St Mary's CE Primary School
'Nurturing Success'

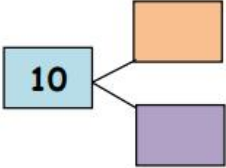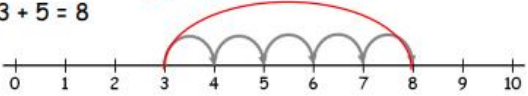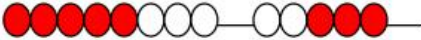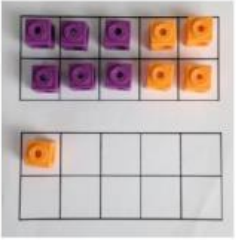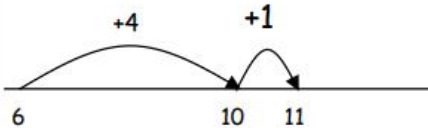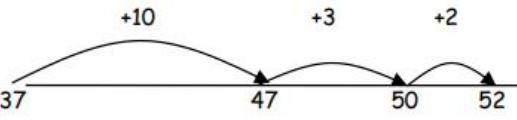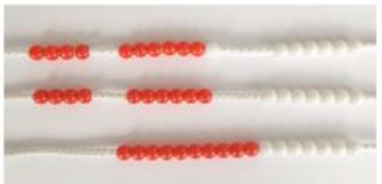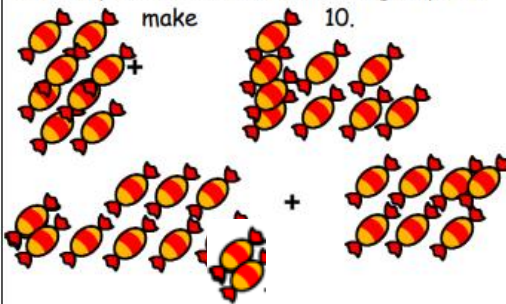| Date Reviewed: July 23 |
|---|
| Date Due for Review: July 25 |

Maths Calculation Policy

Addition			
	Concrete	**Pictorial**	**Abstract**
Part-part whole	Use objects to add two numbers together as a group or in a bar.	Use pictures to add two numbers together as a group or in a bar.	Use the part-whole diagrams to move into the abstract. $2 + 8 = 10$ $10 = 6 + 4$
Counting on	**Count on from the larger number** - 3 + 5 a child chooses the larger number, even when it is not the first number, and counts on from there: *'six, seven, eight'* '5' Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones or one big jump. $3 + 5 = 8$ Children will begin to use 'empty number lines' themselves starting with the larger number and counting on. First counting on in tens and ones. $34 + 23 = 57$	Place the larger number in your head and count on the smaller number to find your answer. **5 + 3 = 8**

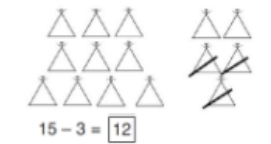| Addition			
	Concrete	Pictorial	Abstract
Regrouping to make 10	Start with the bigger number and use the smaller number to make 10. Bead strings or 10 frames and objects can be used to illustrate addition including bridging through ten by counting on 2 then counting on 3. 5 + 6 = 11	Use pictures or a number line. Regroup or partition the smaller number to make 10. 6 + 5 = 11 /\ 4 1 +4 +1 6 10 11 3 + 9 =	Bridging through ten can help children become more efficient. 37 + 15 = 52 +10 +3 +2 37 47 50 52
Adding 3 single digit	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7. Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	Add together three groups of objects. Draw a picture to recombine the groups to make 10.	Combine the two numbers that make 10 and then add on the remainder. 4 + 7 + 6 = 10 + 7 10 = 17

Addition			
	Concrete	Pictorial	Abstract
Column, no regrouping	Add together the ones first then add the tens. Use the Base 10 blocks first *before moving onto place value counters.* 24 + 15 = 	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions. 33 + 26 = 	Children use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. They begin to use an expanded layout that underpins the standard written method. $$24 = 20 + 4$$ $$+72 \quad 70 + 2$$ $$90 + 6 = 96$$
Column with regrouping	Make both numbers on a place value grid, *this example is completed using place value counters.* 146 +527 Add the ones and then exchange 10 ones for one 10. Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.	Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding. Once drawn, the children group any series of counters which are greater than ten. They should circle ten of the counters before adding onto the next column (like the exchange in the previous example).	Start by partitioning the numbers before moving on to clearly show the exchange below the addition. $$20 + 5$$ $$40 + 8$$ $$60 + 13 = 73$$ Children will consolidate the above and move on by renaming above the Place Value column $$\overset{1}{6}25$$ $$\overset{11}{3}67$$ $$+\ 48$$ $$+\ 54$$ $$673$$ $$421$$

Addition				
National Curriculum Guidance	**Addition and subtraction** 789 + 642 becomes 7 8 9 + 6 4 2 ——— 1 4 3 1 1 1 Answer: 1431	874 – 523 becomes 8 7 4 – 5 2 3 ——— 3 5 1 Answer: 351	932 – 457 becomes 8 12 1 9̸ 3̸ 2 – 4 5 7 ——— 4 7 5 Answer: 475	932 – 457 becomes 1 1 9 3 2 – 4̸ 5̸ 7 5 6 ——— 4 7 5 Answer: 475

