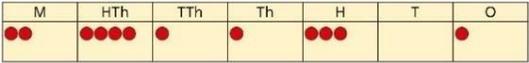
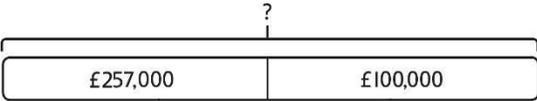
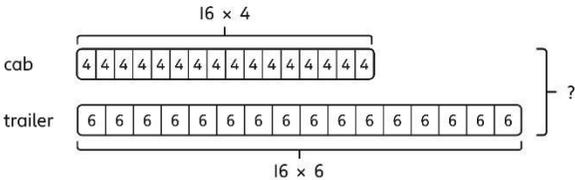




## Ottery St Mary Primary School Year 6 Calculation Policy



	Concrete	Pictorial	Abstract																																																																																																																					
<b>Year 6 Addition</b>																																																																																																																								
<b>Comparing and selecting efficient methods</b>	<p>Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.</p> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <tr> <td>M</td> <td>HTh</td> <td>TTh</td> <td>Th</td> <td>H</td> <td>T</td> <td>O</td> </tr> <tr> <td>●●</td> <td>●●●●</td> <td>●</td> <td>●</td> <td>●●●</td> <td></td> <td>●</td> </tr> </table>	M	HTh	TTh	Th	H	T	O	●●	●●●●	●	●	●●●		●	<p>Discuss similarities and differences between methods, and choose efficient methods based on the specific calculation. Compare written and mental methods alongside place value representations.</p> <div style="text-align: center;"> </div> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <tr> <td>TTh</td> <td>Th</td> <td>H</td> <td>T</td> <td>O</td> </tr> <tr> <td>●●●●</td> <td></td> <td>●●</td> <td>●●●●</td> <td>●●●●</td> </tr> <tr> <td>●●●●</td> <td>●●●●</td> <td>●●●●</td> <td>●</td> <td>●</td> </tr> </table> <div style="margin-left: auto; margin-right: auto;"> <table border="1" style="text-align: center;"> <tr> <td>TTh</td> <td>Th</td> <td>H</td> <td>T</td> <td>O</td> </tr> <tr> <td>4</td> <td>0</td> <td>2</td> <td>6</td> <td>5</td> </tr> <tr> <td>+</td> <td>3</td> <td>5</td> <td>2</td> <td>2</td> </tr> <tr> <td colspan="5" style="border-top: 1px solid black;"></td> </tr> </table> </div>	TTh	Th	H	T	O	●●●●		●●	●●●●	●●●●	●●●●	●●●●	●●●●	●	●	TTh	Th	H	T	O	4	0	2	6	5	+	3	5	2	2						<p>Use column addition where mental methods are not efficient. Recognise common errors with column addition.</p> <p><math>32,145 + 4,302 = ?</math></p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: right;">TTh</td> <td style="text-align: right;">Th</td> <td style="text-align: right;">H</td> <td style="text-align: right;">T</td> <td style="text-align: right;">O</td> <td style="width: 20px;"></td> <td style="text-align: right;">TTh</td> <td style="text-align: right;">Th</td> <td style="text-align: right;">H</td> <td style="text-align: right;">T</td> <td style="text-align: right;">O</td> </tr> <tr> <td style="text-align: right;">3</td> <td style="text-align: right;">2</td> <td style="text-align: right;">1</td> <td style="text-align: right;">4</td> <td style="text-align: right;">5</td> <td></td> <td style="text-align: right;">3</td> <td style="text-align: right;">2</td> <td style="text-align: right;">1</td> <td style="text-align: right;">4</td> <td style="text-align: right;">5</td> </tr> <tr> <td style="text-align: right;">+</td> <td style="text-align: right;">4</td> <td style="text-align: right;">3</td> <td style="text-align: right;">0</td> <td style="text-align: right;">2</td> <td></td> <td style="text-align: right;">+</td> <td style="text-align: right;">4</td> <td style="text-align: right;">3</td> <td style="text-align: right;">0</td> <td style="text-align: right;">2</td> </tr> <tr> <td style="text-align: right;">3</td> <td style="text-align: right;">6</td> <td style="text-align: right;">4</td> <td style="text-align: right;">4</td> <td style="text-align: right;">7</td> <td></td> <td style="text-align: right;">7</td> <td style="text-align: right;">5</td> <td style="text-align: right;">1</td> <td style="text-align: right;">6</td> <td style="text-align: right;">5</td> </tr> </table> <p><i>Which method has been completed accurately?