Progression in Calculations - Multiplication

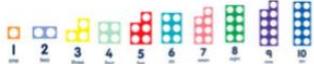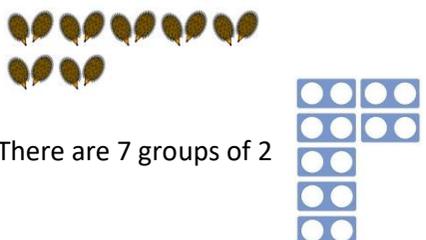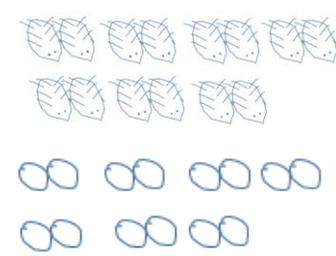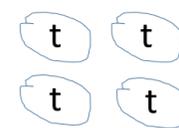| Links to access online manipulative resources |
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| https://whiterosemaths.com/resources/classroom-resources/interactive-whiteboard-resources/ |
| https://www.didax.com/apps/number-line/ |
| https://toytheater.com/marble-jar/ |
| https://mathsbot.com/manipulatives/bar |
| https://www.topmarks.co.uk/maths-games/hit-the-button |
| https://www.ictgames.com/mobilePage/arrayDisplay/index.html |
| https://mathsframe.co.uk/en/resources/category/7/multiplication-and-division |
| https://uk.splashlearn.com/multiplication-games |
| https://www.scootle.edu.au/ec/viewing/L106/index.html |

	Mental Strategies	Concrete	Pictorial	Abstract	Vocabulary	Models, Images and resources
EYFS	The link between addition and multiplication should be introduced though doubling. If available, Numicon is used to visualise the repeated adding of the same number. These can then be drawn around or printed as a way of recording. Real life contexts and use of practical equipment to count in repeated groups of the same size: How many wheels are there altogether? Count in twos; fives; tens both aloud and with objects.	Repeated grouping/repeated addition	Children to draw the concrete resources they are using.	Write the number sentence 2 + 2 + 2 = 6	Lots of Groups of Times Repeated addition Double	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Base tens and ones
		Children are given multiplication problems set in a real-life context. Children are encouraged to visualise the problem. How many fingers on two hands? How many sides on three triangles? How many legs on four ducks? Children are encouraged to read number sentences aloud in different ways "five times two makes ten" "ten Is equal to five multiplied by two"				

