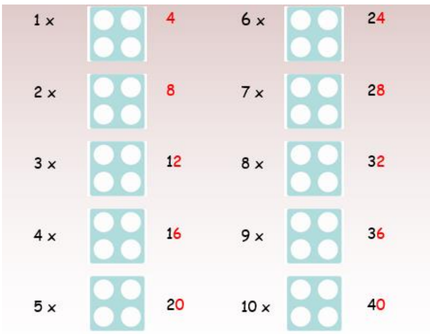
Planning Overview
Year 3 Multiplication and Division

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 two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

3NF–2 Recall multiplication facts, and corresponding division facts, in the 10, 5, 2, 4 and 8 multiplication tables, and recognise products in these multiplication tables as multiples of the corresponding number.
3NF–3 Apply place-value knowledge to known additive and multiplicative number facts
3MD–1 Apply known multiplication and division facts to solve contextual problems with different structures, including quotative and partitive division.

	Teaching and Learning
Introduction	Practical session – range of calculations and resources on each table. Choose a calculation and represent in different ways (on a bead string, with numicon, using arrays, groups of counters, repeated addition) Children should be confident representing 2x, 5x and 10x table facts from Year 2. Remind children about commutativity, this will be covered within the unit, but it gives them an awareness that they already know some of the times tables we haven't covered yet due to the related facts e.g. if I know 8 lots of 5 is 40, I also know 5 lots of 8 is 40. 5 x 8 = 40 8 x 5 = 40 Reinforce this with the use of an array. What arrays can you create, what other multiplication facts do you know?
4 x tables	Build up the 4x table with resources – emphasise that we are repeatedly adding another numicon 4 tile. We do not need to start counting from the first tile. If we already know that 4 x 4 is 16 then to find out 4 x 5, we add another 4 onto this known fact.  As the 4 times table is being built draw out patterns such as the ones column having a pattern of 4, 8, 2, 6, 0.

Also draw out the generalisation around each multiple of 4 being an even number and why this is the case.

Give children 4x table in this format

4 x 1 =	4 x 6 =	4 x 11 =
4 x 2 =	4 x 7 =	4 x 12 =
4 x 3 =	4 x 8 =	
4 x 4 =	4 x 9 =	
4 x 5 =	4 x 10 =	

Can they complete answers and write generalisations about the patterns?
Can they explain links to the 2x tables?

2 x 1 = 2	4 x 1 = 4
2 x 2 = 4	4 x 2 = 8
2 x 3 = 6	4 x 3 = 12
2 x 4 = 8	4 x 4 = 16
2 x 5 = 10	4 x 5 = 20
2 x 6 = 12	4 x 6 = 24
2 x 7 = 14	4 x 7 = 28

To find out answers to our 4 times table we double the known fact from our 2 times table. To find out 4 times a number we can double that number and double it again.

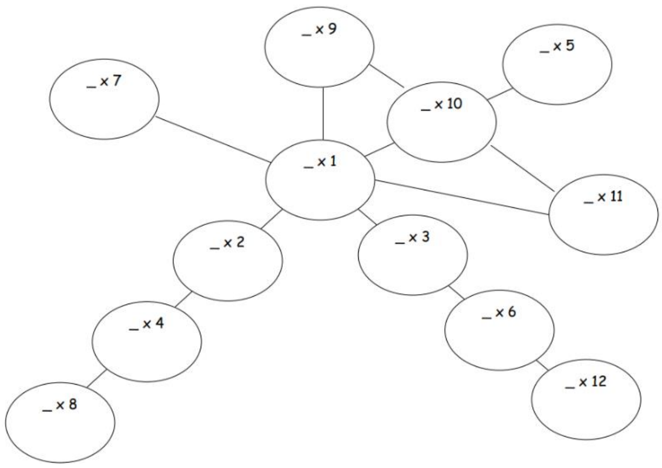
'Fill in the missing numbers.'

2 × 2 = $\boxed{}$ 2 × 5 = $\boxed{}$ 2 × 6 = $\boxed{}$

2 × 4 = $\boxed{}$ 4 × 5 = $\boxed{}$ 6 × 4 = $\boxed{}$

From NCETM – PD materials

Complete times tables fact sheet for the 4x table



<table>
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Can they solve variation questions and word problems?