</i></p> <p><i>What mistake has been made?</i></p> <p>Column methods are also used for decimal additions where mental methods are not efficient.</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: right;">H</td> <td style="text-align: right;">T</td> <td style="text-align: right;">O</td> <td style="text-align: right;">·</td> <td style="text-align: right;">Tth</td> <td style="text-align: right;">Hth</td> </tr> <tr> <td style="text-align: right;">1</td> <td style="text-align: right;">4</td> <td style="text-align: right;">0</td> <td style="text-align: right;">·</td> <td style="text-align: right;">0</td> <td style="text-align: right;">9</td> </tr> <tr> <td style="text-align: right;">+</td> <td style="text-align: right;">4</td> <td style="text-align: right;">9</td> <td style="text-align: right;">·</td> <td style="text-align: right;">8</td> <td style="text-align: right;">9</td> </tr> <tr> <td style="text-align: right;">1</td> <td style="text-align: right;">8</td> <td style="text-align: right;">9</td> <td style="text-align: right;">·</td> <td style="text-align: right;">9</td> <td style="text-align: right;">8</td> </tr> </table>	TTh	Th	H	T	O		TTh	Th	H	T	O	3	2	1	4	5		3	2	1	4	5	+	4	3	0	2		+	4	3	0	2	3	6	4	4	7		7	5	1	6	5	H	T	O	·	Tth	Hth	1	4	0	·	0	9	+	4	9	·	8	9	1	8	9	·	9	8
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<p><b>Selecting mental methods for larger numbers where appropriate</b></p>	<p>Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.</p>  <p><math>2,411,301 + 500,000 = ?</math></p> <p><i>This would be 5 more counters in the HTh place.</i></p> <p><i>So, the total is 2,911,301.</i></p> <p><math>2,411,301 + 500,000 = 2,911,301</math></p>	<p>Use a bar model to support thinking in addition problems.</p> <p><math>257,000 + 99,000 = ?</math></p>  <p><i>I added 100 thousands then subtracted 1 thousand.</i></p> <p><math>257 \text{ thousands} + 100 \text{ thousands} = 357 \text{ thousands}</math></p> <p><math>257,000 + 100,000 = 357,000</math>  <math>357,000 - 1,000 = 356,000</math></p> <p><i>So, <math>257,000 + 99,000 = 356,000</math></i></p>	<p>Use place value and unitising to support mental calculations with larger numbers.</p> <p><math>195,000 + 6,000 = ?</math></p> <p><math>195 + 5 + 1 = 201</math></p> <p><math>195 \text{ thousands} + 6 \text{ thousands} = 201 \text{ thousands}</math></p> <p><i>So, <math>195,000 + 6,000 = 201,000</math></i></p>
<p><b>Understanding order of operations in calculations</b></p>	<p>Use equipment to model different interpretations of a calculation with more than one operation. Explore different results.</p> <p><math>3 \times 5 - 2 = ?</math></p>	<p>Model calculations using a bar model to demonstrate the correct order of operations in multi-step calculations.</p>  <p>This can be written as: <math>16 \times 4 + 16 \times 6</math></p> <p><math>64 + 96 = 160</math></p>	<p>Understand the correct order of operations in calculations without brackets.</p> <p>Understand how brackets affect the order of operations in a calculation.</p> <p><math>4 + 6 \times 16</math>  <math>4 + 96 = 100</math></p> <p><math>(4 + 6) \times 16</math>  <math>10 \times 16 = 160</math></p>