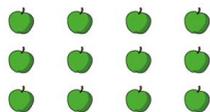|	**Mental Strategies**	**Concrete**	**Pictorial**	**Abstract**	**Vocabulary**	**Models, Images and resources**
Year 1	Count on from and back to zero in ones, twos, fives or tens Make connections between arrays, number patterns, and counting in twos, fives and tens.	**Repeated Addition – Counting in 2s** Use images of different objects There are 7 groups of 2 **Repeated addition – Counting in Tens** Use images of different objects – including Numicon 4 groups of 10 (fingers and thumbs) 10 pencils 10 pencils 10 pencils 10 pencils 4 groups of 10 pens	**Repeated Addition - – Counting in 2s** Draw the objects There are 7 groups of 2 **Repeated addition – Counting in Tens** Draw the objects t t t t 4 groups of ten (t represents ten) 10 10 10 10 Try to avoid pupils drawing out ALL ten objects 4 times.	**Repeated Addition - – Counting in 2s** Can use bar model, number line and equation | 14						
2	2	2	2	2	2	2 | +2 +2 +2 +2 +2 +2 +2 0 2 4 6 8 10 12 14 2 + 2 + 2 + 2 + 2 + 2 + 2 = 14 **Repeated addition – Counting in Tens** As above | 40			
10	10	10	10	 +10 +10 +10 +10 0 10 20 30 40 10 + 10 + 10 + 10 = 40	Lots of Groups of Times Repeated addition Double Sets Groups, Pairs Array	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Base tens and ones
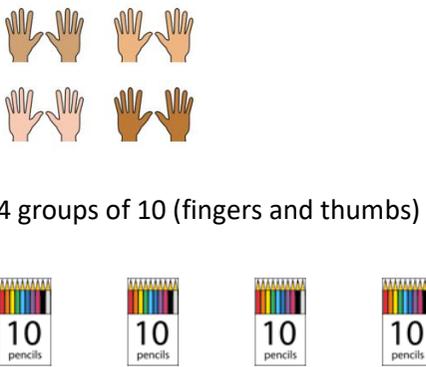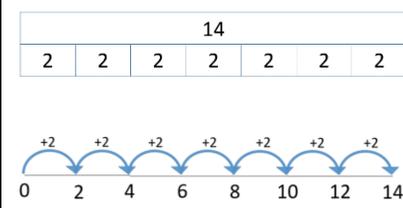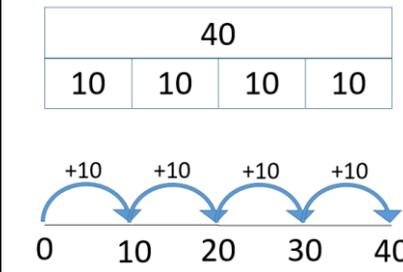
18 – 5 using counters
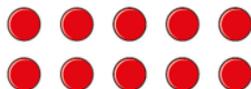
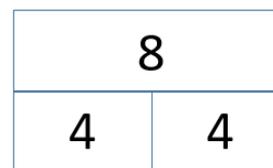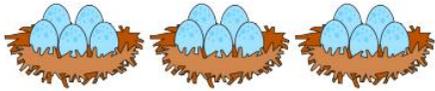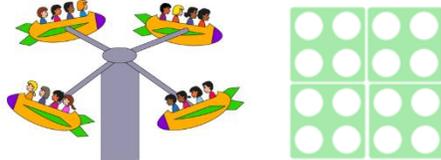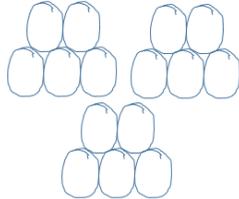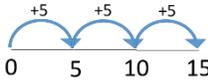| **Repeated addition – Counting in Fives**	**Repeated addition – Counting in Fives**	**Repeated addition – Counting in Fives**
Please follow the guidance from counting in 2s and 10s – exactly the same principle	Please follow the guidance from counting in 2s and 10s – exactly the same principle	Please follow the guidance from counting in 2s and 10s – exactly the same principle
Using arrays Explain the language of columns and rows. Use concrete apparatus.	**Using arrays** Explain the language of columns and rows. Children can draw the arrays	**Using arrays** Explain the language of columns and rows $$3 + 3 + 3 + 3 = 12$$ $$5 + 5 = 10$$
There are 3 apples in each column. There are 4 columns. There are 12 apples altogether.	There are 3 apples in each column. There are 4 columns. There are 12 apples altogether.	
There are 5 counters in each row. There are 2 rows. There are 10 counters altogether.	There are 5 counters in each row. There are 2 rows. There are 10 counters altogether.	
Doubling Use lots of different manipulatives to support doubling numbers	**Doubling** Children can draw it	**Doubling** Use a bar model and equation
Double ☐ is ☐		$$4 + 4 = 8$$

| | | Solve simple one-step problems, calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. Understanding multiplication as an array: see above.

Practical problem-solving activities involving equal sets or groups. Through grouping small quantities, pupils should begin to understand multiplication; doubling numbers and quantities. | | |

