

Cranbrook Primary School- Progression in Maths- Multiplication and Division

Purpose of study –Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history’s most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Aims

The national curriculum for mathematics aims to ensure that all pupils:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions

Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programmes of study are, by necessity, organised into apparently distinct domains, but pupils should make rich connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge to science and other subjects.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils’ understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

Intent

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We want our children to become **confident and articulate communicators** by enriching their mathematical vocabulary. We aim to enrich our pupils learning with a deep and confident understanding in fluency and reasoning. We aspire for our children to appreciate the power of mathematics and build a **life-long passion for maths** by exploring their curiosity through **memorable learning experiences**. As the children progress we aim to build confidence, **widen their horizons** and attain a positive growth mind set. Through our enterprise scheme we will provide children with an opportunity to develop their **global identity** through working with the local community. We want them to know that mathematics is essential to succeed in life and necessary for financial responsibilities and most forms of employment.

Multiplication and Division

Area of Study	Rec	1	2	3	4	5	6
MULTIPLICATION AND DIVISION FACTS	Explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally.	<i>Count in multiples of twos, fives and tens</i> (copied from Number and Place Value)	<i>Count in steps of 2, 3, and 5 from 0, and in tens from any number, forward or backward</i> (copied from Number and Place Value)	<i>Count from 0 in multiples of 4, 8, 50 and 100</i> (copied from Number and Place Value)	<i>Count in multiples of 6, 7, 9, 25 and 1 000</i> (copied from Number and Place Value)	<i>Count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000</i> (copied from Number and Place Value)	
		Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables	Recall multiplication and division facts for multiplication tables up to 12×12			

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			recognising odd and even numbers				
REASONING			<p>Missing numbers $10 = 5 \times \square$ What number could be written in the box?</p> <p>Making links I have 30p in my pocket in 5p coins. How many coins do I have?</p>	<p>Missing numbers $24 = \square \times \square$ Which pairs of numbers could be written in the boxes?</p> <p>Making links Cards come in packs of 4. How many packs do I need to buy to get 32 cards?</p>	<p>Missing numbers $72 = \square \times \square$ Which pairs of numbers could be written in the boxes?</p> <p>Making links Eggs are bought in boxes of 12. I need 140 eggs; how many boxes will I need to buy?</p>	<p>Missing numbers $6 \times 0.9 = \square$ $\square \times 0.03 = 0.008$ $\square \times \square = 0.008$ Which numbers could be written in the boxes?</p> <p>Making links Apples weigh about 170 g each. How</p>	<p>Missing numbers $2.4 \div 0.3 = \square$ $\square \times 1.25 = \square$ Which number could be written in the box?</p>

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						many apples would you expect to get in a 2 kg bag?	
Area of Study		1	2	3	4	5	6
MENTAL CALCULATION				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 (appears also in Written Methods)	Use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers	Multiply and divide numbers mentally drawing upon known facts	Perform mental calculations, including with mixed operations and large numbers

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REASONING				<p>Use a fact</p> <p>$20 \times 3 = 60$.</p> <p>Use this fact to work out</p> <p>$21 \times 3 =$</p> <p>$22 \times 3 =$</p> <p>$23 \times 3 =$</p> <p>$24 \times 3 =$</p>	<p>Use a fact</p> <p>$63 \div 9 = 7$</p> <p>Use this fact to work out</p> <p>$126 \div 9 =$</p> <p>$252 \div 7 =$</p>	<p>Use a fact</p> <p>$3 \times 75 = 225$</p> <p>Use this fact to work out</p> <p>$450 \div 6 =$</p> <p>$225 \div 0.6 =$</p> <p>To multiply by 25 you multiply by 100 and then divide by 4. Use this strategy to solve</p> <p>48×25</p> <p>78×25</p> <p>4.6×25</p>	<p>Use a fact</p> <p>$12 \times 1.1 = 13.2$</p> <p>Use this fact to work out</p> <p>$15.4 \div 1.1 =$</p> <p>$27.5 \div 1.1 =$</p>
			<p>Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot</p>		<p>Recognise and use factor pairs and commutativity in mental calculations (appears also in Properties of Numbers)</p>	<p>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000</p>	<p><i>Associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction</i></p>