$3 \times 5 - 2$   
 $\downarrow \quad \downarrow$   
 $3 \times 3 = 9$

$3 \times 5 - 2$   
 $\downarrow \quad \downarrow$   
 $15 - 2 = 13$

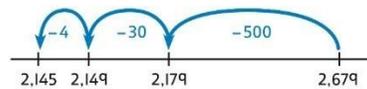
**Year 6 Subtraction**

**Comparing and selecting efficient methods**

Use counters on a place value grid to represent subtractions of larger numbers.

Th	H	T	O
●●	●●●●●	●●●●●	●●●●●
	●	●●	●●●●●

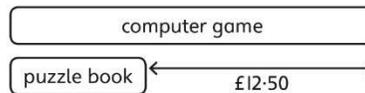
Compare subtraction methods alongside place value representations.



Th	H	T	O
●●	●●●●●	●●●●●	●●●●●
	●	●●	●●●●●

$$\begin{array}{r}
 \text{Th H T O} \\
 2 \ 6 \ 7 \ 9 \\
 - \ 5 \ 3 \ 4 \\
 \hline
 2 \ 1 \ 4 \ 5
 \end{array}$$

Use a bar model to represent calculations, including 'find the difference' with two bars as comparison.

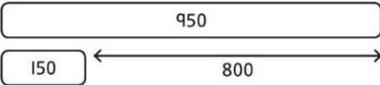
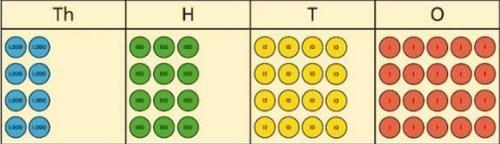
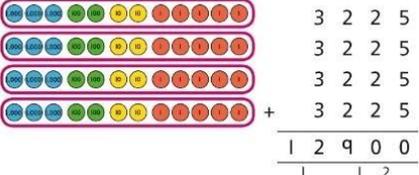
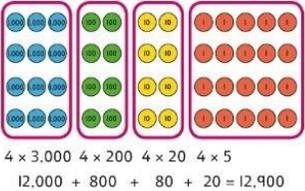
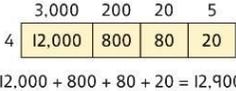
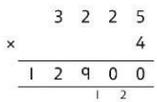


Compare and select methods. Use column subtraction when mental methods are not efficient. Use two different methods for one calculation as a checking strategy.

Th	H	T	O
1	5	5	8
-	1	5	8
	3	9	4

Use column subtraction for decimal problems, including in the context of measure.

$$\begin{array}{r}
 \text{H T O} \cdot \text{Tth Hth} \\
 3 \ 0 \ 9 \cdot 6 \ 0 \\
 - 2 \ 0 \ 6 \cdot 4 \ 0 \\
 \hline
 1 \ 0 \ 3 \cdot 2 \ 0
 \end{array}$$

<p><b>Subtracting mentally with larger numbers</b></p>		<p>Use a bar model to show how unitising can support mental calculations.</p> <p><math>950,000 - 150,000</math> That is 950 thousands – 150 thousands</p>  <p>So, the difference is 800 thousands. <math>950,000 - 150,000 = 800,000</math></p>	<p>Subtract efficiently from powers of 10.</p> <p><math>10,000 - 500 = ?</math></p>
<p><b>Year 6 Multiplication</b></p>			
<p><b>Multiplying up to a 4-digit number by a single digit number</b></p>	<p>Use equipment to explore multiplications.</p>  <p>4 groups of 2,345</p> <p>This is a multiplication:</p> <p><math>4 \times 2,345</math> <math>2,345 \times 4</math></p>	<p>Use place value equipment to compare methods.</p> <p><b>Method 1</b></p>  <p><b>Method 2</b></p> 	<p>Understand area model and short multiplication.</p> <p>Compare and select appropriate methods for specific multiplications.</p> <p><b>Method 3</b></p>  <p><math>12,000 + 800 + 80 + 20 = 12,900</math></p> <p><b>Method 4</b></p> 
<p><b>Multiplying up to a 4-digit number by a 2-digit number</b></p>		<p>Use an area model alongside written multiplication.</p>	<p>Use compact column multiplication with understanding of place value at all stages.</p>