	Mental Strategies	Concrete	Pictorial	Abstract	Vocabulary	Models, Images and resources
Year 2	Practise to become fluent in recall and use of multiplication facts for the 2, 5 and 10 multiplication tables, (connect the 10x table to place value, and the 5x table to the divisions on the clock face) Double any multiple of 5 up to 50, e.g. double 35 Find the total number of objects when they are organised into groups of 2, 5 or 10 Recognise odd and even numbers Show that multiplication of two numbers can	**Fluent in the recall and calculations of 2, 5 and 10 multiplication tables** Please see the guidance for Year 1 Here is one example 3 equal groups of 5 equals 15 eggs **Using arrays** Please see the guidance for Year 1 and using arrays below **Recognising Multiplication with other factors** four groups of four children Numicon can be used too.	**Fluent in the recall and calculations of 2, 5 and 10 multiplication tables** Please see the guidance for Year 1 Here is one example – hand drawn **Using arrays** Please see the guidance for Year 1 and using arrays below **Recognising Multiplication with other factors** four groups of four children	**Fluent in the recall and calculations of 2, 5 and 10 multiplication tables** Please see the guidance for Year 1 	15
5	5	5	 +5 +5 +5 0 5 10 15 Introduce the multiplication symbol $5 + 5 + 5 = 5 \times 3 = 15$ **Using arrays** Please see the guidance for Year 1 and using arrays below **Recognising Multiplication with other factors** 	16
4	4	4	4	 +4 +4 +4 +4 0 4 8 12 16	Lots of Groups of Times Repeated addition Double Sets Groups, Pairs Array symbol x times as big ...as wide ...as long	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Cuisenaire Base hundreds tens and ones Arrow Cards

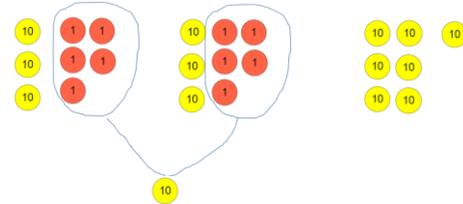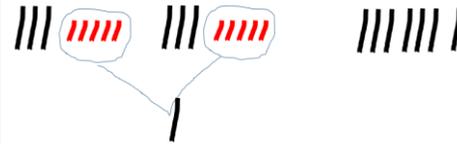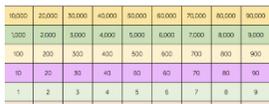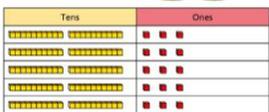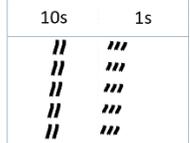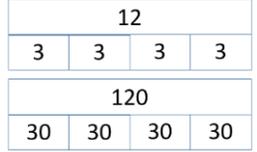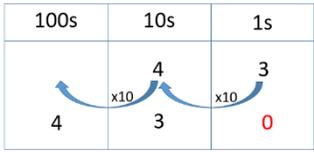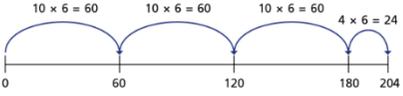|			
be done in any order (commutative) and division of one number by another cannot. Introduce the symbol for multiplication	**Doubling** See Y1. Children need to double multiples of 10 to 100, then double multiples of 5 to 100 E.g. 35 doubled – use counters –	**Doubling** See Y1. Children need to double multiples of 10 to 100, then double multiples of 5 to 100 E.g. 35 doubled Can be drawn	$4 + 4 + 4 + 4 = 4 \times 4$ **Doubling** See Y1. Children need to double multiples of 10 to 100, then double multiples of 5 to 100 E.g. 35 doubled $$35 + 35$$ 30 + 30 5 + 5 60 10
