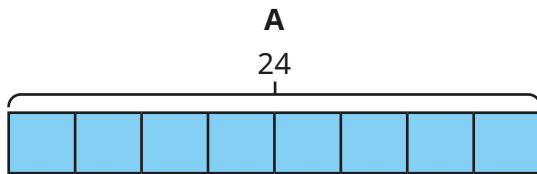
Reasoning and problem solving

Amir has 24 sweets.

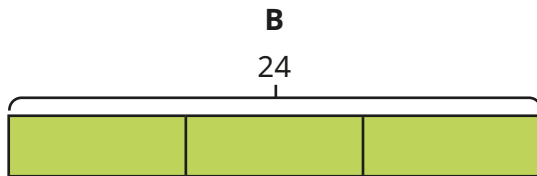
He shares them equally between 8 friends.

How many does each friend get?

Which bar model would you use to show this problem?



3 sweets



A

Explain your answer.

Write a problem to match the other bar model.



Whitney has £30 pocket money.



She buys some of these books and gets £6 change.



3 books

How many books does she buy?

Complete the divisions.



$$48 \div 2 = \underline{\quad}$$

$$48 \div 4 = \underline{\quad}$$

$$48 \div 8 = \underline{\quad}$$

24, 12, 6

What do you notice about the answers?



Can you predict the answer to $48 \div 16$?

$$48 \div 16 = 3$$

The 8 times-table

Notes and guidance

In this small step, children draw together their knowledge of multiplying and dividing by 8 in order to deepen their understanding of the 8 times-table.

Children continue to use concrete manipulatives and pictorial representations within this step. They use arrays to support their understanding of partitioning, for example $7 \times 8 = 5 \times 8 + 2 \times 8$. Children continue to explore the commutativity of multiplication: if $3 \times 8 = 24$, then $8 \times 3 = 24$

Children could be stretched to consider finding numbers in the 8 times-table that are greater than 96. They should use their understanding of partitioning to support them with this, for example $10 \times 8 + 6 \times 8 = 128$ so 128 is in the 8 times-table.

Things to look out for

- Children may need support using a range of terminology to describe multiplication such as “equal groups”, “lots of”, “times”, “multiples” and so on.
- Children may need support using a range of terminology to describe division such as “sharing”, “grouping”, “equal groups”, “divide” and so on.

Key questions

- How many lots of 8 do you have?
- How many groups of 8 are there in _____?
- What can you partition _____ into to help you multiply _____ by 8?
- What can you partition _____ into to help you decide whether it is in the 8 times-table?
- What strategy can you use when multiplying/dividing by 8?

Possible sentence stems

- _____ \times 8 = _____
- There are 8 groups of _____ in _____
- _____ \times 8 = _____ \times 8 + _____ \times 8

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

The 8 times-table

Key learning

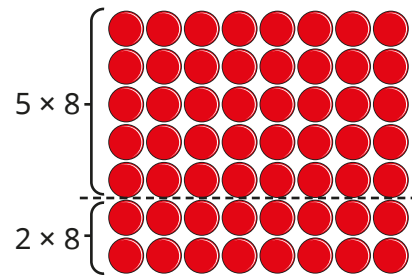
- Complete the table.

x	4	8
3		
7		
8		
11		

What do you notice?

- Teddy is using partitioning to help him work out 7×8

$$\begin{aligned}
 7 \times 8 &= 5 \times 8 + 2 \times 8 \\
 &= 40 + 16 \\
 &= 56
 \end{aligned}$$



Use Teddy's method to work out the multiplications.

6×8

9×8

13×8

- Complete the calculations.

▶ $1 \times 8 = \underline{\quad}$

▶ $72 \div 8 = \underline{\quad}$

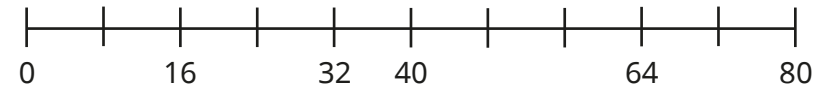
▶ $2 \times \underline{\quad} = 16$

▶ $64 = \underline{\quad} \times 8$

▶ $\underline{\quad} \div 8 = 11$

▶ $\underline{\quad} \times 8 = 48$

- Complete the number line.



- 9 children go swimming.
It costs £8 for one child to go swimming.
How much does it cost altogether?



- 56 children are going on a school trip.
Each minibus can take 8 children.
How many minibuses are needed?

The 8 times-table

Reasoning and problem solving

Colour the multiples of 8 on the hundred square.

Circle the multiples of 4 on the hundred square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Use your hundred square to decide whether each statement is always true, sometimes true or never true.

Multiples of 4 are also multiples of 8

Multiples of 8 are also multiples of 4

sometimes true

always true

Rosie has some packs of drink.

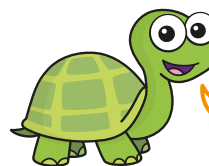
Some packs have 4 cans in them, and some packs have 8 cans in them.



Rosie has 64 cans.

How many packs of 4 cans and how many packs of 8 cans could there be?

multiple possible answers e.g.
2 packs of 4 and 7 packs of 8



146 is in the 8 times-table.

Do you agree with Tiny?

Explain your answer.