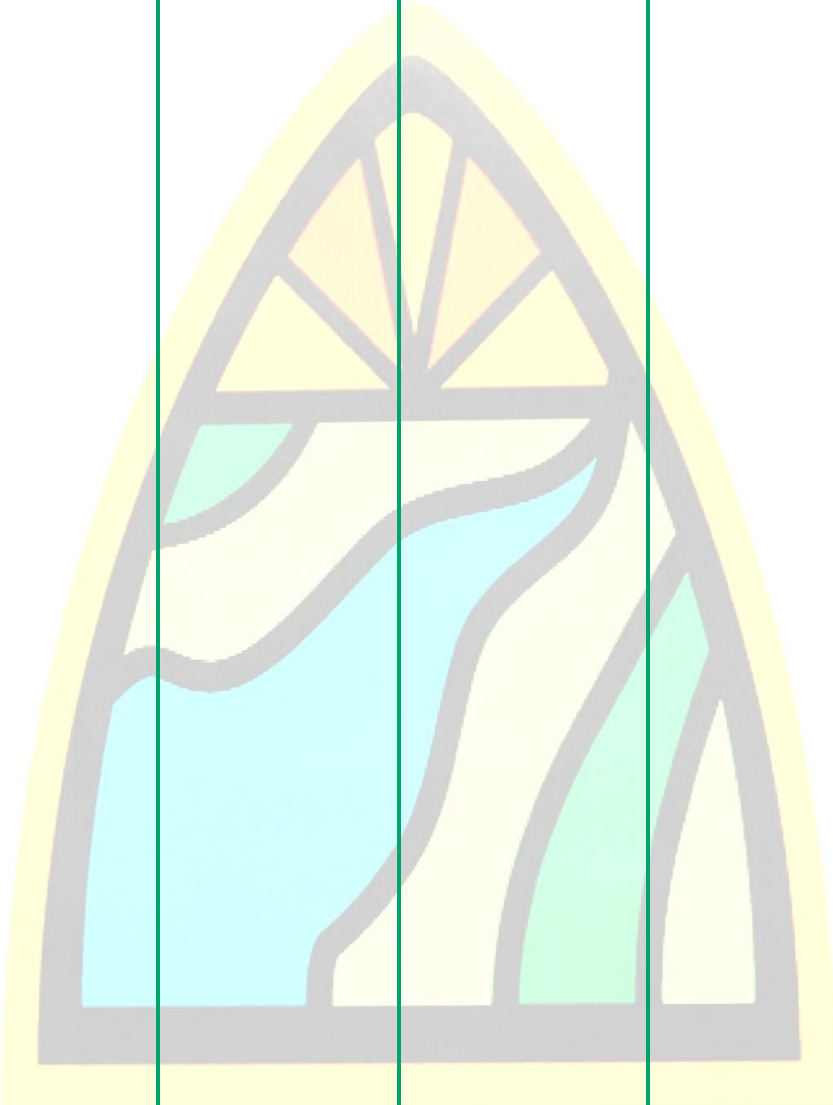
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							(e.g. $\frac{3}{8}$) (copied from Fractions)						
		<p>Making links</p> <p>If one teddy has two apples, how many apples will three teddies have? Here are 10 lego people. If 2 people fit into the train carriage, how many carriages do we need?</p>	<p>Making links</p> <p>Write the multiplication number sentences to describe this array.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>x</td> <td>x</td> <td>x</td> </tr> </table> <p>What do you notice? Write the division sentences.</p>	x	x	x	x	x	x	<p>Making links</p> <p>$4 \times 6 = 24$</p> <p>How does this fact help you to solve these calculations? $40 \times 6 =$ $20 \times 6 =$ $24 \times 6 =$</p>	<p>Making links</p> <p>How can you use factor pairs to solve this calculation? 13×12 ($13 \times 3 \times 4$, $13 \times 3 \times 2 \times 2$, $13 \times 2 \times 6$)</p>	<p>Making links</p> <p>$7 \times 8 = 56$</p> <p>How can you use this fact to solve these calculations? $0.7 \times 0.8 =$ $5.6 \div 8 =$</p>	<p>Making links</p> <p>$0.7 \times 8 = 5.6$</p> <p>How can you use this fact to solve these calculations? $0.7 \times 0.08 =$ $0.56 \div 8 =$</p>
x	x	x											
x	x	x											
Area of Study		1	2	3	4	5	6						
WRITTEN CALCULATION			Calculate mathematical statements for multiplication and division within the	Write and calculate mathematical statements for multiplication and division	Multiply two-digit and three-digit numbers by a one-digit number using	Multiply numbers up to 4 digits by a one- or two digit number using a formal	Multiply multi-digit numbers up to 4 digits by a two-digit whole						