Missing-number sequences/problems:
'Fill in the missing numbers.'
<table><tr><td>0</td><td>4</td><td>8</td><td>12</td><td>16</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>
<table><tr><td>48</td><td>44</td><td>40</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>
$$4 \times \begin{array}{|c|}\hline 1 \\ \hline 3 \\ \hline 5 \\ \hline 7 \\ \hline 9 \\ \hline 11 \\ \hline\end{array} = \begin{array}{|c|}\hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline\end{array}$$
$$\begin{array}{|c|}\hline 0 \\ \hline 2 \\ \hline 4 \\ \hline 6 \\ \hline 8 \\ \hline 10 \\ \hline 12 \\ \hline\end{array} \times 4 = \begin{array}{|c|}\hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline \\ \hline\end{array}$$
Missing-number/symbol problems:
'Fill in the missing numbers.'
$3\times4=2\times4+\square$ $6\times4=\square\times4+4$
$3\times4-\square=2\times4$ $6\times4-4=\square\times4$

'Fill in the missing symbols (<, > or =).'
$9\times4 \bigcirc 8\times4$
$9\times4 \bigcirc 8\times4+4$
From NCETM – PD materials
</td>
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<tr>
<td>8 x tables</td>
<td>
Build 8 times table using numicon. Draw out patterns and generalisations in the same way as with the 4 times table.

Complete the times table facts map.

If I know ____I can work out ____by____
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Make links and connections between the 2, 4 and 8 times table.
'If I can double to work out my 2 times table, double again to work out my 4 times table then I can double again to work out my 8 times table'
Variation and word problems.
Top to bottom – Mathsticks

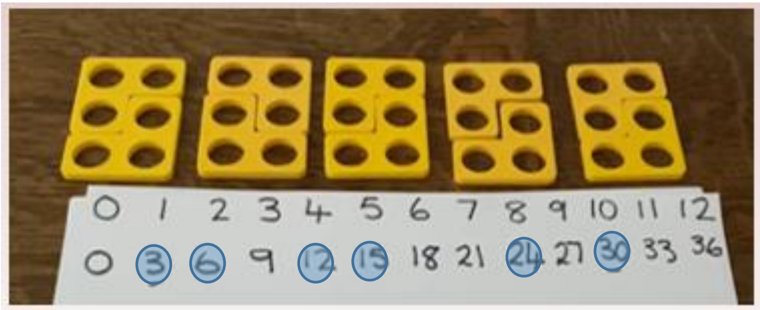
Make a path from top to bottom

Multiples of 8

25	23	18	10	96	14	51	60
50	26	10	5	40	16	8	32
18	17	35	54	1	25	11	48
6	7	12	39	5	45	16	72
13	23	8	24	88	32	48	55
37	11	24	34	30	33	15	17
12	10	72	80	48	15	20	6
36	41	28	12	56	4	18	2

3 x tables

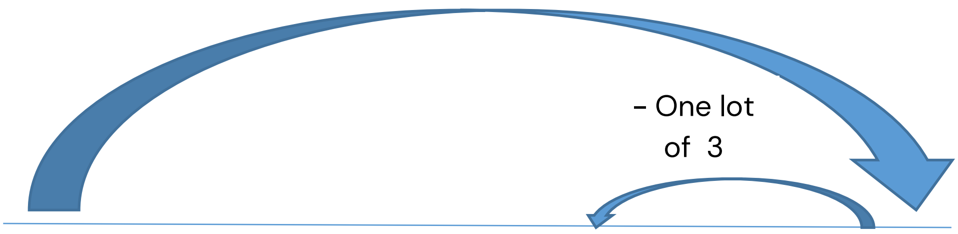
Build the 3x tables using counters or numicon. Which ones do you know?



We already know 1x3, 2x3, 4x3, 5x3, 8x3 and 10x3

How can we work out the ones that we don't know? If I know 10 x 3 how can I work out 9 x 3? Use an array of counters, Numicon or a blank number line to support their explanations, e.g.