		<p><b>Method 1</b></p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td></td> <td>1,000</td> <td>200</td> <td>30</td> <td>5</td> </tr> <tr> <td>20</td> <td>20,000</td> <td>4,000</td> <td>600</td> <td>100</td> </tr> <tr> <td>1</td> <td>1,000</td> <td>200</td> <td>30</td> <td>5</td> </tr> </table> $  \begin{array}{r}  1\ 2\ 3\ 5 \\  \times \quad 2\ 1 \\  \hline  5 \quad 1 \times 5 \\  3\ 0 \quad 1 \times 30 \\  2\ 0\ 0 \quad 1 \times 200 \\  1\ 0\ 0\ 0 \quad 1 \times 1,000 \\  1\ 0\ 0 \quad 20 \times 5 \\  6\ 0\ 0 \quad 20 \times 30 \\  4\ 0\ 0\ 0 \quad 20 \times 200 \\  2\ 0\ 0\ 0\ 0 \quad 20 \times 1,000 \\  \hline  2\ 5\ 9\ 3\ 5 \quad 21 \times 1,235  \end{array}  $		1,000	200	30	5	20	20,000	4,000	600	100	1	1,000	200	30	5	$  \begin{array}{r}  1\ 2\ 3\ 5 \\  \times \quad 2\ 1 \\  \hline  1\ 2\ 3\ 5 \quad 1 \times 1,235 \\  2\ 4\ 7\ 0\ 0 \quad 20 \times 1,235 \\  \hline  2\ 5\ 9\ 3\ 5 \quad 21 \times 1,235  \end{array}  $
	1,000	200	30	5														
20	20,000	4,000	600	100														
1	1,000	200	30	5														

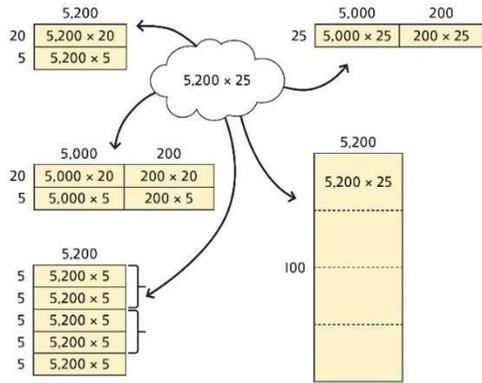
**Using knowledge of factors and partitions to compare methods for multiplications**

Use equipment to understand square numbers and cube numbers.



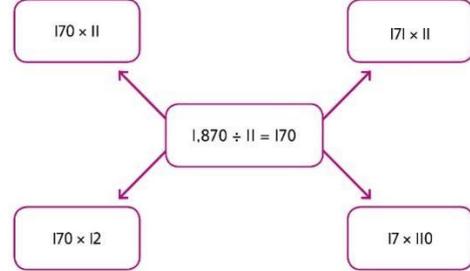

$5 \times 5 = 5^2 = 25$   
 $5 \times 5 \times 5 = 5^3 = 25 \times 5 = 125$

Compare methods visually using an area model. Understand that multiple approaches will produce the same answer if completed accurately.



Represent and compare methods using a bar model.

Use a known fact to generate families of related facts.



Use factors to calculate efficiently.

$$\begin{aligned}
 &15 \times 16 \\
 &= 3 \times 5 \times 2 \times 8 \\
 &= 3 \times 8 \times 2 \times 5 \\
 &= 24 \times 10 \\
 &= 240
 \end{aligned}$$

**Multiplying by 10, 100 and 1,000**

Use place value equipment to explore exchange in decimal multiplication.