Subtraction			
	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.	Cross out drawn objects to show what has been taken away. 15 – 3 = 12	18 - 3 = 15 8 - 2 = 6

	Concrete	Pictorial	Abstract
Subtraction			
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4 = 11 Use counters and move them away from the group as you take them away counting backwards as you go.	**Children to also use number lines to count back.** 10 and 4 less Start at the bigger number and count back the smaller number showing the jumps on the number line. This can progress all the way to counting back using two 2 digit numbers. Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4). Subtracting the tens in one jump and the units in one jump. Bridging through ten can help children become more efficient. 42 – 25 = 173 -3 -2 -20 17 20 22 42	18 - 3 = 15 8 - 2 = 6
Counting on – finding the difference	Compare amounts and objects to find the difference. Use cubes to build towers or make bars to find the difference.	Using a number line to count on. +6 0 1 2 3 4 5 6 7 8 9 10 11 12 11 – 5 = 6	18 - 3 = 15 8 - 2 = 6

	Use basic bar models with items to find the difference. 5 Pencils 3 Erasers ? A teddy costs 50p and doll costs 20p. How much more does the teddy cost? 10p 10p 10p 10p 10p 10p 10p	When dealing with larger numbers, the number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'. 82 – 47 +1 +1 +1 +10 +10 +10 +1 +1 0 47 48 49 50 60 70 80 81 82 4 cm 20 cm 3 cm 56 cm 60 cm 80 cm 83 cm Lisa 13 ? Sister 22 **Using the bar method.**	
Part part whole	Link to addition- use the part whole model to help explain the inverse between addition and subtraction. 10 If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =	Use a pictorial representation of objects to show the part-part whole model.	Move to using numerals within the part whole model. 5 10
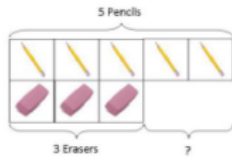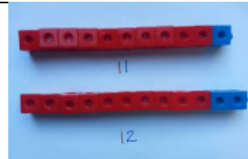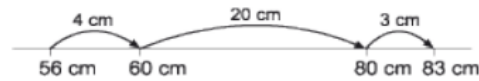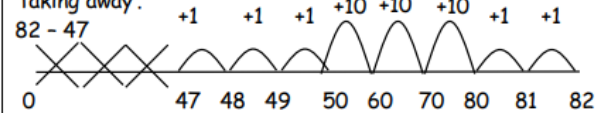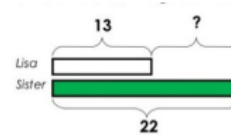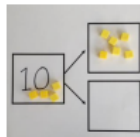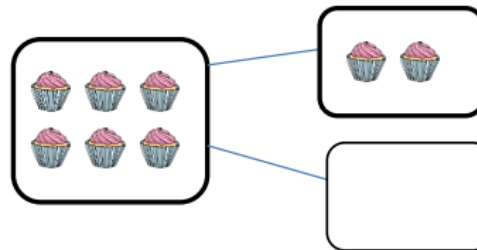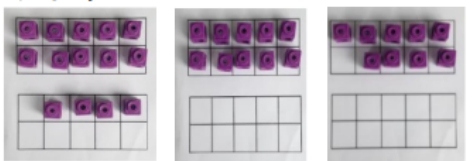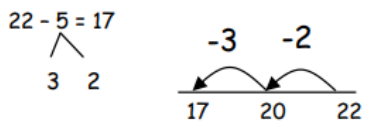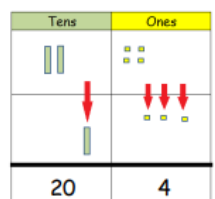
Subtraction

	Concrete	Pictorial	Abstract
Subtraction			
Make 10	Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9. 14 – 5 = 9 	Using a numberline whilst partitioning the number you re subtracting. Start at 22. Take away 2 to reach 20. Then take away the remaining 3 so you have taken away 5 altogether. You have reached your answer. 22 – 5 = 17 	16 – 8 = How many do we take off to reach the next 10? How many do we have left to take off?

Column method without regrouping	Use Base 10 to make the bigger number then take the smaller number away. Always write the calculation alongside, as seen in the example below.
	37 – 13 =
	
		Draw the Base 10 or place value counters alongside the written calculation to help to show working.
		
			Initially, the children will be taught using examples that do not need the children to exchange.
			Partitioning and decomposition.
			e.g.
			
			                   tens ones
			   89 = 80 + 9
			
			 - 57 - 50 + 7
			
			               30 + 2 = 32
			
			This will eventually lead to;

	Show how you partition numbers to subtract. Again make the larger number first.		$32 - 12 = 20$
Column method with regrouping	Use Base 10 to start with before moving on to *place value counters*. Start with one exchange before moving onto subtractions with 2 exchanges. Make the larger number with the place value counters	Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.	**Partitioning and decomposition** Children can start their formal written method by partitioning the number into clear place value columns.
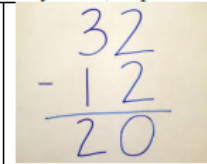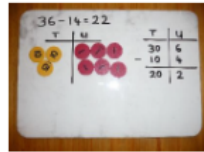
Column method with regrouping (continued):

Use Base 10 to start with before moving on to *place value counters*. Start with one exchange before moving onto subtractions with 2 exchanges.