10 x 3



<table>
<tr>
<td></td>
<td>Children to complete times table fact sheet.

Give sentence
If I know ____I can work ____by____

Variation and word problems.

Missing-number/symbol problems:
'Fill in the missing numbers.'
$10 \times 3 = 9 \times 3 + \square$ $6 \times 3 = \square \times 3 + 3$
$10 \times 3 - \square = 9 \times 3$ $6 \times 3 - 3 = \square \times 3$

'Fill in the missing symbols (<, > or =).'
$9 \times 3 \bigcirc 8 \times 3$
$9 \times 3 \bigcirc 8 \times 3 + 3$
$9 \times 3 \bigcirc 9 \times 3 + 3$
$9 \times 3 \bigcirc 10 \times 3 - 3$
From NCETM PD materials</td>
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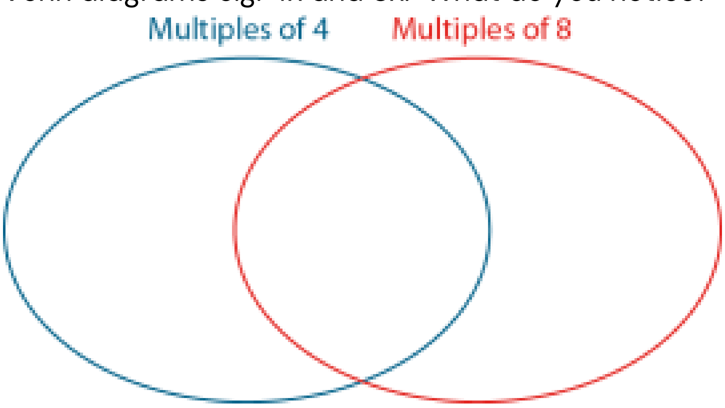
<tr>
<td>**Links and development of multiplication**</td>
<td>Multiple aerobics. Children count from 1 to 30. In the first round they raise their left hand up for x2.

In the second round they keep their left hand going for x2 but now raise their right hand for x4. In the last round they keep their x2 and x4 hands going but now stand for x8.

When are you completing all 3 actions? No actions? What do you notice?

Complete Venn diagrams e.g. 4x and 8x. What do you notice?

From NCETM PD materials
Can children explain why there are no numbers in the right-hand section of the Venn Diagram?</td>
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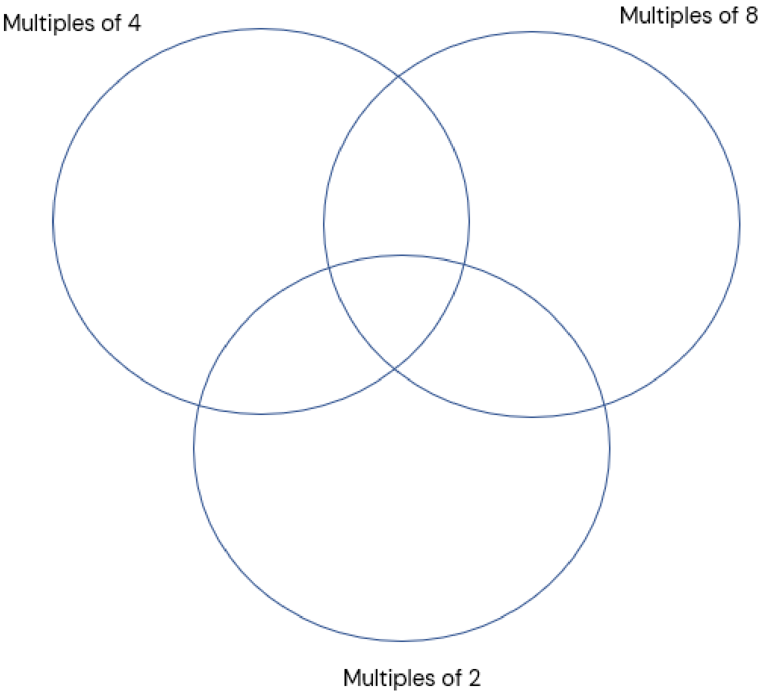
Extend to include multiples of 2.