T	O	.	Tth
		.	3 3 3

Represent 0.3.

T	O	.	Tth
		.	30 30 30

Multiply by 10.

T	O	.	Tth
3	0	.	0 0

Exchange each group of ten tenths.

$0.3 \times 10 = ?$   
 $0.3$  is 3 tenths.  
 $10 \times 3$  tenths are 30 tenths.  
 $30$  tenths are equivalent to 3 ones.

Understand how the exchange affects decimal numbers on a place value grid.

T	O	.	Tth
3	0	.	0 0

T	O	.	Tth
	3	.	3

T	O	.	Tth
	3	.	3

T	O	.	Tth
	3	.	

$3 \times 10 = 30$

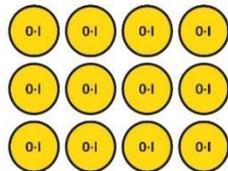
Use knowledge of multiplying by 10, 100 and 1,000 to multiply by multiples of 10, 100 and 1,000.

$8 \times 100 = 800$   
 $8 \times 300 = 800 \times 3$   
 $= 2,400$

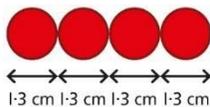
$2.5 \times 10 = 25$   
 $2.5 \times 20 = 2.5 \times 10 \times 2$   
 $= 50$

**Multiplying decimals**

Explore decimal multiplications using place value equipment and in the context of measures.



3 groups of 4 tenths is 12 tenths.  
 4 groups of 3 tenths is 12 tenths.



$4 \times 1 \text{ cm} = 4 \text{ cm}$

Represent calculations on a place value grid.

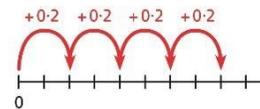
$3 \times 3 = 9$

$3 \times 0.3 = 0.9$

T	O	.	Tth
		.	9 0 0

Understand the link between multiplying decimals and repeated addition.

T	O	.	Tth
		.	0 2 0



Use known facts to multiply decimals.

$\times 3 = 12$   
 $\times 0.3 = 1.2$   
 $\times 0.03 = 0.12$

$0 \times 5 = 100$   
 $0 \times 0.5 = 10$   
 $0 \times 0.05 = 1$

Find families of facts from a known multiplication.

know that  $18 \times 4 = 72$ .

this can help me work out:

$1.8 \times 4 = ?$

$$4 \times 0.3 \text{ cm} = 1.2 \text{ cm}$$

$$4 \times 1.3 = 4 + 1.2 = 5.2 \text{ cm}$$

$$8 \times 0.4 = ?$$

$$80 \times 0.4 = ?$$

$$8 \times 0.04 = ?$$

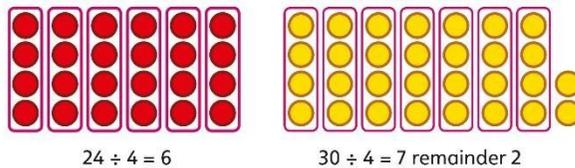
Use a place value grid to understand the effects of multiplying decimals.

	H	T	O	•	Tth	Hth
$2 \times 3$			6	•		
$0.2 \times 3$			0	•	6	
$0.02 \times 3$				•		

**Year 6  
Division**

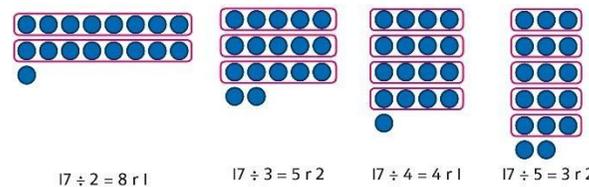
**Understanding  
factors**

Use equipment to explore different factors of a number.



*4 is a factor of 24 but is not a factor of 30.*

Recognise prime numbers as numbers having exactly two factors. Understand the link with division and remainders.