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			<p>multiplication tables and write them using the multiplication (\times), division (\div) and equals (=) signs</p>	<p>using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods (appears also in Mental Methods)</p>	<p>formal written layout</p>	<p>written method, including long multiplication for two digit numbers</p>	<p>number using the formal written method of long multiplication</p>
						<p>Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.</p>	<p>Divide numbers up to 4 digits by a two-digit whole number using the formal written method of short division where appropriate for the context</p>

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						<p>divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.</p> <p>Use written division methods in cases where the answer has up to two decimal</p>
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							places (Copied from Fractions including decimals)						
		<p>Practical</p> <p>If we put two pencils in each pencil pot how many pencils will we need?</p>	<p>Prove It</p> <p>Which four number sentences link these numbers? 3, 5, 15?</p> <p>Prove it.</p>	<p>Prove It</p> <p>What goes in the missing box?</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>?</td> <td>?</td> </tr> <tr> <td>4</td> <td>80</td> <td>12</td> </tr> </table> <p>Prove it.</p> <p>How close can you get?</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> x </div> <p>Using the digits 2, 3 and 4 in the calculation above how close can you get to 100? What is the largest product? What is the</p>	x	?	?	4	80	12	<p>Prove It</p> <p>What goes in the missing box?</p> <p>6 x 4 = 512</p> <p>Prove it.</p> <p>How close can you get?</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> x 7 </div> <p>Using the digits 3, 4 and 6 in the calculation above how close can you get to 4500? What is the largest product? What</p>	<p>Prove It</p> <p>What goes in the missing box?</p> <p>12 2 ÷ 6 = 212</p> <p>14 4 ÷ 7 = 212</p> <p>22 3 ÷ 7 = 321 r 6</p> <p>323 x 1 = 13243</p> <p>Prove it.</p>	<p>Prove It</p> <p>18 4 ÷ 12 = 157</p> <p>38 5 ÷ 18 = 212.5</p> <p>33 2 ÷ 8 = 421.5</p> <p>38 x .7 = 178.6</p> <p>Can you find?</p> <p>Can you find the smallest number that can be added to or subtracted from 87.6 to make it exactly divisible by 8/7/18?</p>
x	?	?											
4	80	12											

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				smallest product?	is the smallest product?		
Area of Study		1	2	3	4	5	6
PROPERTIES OF NUMBER, MULTIPLES, FACTORS, PRIMES, SQUARE AND CUBE NUMBERS					Recognise and use factor pairs and commutativity in mental calculations (repeated)	Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.	Identify common factors, common multiples and prime numbers <i>use common factors to simplify fractions; use common multiples to express</i>

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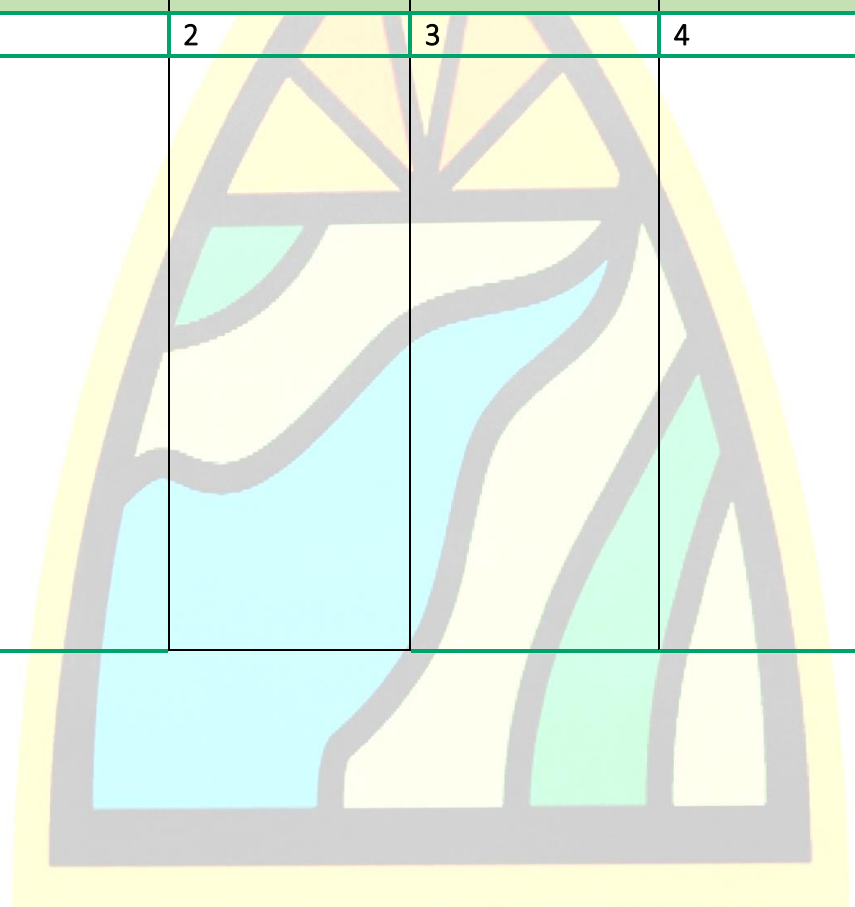
						Establish whether a numbers up to 100 is prime and recall prime numbers up to 19.	
						Recognise and use square numbers and cube numbers, and the notation for squared and cubed	Calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed and cubic metres and extending to other units
REASONING		Spot the mistake Use a puppet to count but	True or false? When you count up in	True or false? All the numbers in	Always, sometimes, never?	Always, sometimes, never?	Always, sometimes, never?