Can children use the completed Venn Diagrams to answer the reasoning questions below?

Always, sometimes or never true?
- Multiples of 2 are multiples of 4
- Multiples of 4 are multiples of 2
- Multiples of 8 are multiples of 2

Captain Conjecture says
“All multiples of 4 are multiples of 2 so all multiples of 2 are multiples of 4”

From the activities above the children will have explored the concept that every multiple of 8 contains double the amount of 4s. Numicon is a valuable resource to support this understanding.

Mastery

What do you notice about the following calculations?

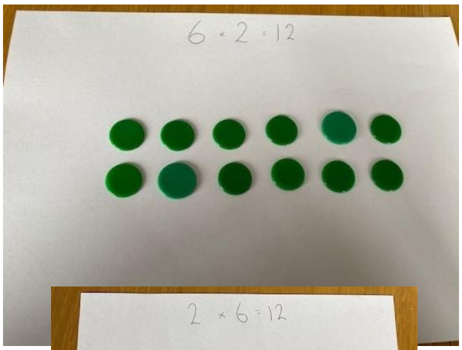
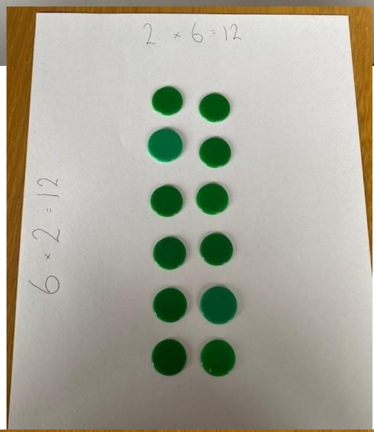
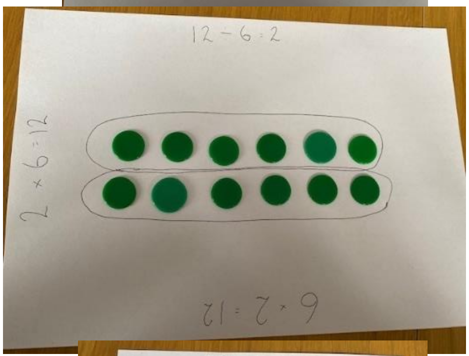
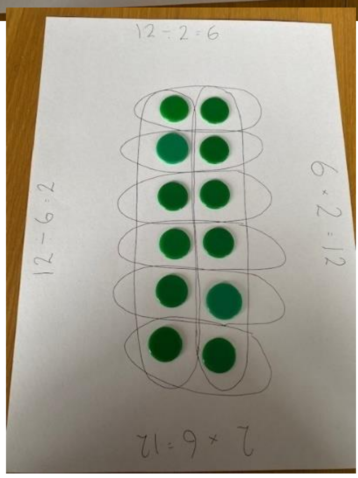
3×4	3×8
4×4	4×8
3×5	3×10

Mastery with Greater Depth

Write these addition statements as multiplication statements:

$2 + 2 + 2 + 2 + 4$

$3 + 3 + 3 + 2 + 4$

Arrays and the link to division	Make an array with 12 counters on a white board. Ask children to write at the top of their whiteboard the calculation that matches the array that they have made. **6 x 2 = 12** Ask the children to turn the board 90 degrees and now write the calculation this this array describes. **2 x 6 = 12** Ask the children to turn the board again another 90 degrees. Now start to circle the groups that they can see and count how many of those groups they have – model the language and how to record this as a division statement. 12 made into groups of 6 has given us 2 groups. **12 ÷ 6 = 2** Finally rotate the board another 90 degrees and record the groups that have been made from the whole and record this as the final division statement. **12 ÷ 2 = 6** What can the children notice about the calculations that they have just created?     What sentences can you make from what we have just done? Can they describe how the same numbers have been used? Do children recognise that when we multiply these two numbers together, we will get a larger product. Similarly, do they realise that when we divide we always start with a larger number and end with a smaller number? Try with a different starting array, can the children write all of the related facts for the array?