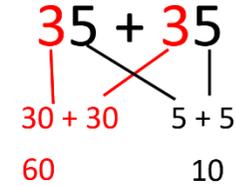
Calculate mathematical statements and write them using the multiplication (×) and equals (=) signs
Solve one-step x problems using materials, arrays, repeated addition and x facts, include problems in contexts.
Understand multiplication as repeated addition
Begin recording subtraction in columns to support understanding of place value and prepare for efficient written methods
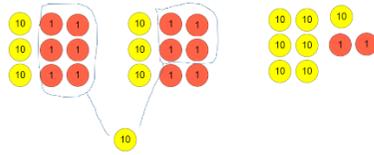
	Mental Strategies	Concrete	Pictorial	Abstract	Vocabulary	Models, Images and resources
Year 3	Recall and use multiplication facts for the 4, 8 and 3 multiplication tables Practise mental recall of x tables to improve fluency. Use doubling to connect the 2, 4 and 8 x tables. Use x facts to derive related facts and write mathematical statements e.g. using $3 \times 2 = 6$ to derive $30 \times 2 = 60$ Develop efficient mental methods using commutativity e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) Double any two-digit number, e.g. double 39 and any multiple of 5, 10 or 100, e.g. double 340, double 800, Multiply one-digit or two-digit numbers by 10 or 100 and understand the effect	**Consolidate 2, 5 10 times table** Please see Y2 examples **4, 8 then 3 times table** Please see Y2 examples as they hold the same principles **Make connections x10** 4 x 3, 4 x 30, 4 x 300 – use counters Also use the Gattegno Chart to help **Simple 2 digit by one digit** Use dienes or counters	**Consolidate 2, 5 10 times table** Please see Y2 examples **4, 8 then 3 times table** Please see Y2 examples as they hold the same principles **Make connections x10** 4 x 30 = 120 – draw it Draw on a place value grid **Simple 2 digit by one digit** Draw it in a grid Draw it in a grid See above	**Consolidate 2, 5 10 times table** Please see Y2 examples **4, 8 then 3 times table** Please see Y2 examples as they hold the same principles **Make connections x10** 4 x 3 = 12 4 x 30 =120 Use place value grid **Simple 2 digit by one digit** 23 x 5 23 x 5 = 20 x 5 + 3 x 5 = 100 + 15 = 115 $10 \times 6 = 60$ $10 \times 6 = 60$ $10 \times 6 = 60$ $4 \times 6 = 24$ 14 x 3 14 x 3 = 10 x 3 + 4 x 3 = 30 + 12 = 42	Lots of Groups of Times Repeated addition Double Sets Groups, Pairs Array symbol x times as big …as wide …as long factor product multiple ten times the size	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Cuisenaire Base hundreds tens and ones Arrow Cards Gattegno chart Place Value Grid
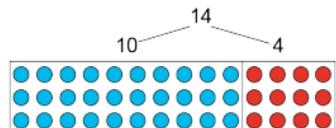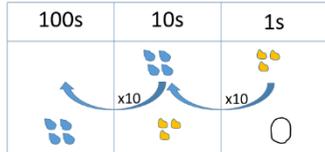
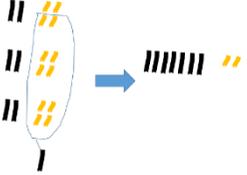| | e.g. 7 × 100, 46 × 10, 54 x 100