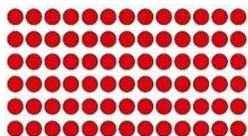


Recognise and know primes up to 100. Understand that 2 is the only even prime, and that 1 is not a prime number.

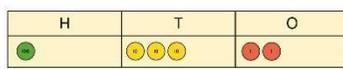
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

**Dividing by a single digit**

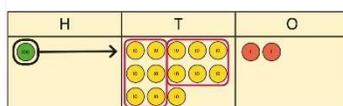
Use equipment to make groups from a total.



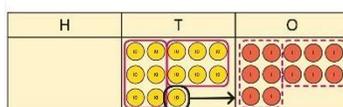
There are 78 in total.  
There are 6 groups of 13.  
There are 13 groups of 6.



How many groups of 6 are in 100?  
 $6 \overline{) 100}$



How many groups of 6 are in 13 tens?  
 $6 \overline{) 130}$



How many groups of 6 are in 12 ones?  
 $6 \overline{) 12}$

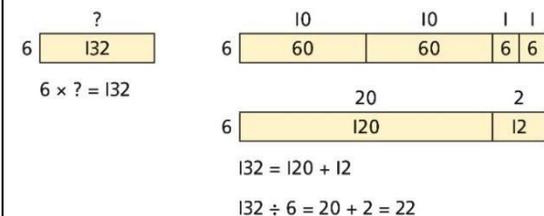
Use short division to divide by a single digit.

$$\begin{array}{r} 0 \\ 6 \overline{) 132} \end{array}$$

$$\begin{array}{r} 0 \ 2 \\ 6 \overline{) 132} \end{array}$$

$$\begin{array}{r} 0 \ 2 \ 2 \\ 6 \overline{) 132} \end{array}$$

Use an area model to link multiplication and division.



**Dividing by a 2-digit number using factors**

Understand that division by factors can be used when dividing by a number that is not prime.

Use factors and repeated division.

$$1,260 \div 14 = ?$$



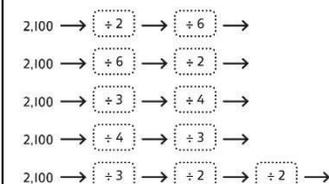
$$1,260 \div 2 = 630$$

$$630 \div 7 = 90$$

$$1,260 \div 14 = 90$$

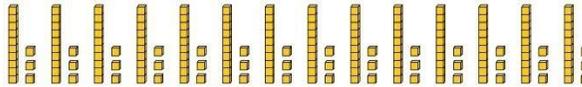
Use factors and repeated division where appropriate.

$$2,100 \div 12 = ?$$



**Dividing by a 2-digit number using long division**

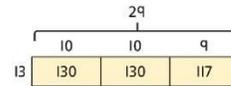
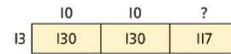
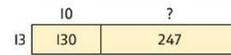
Use equipment to build numbers from groups.



182 divided into groups of 13.  
There are 14 groups.

Use an area model alongside written division to model the process.

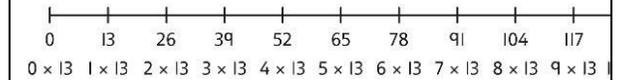
$$377 \div 13 = ?$$



$$377 \div 13 = 29$$

Use long division where factors are not useful (for example, when dividing by a 2-digit prime number). Write the required multiples to support the division process.