What calculations can we elicit from this known fact?
5 x 8 = 40

Mastery

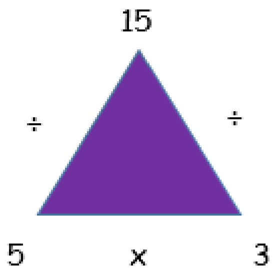
What is the relationship between these calculations?

3×4	4×8
4×3	8×4

Children should understand that multiplication is commutative.

What calculations could this array represent?

Begin to express arrays as a fact family triangle.



Write the related facts and discuss how the top number in the triangle is the one that is then shared/grouped into the numbers below.

Use a fact family triangle to begin to answer missing number problems.

Mastery

Complete the following: $3 \times \square = 12$ $4 \times \square = 20$

$\square \times 3 = 15$ $8 \times \square = 24$

Extending Related Facts

For those children who have fully secured their understanding of related facts, can they then move on to show the link between the following statements?

3 x 2 = 6

30 x 2 = 60

<table>
<tr><td></td><td>Discuss how each yellow counter is 10 times the size of a red counter so we now have one number in the second calculation that is 10 times the size of the number in the first calculation. Because of this our answer will be 10 times bigger too.

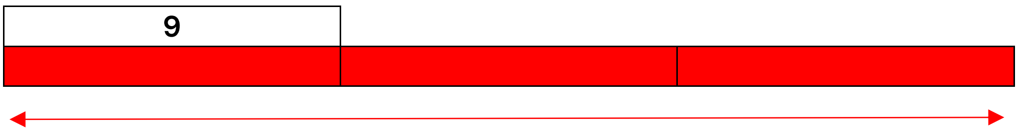
Use cloze procedures or stem sentences to support.
To solve _20_ x _7_ I need to make the number 20 ten times smaller to make this a known fact of _2_ x _7_ = _14_ . I then need to make the answer ten times bigger so _20_ x _7_ = _140_

What would these calculations look like if put them onto a number triangle? What would the related division facts be?

Mastery with Greater Depth
What is the relationship between these calculations?
2 × 3   4 × 3
2 × 30   4 × 30
20 × 3   40 × 3
20 × 3 × 10   40 × 3 × 10

Children should use their knowledge of place value to mentally calculate by multiples of 10.</td></tr>
<tr><td>Scaling</td><td>Using a resource such as Cuisenaire or multilink, ask children to compare the size of resources. E.g. how much longer is the red tower than the blue tower? Children can use a bar model to support their understanding of these problems.

There are 9 white flowers. There are three times as many red flowers as white flowers. How many red flowers are there?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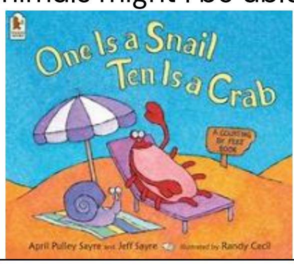
<tr><td>How many ways?</td><td>2 x 5 pieces of numicon plus 2 x 10 pieces of numicon = 30 how many other ways could you make 30 using 2 colours of numicon?

Children can have a bit of choice about what to wear for PE. You can choose your own colour of top, shorts and socks and you have a choice between blue, white and red. What range of combinations of kit could you have? *This activity also appears in the Y3 Place Value unit.

Using the text, one is a snail, ten is a crab, ask questions such as
'I can see 20 legs which animals might I be able to see?'