Know the vocabulary below
Factor multiplied by factor equals product

 | **Doubling all two-digit numbers**
 | **Doubling all two-digit numbers**
 | **Doubling all two-digit numbers**
36 + 36
30 + 30   6 + 6
60   12 | hundred times the size

a tenth the size

a hundredth the size |

Solve problems in context decide which operation to use and why, including missing number problems
integer scaling problems eg double or treble 50p or 5 x 60cm

Correspondence problems in which m objects are connected to n objects eg finding all possibilities '3 hats and 4 coats, how many different outfits?'
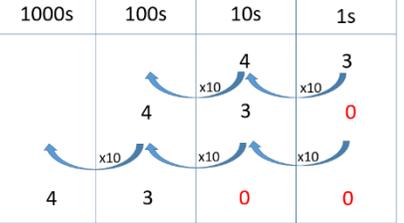
Understand multiplication represented as an array and the concept of commutativity.
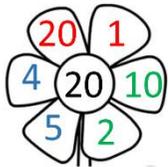"The order of the factors does not affect the product."

7 groups of 2   2 groups of 7
7 × 2 = 14   2 × 7 = 14
          7 × 2 = 2 × 7

	Mental Strategies	Concrete	Pictorial	Abstract	Vocabulary	Models, Images and resources
Year 4	Recall and practise multiplication facts for tables up to 12 × 12 to aid fluency. Use place value, known and derived facts to multiply mentally, including multiplying by 0 and 1 Multiply two-digit numbers by 4 or 8, e.g. 26 × 4 by doubling Multiply three numbers together Multiply a two-digit number by a one-digit number e.g. 17 × 3 Multiply numbers to 1000 by 10 and 100 (whole-number answers) e.g. 325 × 10, 42 × 100 Extend mental methods to three-digit numbers to derive facts e.g. 200 × 3 = 600 into 600 ÷ 3 = 200	**Consolidate 3, 4, 8 times table** See Y3 guidance – same principle **Learn the remaining tables to x 12** See Y3 guidance – same principle **Multiply 2 digit by one digit** 24 x 3 – Use Dienes or counters **Make connections x10 x 100** 4 x 3, 4 x 30, 4 x 300 – use counters Also use the Gattegno Chart to help	**Consolidate 3, 4, 8 times table** See Y3 guidance – same principle **Learn the remaining tables to x 12** See Y3 guidance – same principle **Multiply 2 digit by one digit** 24 x 3 – Draw it **Make connections x10 x 100** The counters can be drawn also	**Consolidate 3, 4, 8 times table** See Y3 guidance – same principle **Learn the remaining tables to x 12** See Y3 guidance – same principle **Multiply 2 digit by one digit** Informal partition as in Y3 3 x 4 ones = 12 ones 3 x 2 tens = 6 tens **Make connections x10 x 100** 43 x 100 = 43 x 10 x 10 Use Place Value charts	Lots of Groups of Times Repeated addition Double Sets Groups, Pairs Array symbol x times as big …as wide …as long factor product multiple ten times the size	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Cuisenaire Base hundreds tens and ones Arrow Cards Gattegno chart Place Value Grid
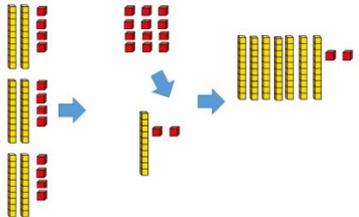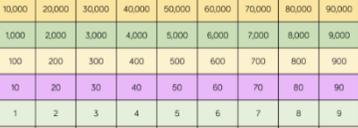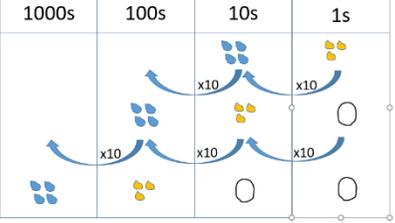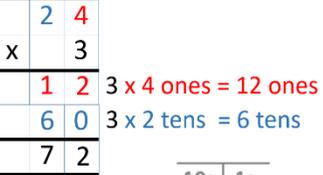
	Recognise and use factor pairs e.g. give the factor pair associated with a multiplication fact, (if 2 x 3 = 6 then 6 has the factor pair 2 and 3) Factor flower for 20 Know the vocabulary below Factor multiplied by factor equals product Use divisibility tests to identify multiples of 2, 4, 10 and 5	Multiply using partitioning Develop fluency in efficient written method of short multiplication Write statements using the distributive law 39 × 7 = 30 × 7 + 9 × 7 and associative law (2 × 3) × 4 = 2 × (3 × 4) Solve two step problems with increasingly harder numbers and in which n objects are connected to m objects e.g. Finding all possibilities '6 hats and 5 coats, how many different outfits?' Understand multiplication as scaling, not just repeated addition. E.g. "23, made 100 times the size, is 2,300." Then they can solve simple equations Understand that adjacent multiples of a times table have a difference of the multiplication table. E.g. adjacent multiples of 6, have a difference of 6. Understand the distributive law. Where a factor can be partitioned and multiplied out. $a \times (b+c) = a \times b + a \times c$ and $a \times (b-c) = a \times b - a \times c$		hundred times the size a tenth the size a hundredth the size scaling adjacent multiples	
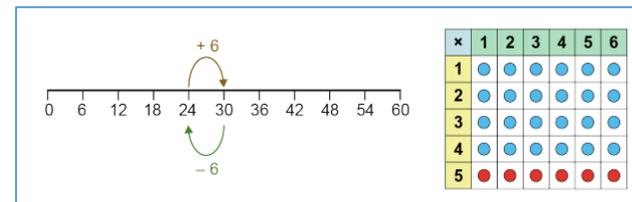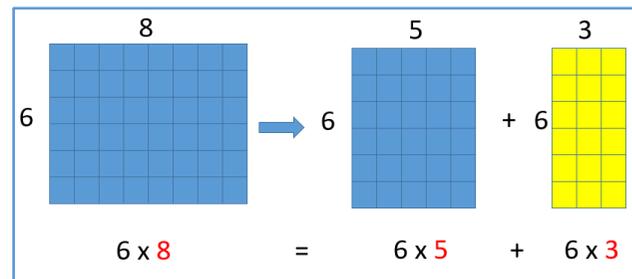
The wardrobe is 3 times the width of the cabinet. How wide is the wardrobe?
40 cm × 3 = 120 cm
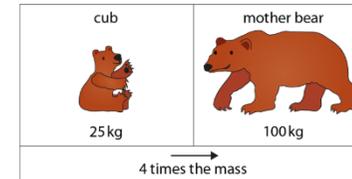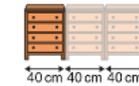
$\square \times 100 = 600$ $1,500 = \square \times 10$
$\square \div 100 = 8$ $1,200 = \square \div 10$