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		<p>make some deliberate mistakes.</p> <p>e.g. 2 4 5 6 10 9 8 6</p> <p>See if the pupils can spot the deliberate mistake and correct the puppet</p>	<p>tens starting at 5 there will always be 5 ones.</p>	<p>the two times table are even.</p> <p>There are no numbers in the three times table that are also in the two times table.</p>	<p>Is it always, sometimes or never true that an even number that is divisible by 3 is also divisible by 6.</p> <p>Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.</p>	<p>Is it always, sometimes or never true that multiplying a number always makes it bigger</p> <p>Is it always, sometimes or never true that prime numbers are odd.</p> <p>Is it always, sometimes or never true that when you multiply a whole number by 9, the sum of its digits is also a multiple of 9 .</p> <p>Is it always, sometimes or</p>	<p>Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big.</p> <p>Is it always, sometimes or never true that when you square an even number, the result is divisible by 4</p> <p>Is it always, sometimes or never true that multiples of 7 are 1 more</p>
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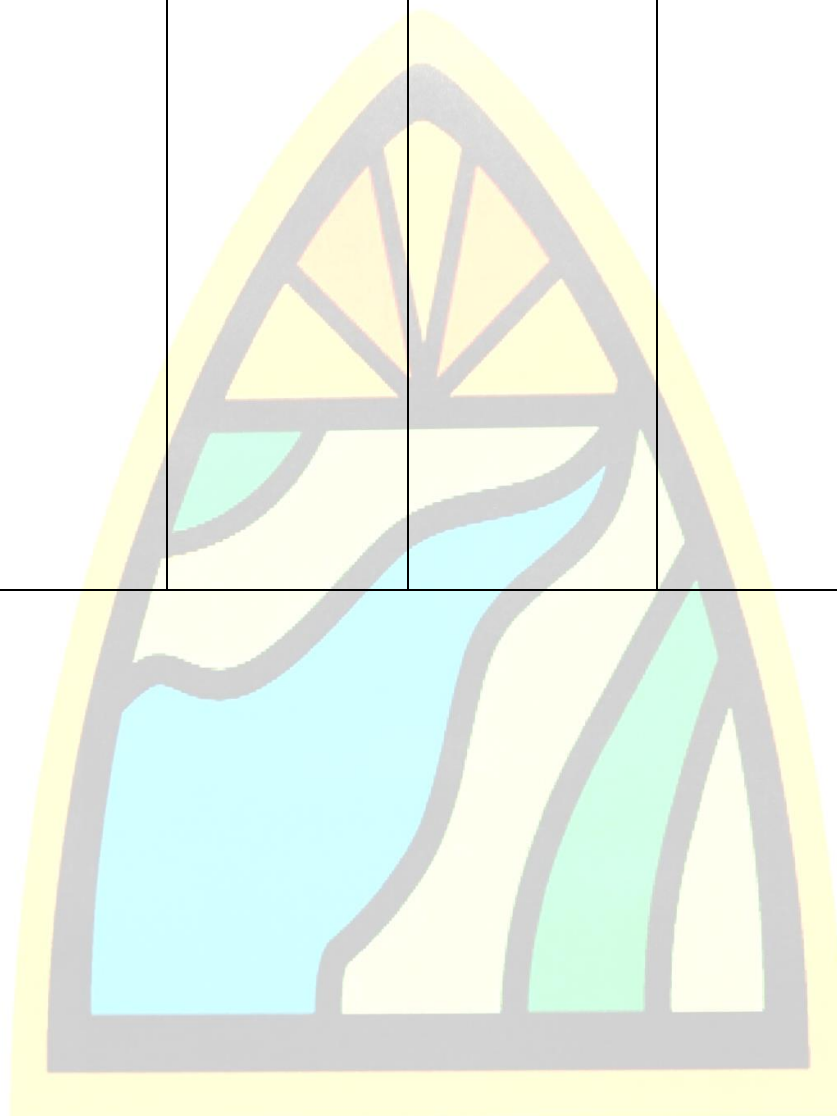
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						never true that a square number has an even number of factors.	or 1 less than prime numbers.
Area of Study		1	2	3	4	5	6
ORDER OF OPERATIONS							Use their knowledge of the order of operations to carry out calculations involving the four operations.