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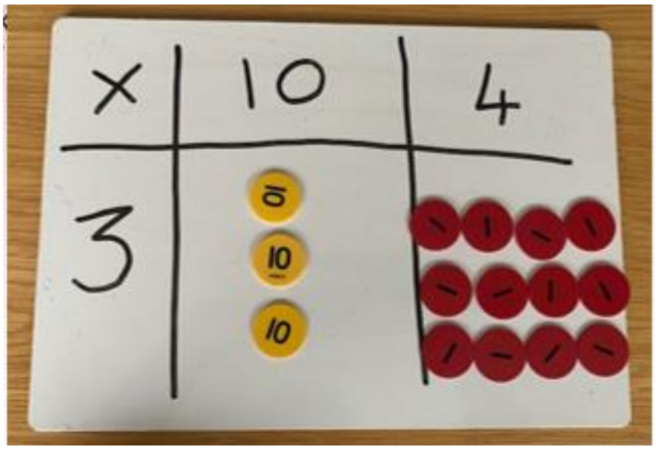
Consolidation of Mental Strategies and Problem Solving	Range of word problems linked to multiplication and division – can children decide whether it is multiplication or division based on the language used? **Mastery with Greater Depth** Write a story for $18 \div 3$. NRICH - biscuit decorations **Biscuit Decorations** **Age 5 to 7** **Challenge Level** ★ Andrew decorated 20 biscuits to take to a party. He lined them up and put icing on every second biscuit. Then he put a cherry on every third biscuit. Then he put a chocolate button on every fourth biscuit. So there was nothing on the first biscuit. How many other biscuits had no decoration? Did any biscuits get all three decorations? 
Written multiplication	Secure children's understanding of partitioning using resources such as Place Value Counters. **Mastery** What is 3×4? What is 13×4? *Asking 'How did you get that?' can help you decide whether children are working efficiently with questions like 13×4 by, for example, calculating 10×4 and adding 3×4, and that 3×4 is not obtained by counting in 1s.* **Mastery with Greater Depth** Make up a problem for 13×4 and solve it.

Using your school progression in calculation document, build children's understanding of how to solve TU x U – this may include the partitioning method, grid method, expanded compact method and then compact method. You may need to use Place Value counters and other resources to support understanding. E.g.



Children may find it an easier progression to begin by multiplying teen numbers by a single digit as each step can be solved by applying known facts as long as the number being partitioned contains 10 and then one of 2, 5, 3, 4 or 8 or the single digit number is 2, 5, 3, 4 or 8.

When children can partition and multiply teen numbers confidently, progress onto other relevant 2-digit numbers where children would need to use their understanding of scaling.

Be aware that the objective for Y3 is only TU x U

Mastery

Use a column method to calculate the following:

123×3 324×4 234×8

Mastery with Greater Depth

Find the missing digits.

$$\begin{array}{r} 2\square \\ \times\ \ 8 \\ \hline 176 \end{array} \qquad \begin{array}{r} 2\square \\ \times\ \ \square \\ \hline 112 \end{array} \qquad \begin{array}{r} 1\square4 \\ \times\ \ \square \\ \hline 736 \end{array}$$

Mastery with Greater Depth

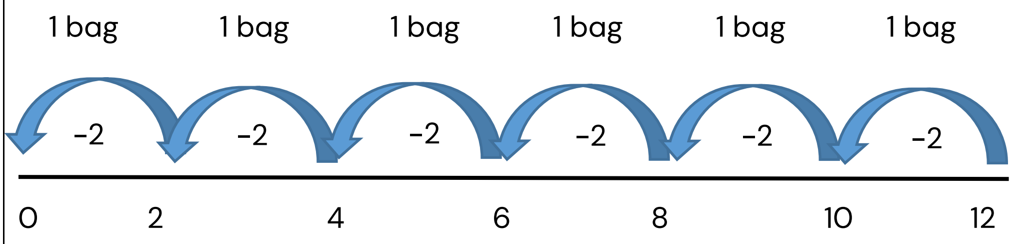
$\square\square \times \square = ?$

Putting the digits 1, 2 and 3 in the empty boxes, how many different calculations can you make?

Which one gives the largest answer?
Which one gives the smallest answer?

<table>
<tr>
<td>Written division</td>
<td>
Using your school progression in calculation document, build children's understanding of how to solve TU ÷ U – this may include counting back on a number line, partitioning method, chunking and then compact method.