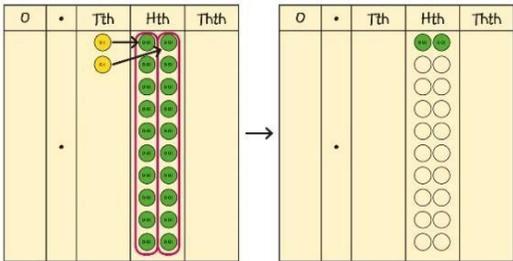
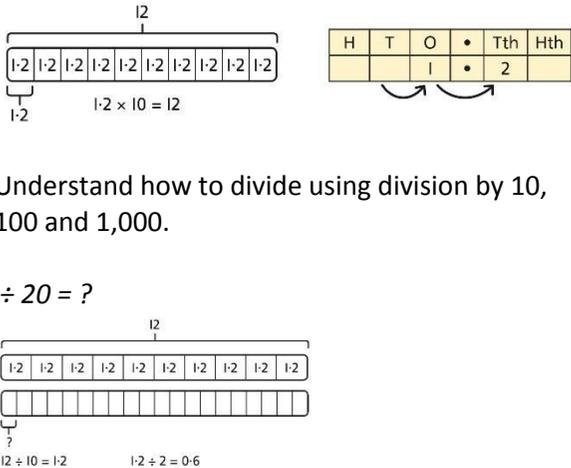
$$377 \div 13 = ?$$

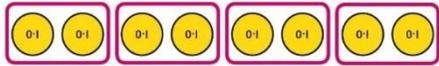


$$\begin{array}{r}
 13 \overline{) 377} \\
 - 130 \quad 10 \\
 \hline
 247 \\
 - 130 \quad 10 \\
 \hline
 117 \\
 - 117 \quad 9 \\
 \hline
 0 \quad 29
 \end{array}$$

$$377 \div 13 = 29$$

A slightly different layout may be used, with the division completed above rather than at the side.

			$\begin{array}{r} 3 \\ 21 \overline{) 798} \\ - 630 \\ \hline 168 \end{array}$ $\begin{array}{r} 38 \\ 21 \overline{) 798} \\ - 630 \\ \hline 168 \\ - 168 \\ \hline 0 \end{array}$ <p>Divisions with a remainder explored in problem-solving contexts.</p>
<p><b>Dividing by 10, 100 and 1,000</b></p>	<p>Use place value equipment to explore division as exchange.</p>  <p>Exchange each 0.1 for ten 0.01s.      Divide 20 counters by 10.</p> <p><i>0.2 is 2 tenths. 2 tenths is equivalent to 20 hundredths. 20 hundredths divided by 10 is 2 hundredths.</i></p>	<p>Represent division to show the relationship with multiplication. Understand the effect of dividing by 10, 100 and 1,000 on the digits on a place value grid.</p>  <p>Understand how to divide using division by 10, 100 and 1,000.</p> <p><math>2 \div 20 = ?</math></p>	<p>Use knowledge of factors to divide by multiples of 10, 100 and 1,000.</p> <p><math>40 \div 50 = \square</math></p> <p><math>40 \rightarrow \div 10 \rightarrow \div 5 \rightarrow ?</math></p> <p><math>40 \rightarrow \div 5 \rightarrow \div 10 \rightarrow ?</math></p> <p><math>40 \div 5 = 8</math> <math>8 \div 10 = 0.8</math></p> <p>So, <math>40 \div 50 = 0.8</math></p>
<p><b>Dividing decimals</b></p>	<p>Use place value equipment to explore division of decimals.</p>	<p>Use a bar model to represent divisions.</p>	<p>Use short division to divide decimals with up to 2 decimal places.</p>



8 tenths divided into 4 groups. 2 tenths in each group.

0.8			
?	?	?	?

$$4 \times 2 = 8$$

$$8 \div 4 = 2$$

$$\text{So, } 4 \times 0.2 = 0.8$$

$$0.8 \div 4 = 0.2$$

$$\begin{array}{r} . \\ 8 \overline{) 4 \cdot 2 \ 4} \end{array}$$

$$\begin{array}{r} 0 \cdot \\ 8 \overline{) 4 \cdot 2 \ 4} \end{array}$$

$$\begin{array}{r} 0 \cdot 5 \\ 8 \overline{) 4 \cdot 2 \ 24} \end{array}$$

$$\begin{array}{r} 0 \cdot 5 \ 3 \\ 8 \overline{) 4 \cdot 2 \ 24} \end{array}$$