Yes

The 2, 4 and 8 times-tables

Notes and guidance

So far, children have explored multiplying by 2, 4 and 8 in detail, but focused on one particular skill at a time. Although they may have begun to make links between them, this small step provides children with explicit opportunities to make connections between the 2, 4 and 8 times-tables.

They link multiplying by 4 to doubling then doubling again, and multiplying by 8 to doubling three times. They should also recognise that dividing by 4 is the same as halving then halving again, and dividing by 8 is the same as halving three times. By the end of this step, children will be able to apply their knowledge of known facts to support them; for example, to work out 7×8 , children can do $7 \times 2 \times 2 \times 2$, or to calculate $56 \div 8$, they can do $56 \div 2 \div 2 \div 2$

Things to look out for

- Children may not recognise how to use different terminology to describe multiplication, for example “equal groups”, “lots of”, “times”, “multiples” and so on.
- Children may not see the link between multiplying by 2 and doubling.
- When multiplying by 8, children may multiply by 4 and then by 4 again, or multiply by 2 four times.

Key questions

- How does knowing $\text{_____} \times 2$ help you work out $\text{_____} \times 4$ and $\text{_____} \times 8$?
- What is the relationship between multiplying by 4 and multiplying by 8?
- How can you show that multiplying by 4 is the same as multiplying by 2 and then by 2 again?
- How can you show that dividing by 4 is the same as dividing by 2 and then by 2 again?

Possible sentence stems

- $\text{_____} \times 4 = \text{_____} \times 2 \times 2$
- $\text{_____} \times 8 = \text{_____} \times 2 \times 2 \times 2$
- $\text{_____} \times 8 = \text{_____} \times 2 \times 4$

National Curriculum links

- Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods

The 2, 4 and 8 times-tables

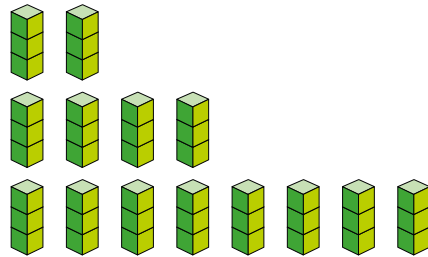
Key learning

- Complete the multiplications.

▶ $3 \times 2 = \underline{\quad}$

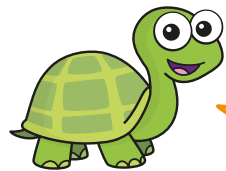
▶ $3 \times 4 = \underline{\quad}$

▶ $3 \times 8 = \underline{\quad}$



What do you notice?

- Tiny has been looking at the 2, 4 and 8 times-tables.



Doubling the 2 times-table is equal to the 4 times-table and doubling the 4 times-table is equal to the 8 times-table.

Use Tiny's method to complete the calculations.

▶ $7 \times 2 = \underline{\quad}$ ▶ $9 \times 2 = \underline{\quad}$ ▶ $12 \times 2 = \underline{\quad}$

$7 \times 4 = \underline{\quad}$ $9 \times 4 = \underline{\quad}$ $12 \times 4 = \underline{\quad}$

$7 \times 8 = \underline{\quad}$ $9 \times 8 = \underline{\quad}$ $12 \times 8 = \underline{\quad}$

- Complete the table.

×	2	4	8
3	6		
	10	20	
			72

What do you notice?

- $100 \div 2 = 50$, so $100 \div 4 = \underline{\quad}$

Which is the correct answer?

50

75

25

20

- Match the equivalent calculations.

6×8

6×4

$64 \div 8$

$64 \div 4$

$64 \div 2 \div 2 \div 2$

$6 \times 4 \times 2$

half 64, then half it again

$6 \times 2 \times 2$

The 2, 4 and 8 times-tables

Reasoning and problem solving

Is the statement true or false?

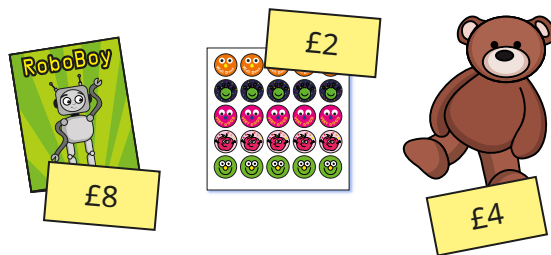
Multiples of 8 are also multiples of 4 and 2

Explain your answer.



True

A shop sells books, packets of stickers and teddy bears.



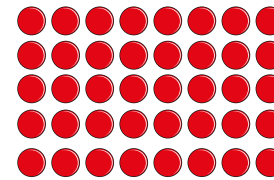
Filip spends exactly £20 in the shop.

What could Filip have bought?

Is there more than one answer?

- multiple possible answers, e.g.
- 2 books and 1 bear
- 1 book and 3 bears
- 1 book, 2 bears and 2 packs of stickers
- 10 packs of stickers
- 5 bears

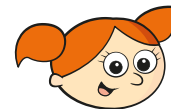
Here is an array.



I can see 8×5



I can see 5×8



I can see 2 lots of 5×4

- multiple possible answers, e.g.
- 2 lots of 20
- 20 lots of 2
- 4 lots of 10
- 4 lots of 2×5

Make the array using counters.

What else can you see?