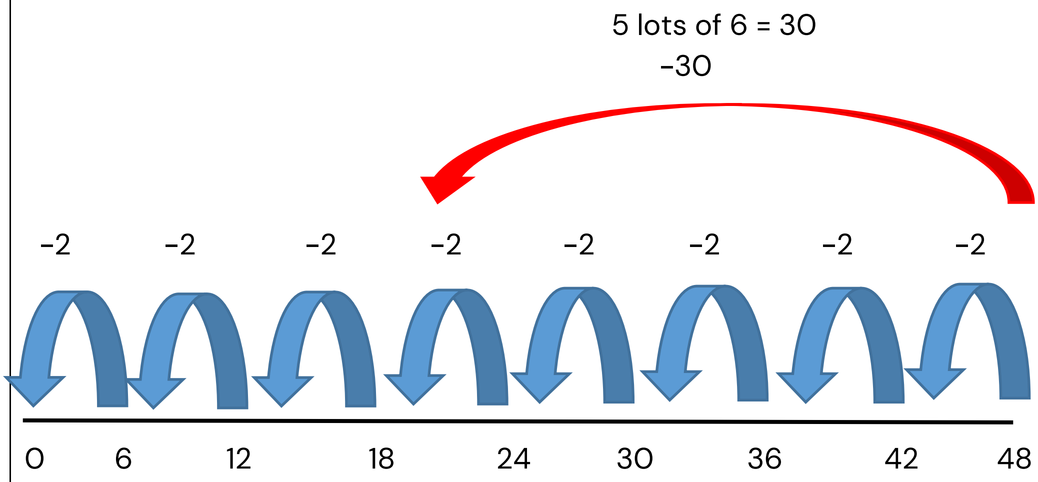
There are 12 sweets and each party bag needs two sweets.
How many party bags can be made?



6 party bags can be made

You may wish to look at how to develop a more efficient way to divide on a number line by developing an understanding of chunking. When completing the jumps of the number line below discuss with the children that doing lots of individual jumps of 8 is inefficient. We know what 5 jumps of 8 would be so we can take that amount off in one go.

A carton of orange juice fills 6 cups. Mrs Green wants to fill 48 cups with orange. How many cartons of orange does she need to buy?



Mrs Green would need to buy 8 cartons
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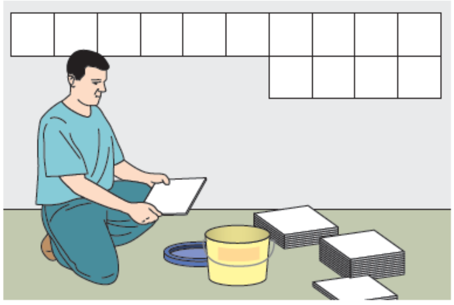
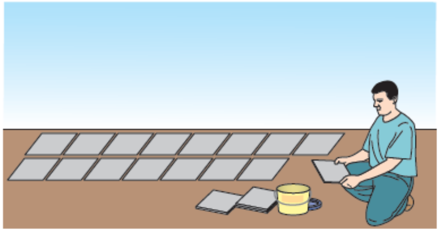
Mastery



Roger is laying tiles.
He has 84 tiles altogether.
How many complete rows of tiles can he make?

Mastery with Greater Depth



Roger has 96 patio slabs.
Using all of the slabs find three different ways that he can arrange the slabs to form a rectangular patio.

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Consolidation and problem solving

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Do children understand when to use a mental method or a written method for multiplication and division?

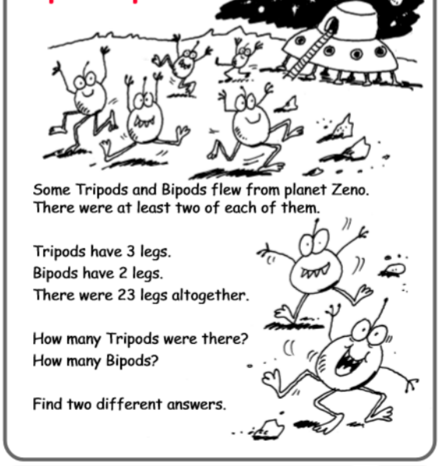
Sort a list of calculations from easiest to most difficult.

Solve word problems for a range of multiplication and division questions.