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							<p>Which is correct? Which of these number sentences is correct?</p> <p>$3 + 6 \times 2 = 15$</p> <p>$6 \times 5 - 7 \times 4 = 92$</p> <p>$8 \times 20 \div 4 \times 3 = 37$</p>
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<p>INVERSE OPERATIONS, ESTIMATING AND CHECKING ANSWERS</p>				<p><i>Estimate the answer to a calculation and use inverse operations to check answers (copied from Addition and Subtraction)</i></p>	<p><i>Estimate and use inverse operations to check answers to a calculation (copied from Addition and Subtraction)</i></p>		<p>Use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p>
			<p>Use the inverse Use the inverse to check if the following calculations are correct: $12 \div 3 = 4$ $3 \times 5 = 14$</p>	<p>Use the inverse Use the inverse to check if the following calculations are correct $23 \times 4 = 82$ $117 \div 9 = 14$</p> <p>Size of an answer Will the answer to the following calculations</p>	<p>Use the inverse Use the inverse to check if the following calculations are correct: $23 \times 4 = 92$ $117 \div 9 = 14$</p> <p>Size of an answer Will the answer to the following calculations be</p>	<p>Use the inverse Use the inverse to check if the following calculations are correct: $4321 \times 12 = 51852$ $507 \div 9 = 4563$</p>	<p>Use the inverse Use the inverse to check if the following calculations are correct: $2346 \times 46 = 332796$ $27.74 \div 19 = 1.46$</p>

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				<p>be greater or less than 80 $23 \times 3 =$</p> <p>$32 \times 3 =$</p> <p>$42 \times 3 =$</p> <p>$36 \times 2 =$</p>	<p>greater or less than 300 $152 \times 2 =$</p> <p>$78 \times 3 =$</p> <p>$87 \times 3 =$</p> <p>$4 \times 74 =$</p>	<p>Size of an answer</p> <p>The product of a two digit and three digit number is approximately 6500. What could the numbers be?</p>	<p>Size of an answer</p> <p>The product of a single digit number and a number with two decimal places is 21.34 What could the numbers be?</p>
PROBLEM SOLVING		Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with	Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including	Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in	Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence	Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes	Solve problems involving addition, subtraction, multiplication and division

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		the support of the teacher	problems in contexts	which n objects are connected to m objects	problems such as n objects are connected to m objects	<p>solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign</p> <p>solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates</p>	<p><i>solve problems involving similar shapes where the scale factor is known or can be found (copied from Ratio and Proportion)</i></p>
Key Vocabulary							
Areas	R	Y1	Y2	Y3	Y4	Y5	Y6

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<p>Multiplication and Division</p>	<p>Sharing Doubling Halving Number patterns</p>	<p>Lots of Sets of Groups of Equal groups Array Row Column Patterns Double Doubling Twice as much as... Twos Fives Tens Skip counting Equal groups of Equal lots of Equal sets of Grouping Share equally Sharing Share Half Halves Halving Half as much/ many as...</p>	<p>Times Multiplication Multiply Multiplied by Multiple of Repeated addition Ten/five times as much/many as... Once, twice, three times... ten times Multiplication facts Multiplication table Commutative Law Commutativity Calculation Equation Bar model Division Divide Divided by Divided into</p>	<p>Threes Fours Eights Product Factor Short multiplication Associative Law Associativity Scaling (integers) Correspondence Remainder Short division Quarter Third Eighth</p>	<p>Inverse Distributive law Multiplying by 0 and 1 Multiplying by 10, 100 Inverse Dividend Divisor Quotient Divisible by Dividing by 10, 100 Factor Factor pair</p>	<p>Common multiples Composite numbers Multiplying by 10, 100 and 1000 Square Squared Cube Cubed Common factors Prime Prime factors Composite numbers Dividing by 10, 100 and 1,000</p>	<p>Indices (powers) Lowest common multiple Brackets Order of operations (BIDMAS) Highest common factor</p>

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		Arrays Row Column Patterns	Repeated subtraction Left over One each, two each, three each... Group in pairs, threes... tens Division facts				
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