6 x 8 = 6 x 5 + 6 x 3

	Mental Strategies	Concrete	Pictorial	Abstract	Vocabulary	Models, Images and resources
Year 5 and Year 6	Multiply two-digit numbers X one digit mentally using known facts for all multiplication tables to 12 x 12 numbers Identify multiples and factors, including finding all factor pairs for numbers to 100, e.g. 30 has the factor pairs 1 × 30, 2 × 15, 3 × 10 and 5 × 6 Establish whether a number up to 100 is prime and recall prime numbers up to 19 Recognise and use square and cube numbers, and relevant notation. Multiply by 25 or 50, e.g. 48 × 25, 32 × 50 Multiply whole numbers decimals by 10, 100 and 1000 e.g. 4.3 × 10, 0.75 × 100 Multiply pairs of multiples of 10, e.g. 60 × 30, and a multiple of 100 by a single digit number, e.g. 900 × 8 30 × 80 = 3 × 8 × 10 × 10 = 3 × 8 × 100 = 2,400	**Multiply up to 4 digits by a one- number** 2214 x 4 – use counters **Multiply up to 4 digits by a two- number** If children are working at this level – moving straight to a formal method is the best approach.	**Multiply up to 4 digits by a one- number** 2214 x 4 – can draw in a place value grid | 1000s	100s	10s	1s | **Multiply up to 4 digits by a two- number** If children are working at this level – moving straight to a formal method is the best approach.	**Multiply up to 4 digits by a one- number** Use formal short method 2 2 1 4 × 4 **Multiply up to 4 digits by a two- number** 4 3 × 1 3 1 2 9 (43 × 3) 4 3 0 (43 × 10) 7.5 5 × 4 5 3 7.7 5 3 0 2.0 0 3 3 9.7 5	As above factor product multiple ten times the size hundred times the size a tenth the size a hundredth the size scaling adjacent multiples prime square cubed	100 square Number lines Number tracks Bead strings (for children) Bead bar Tens Frame Numicon Place Value Disks Cuisenaire Base hundreds tens and ones Arrow Cards Gattegno chart Place Value Grid

100
Has an odd number of factors because it's a square number!

17 has only 2 factors which makes it a prime number

Use divisibility tests to identify multiples of 3, 6, 9 8 and revise 2, 4, 10 and 5 **Year 6** Multiply two-digit decimals such as 0.8 × 7 and pairs of multiples of 10 and 100, e.g. 50 × 30, 600 × 20 Double decimals with units and tenths, e.g. double 7.6 Scale up and down using known facts, e.g. given that three oranges cost 24p, find the cost of four oranges Identify numbers with an odd number of factors (square numbers), even numbers of factors and no factor pairs other than 1 and themselves (prime numbers) Explore the order of operations using brackets; e.g. 2 + 1 x 3 = 5 and (2 + 1) x 3 = 9. Use multiplication facts to solve ratio and proportion problems.	Multiplying whole numbers by 10, 100 and 1000 using place value grids 	HTh	TTh	Th	H	T	O		9 × 100 = ☐
					9		9 × 1,000 = ☐ | | HTh	TTh	Th	H	T	O		16 × 100 = ☐
				1	6		16 × 1,000 = ☐ | Multiplying decimals by 10 and 100 using place value grids | H	T	O •	Tths	Hths		4.1 × 100 = ☐
		4 •	1				 	H	T	O •	Tths	Hths		4.15 × 100 = ☐
		4 •	1	5			 Express a product as a multiple of three factors 20 5 X 4 5 X 2 X 2		