If they are struggling to unpick the calculation, can they use a bar model to support them in developing their understanding of what information they have and where the answer would be on their bar model?

https://www.first4maths.co.uk/product/maths-challenges-with-reasoning/

Bipods and Tripods – multiplication



Spaceship

Some Tripods and Bipods flew from planet Zeno.
There were at least two of each of them.

Tripods have 3 legs.
Bipods have 2 legs.
There were 23 legs altogether.

How many Tripods were there?
How many Bipods?

Find two different answers.

Teaching objectives
Solve mathematical problems or puzzles.
Count on in steps of 2 or 3.
Know multiplication facts for 2 and 3 times tables.

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Questions and Activities to Develop Reasoning

Another and Another

Give me a number of legs that I could count if I have twice as many bipods as tripods. And another... And another ...
What do you notice?

Agree or Disagree?

There can never be the same number of bipod legs as tripod legs. Do you agree or disagree?

Is It Quicker?

Is it quicker to count the legs on 4 bipods and 5 tripods or 6 bipods and 3 tripods?

Always Sometimes Never

If I have the same number of bipods and tripods, I will count an odd number of legs.

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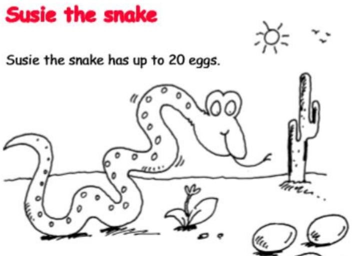
Susie the Snake/Maisie the Mouse – division

Susie the snake

Susie the snake has up to 20 eggs.



She counted her eggs in fours.
She had 3 left over.

She counted them in fives.
She had 4 left over.

How many eggs has Susie got?

30

Teaching objectives
Solve mathematical problems or puzzles.
Know multiplication facts for 4 and 5 times tables.
Find remainders after division.

Questions and Activities to Develop Reasoning

Convince Me

Convince me that Susie cannot have 17 eggs if she has 2 eggs left over when she counts in 4s.

Agree or Disagree?

Susie has 19 eggs. She says that she cannot count her eggs into groups without having any left over. Do you agree or disagree?

Find the Fiction

Susie has 15 eggs. She counts in 4s and has 3 left over.

Susie has an odd number of eggs. She will always have some eggs left over if she counts in 4s.

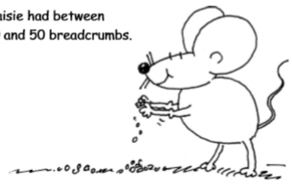
Susie has an even number of eggs. She will never have any left over if she counts in 4s.

Create a Question

Create your own question about the number of eggs that Susie has.

Maisie the mouse

Maisie had between 30 and 50 breadcrumbs.



She counted the breadcrumbs in fours.
There were 2 left over.

She counted them in fives.
There was 1 left over.

How many breadcrumbs did Maisie have?

38

Teaching objectives
Solve mathematical problems or puzzles.
Know multiplication facts for 4 and 5 times tables.
Find remainders after division.

Questions and Activities to Develop Reasoning

Agree or Disagree?

If Maisie counted the breadcrumbs in threes and had two left over, she cannot have 34 breadcrumbs.

Another and Another

Suggest how many breadcrumbs Maisie might have if she counts in fours and has three left over.

And another … And another …

Spot the Mistake

Maisie counts the breadcrumbs in 2s and has 3 left over.

Is it Possible?

Maisie has between 40 and 60 breadcrumbs. She counts them in 4s and there are none leftover. She counts them in 5s and there are none leftover. Is this possible?

Mastery

The following problems can be solved by using the calculation 8 ÷ 2. True or false?

- There are 2 bags of bread rolls that have 8 rolls in each bag. How many rolls are there altogether?
- A boat holds 2 people. How many boats are needed for 8 people?
- I have 8 pencils and give 2 pencils to each person. How many people receive pencils?
- I have 8 pencils and give 2 away. How many do I have left?

Mastery with Greater Depth

Sam is planting onions in the vegetable plot in his garden.
He arranges the onions into rows of 4 and has two left over.
He then arranges them into rows of 3 and has none left over.
How many onions might he have had?

Explain your reasoning.