Make the larger number with the place value counters

Start with the ones, can I take away 8 from 4 easily? I need to exchange one of the tens for ten ones.

Now I can subtract the ones.

Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens. Now I can

Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

Hundreds	Tens	Ones
600	120	6
- 200	70	5
300	50	1

Calculation: $626 - 275 = 351$

When confident, children can find their own way to record the exchange/regrouping.

Partitioning and decomposition

Children can start their formal written method by partitioning the number into clear place value columns.

$754 = $
$- 86$

	H	T	O
Step 1	700	+ 50	+ 4
-		80	+ 6

	H	T	O
Step 2	700	+ 40	+ 14 (exchange T-O)
-		80	+ 6

	H	T	O
Step 3	600	+ 140	+ 14 (exchange H-T)
-		80	+ 6
	600	+ 60	+ 8 = 668

This would be recorded by the children as

$$700 (600) + 50 (140) + {}^1 4$$
$$- \qquad 80 + 6$$
$$600 + 60 + 8 = 668$$

Decomposition

Subtraction

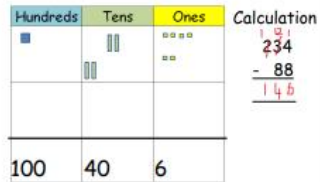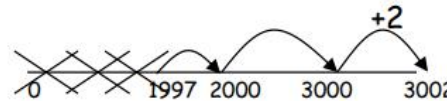|		
take away eight tens and complete the subtraction. Show the written methods beside to gather understanding. <table><tr><th>Hundreds</th><th>Tens</th><th>Ones</th><th>Calculation</th></tr><tr><td>■</td><td></td><td></td><td>234 - 88 ___</td></tr></table> <table><tr><th>Hundreds</th><th>Tens</th><th>Ones</th><th>Calculation</th></tr><tr><td>■</td><td></td><td></td><td>234 - 88 146</td></tr><tr><td>100</td><td>40</td><td>6</td><td></td></tr></table>	Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup. $42 - 18 = 24$ Step 1 Step 3 Step 2 **Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.** +2 0 1997 2000 3000 3002	**When children are secure** with the previous method they move on to decomposition. 614 1 7̶5̶4̶ - 86 ____ 668

Multiplication

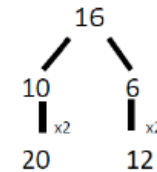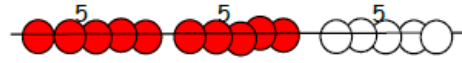|	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number. double 4 is 8 $4 \times 2 = 8$	Draw pictures to show how to double a number. Double 8	Partition a number and then double each part before recombining it back together. 16 10 6 x2 x2 20 12

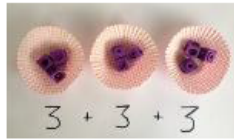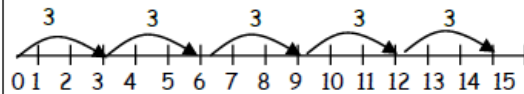| Multiplication			
Counting in multiples	Count in multiples supported by concrete objects in equal groups (**commutativity**). Show on bead bar or on a number line: $3 \times 5 = 5 + 5 + 5$	Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Repeated addition	Use different objects to add equal groups.	Children will develop their understanding of multiplication and use jottings to support calculation: Repeated addition can be shown easily on a number line: $5 \times 3 = 3+3+3+3+3$ (5 lots of 3)	Using symbols to stand for unknown numbers to complete equations using inverse operations $\square \times 5 = 20$ $3 \times \triangle = 18$ $\square \times O = 32$

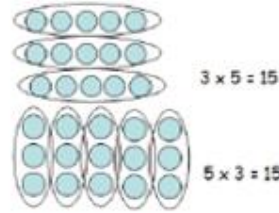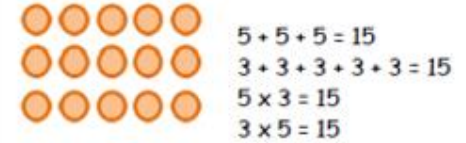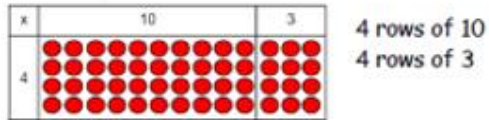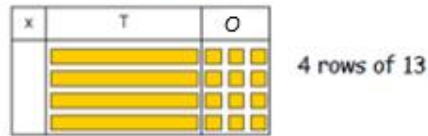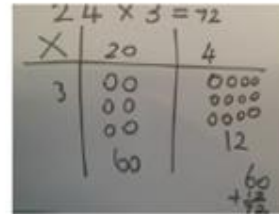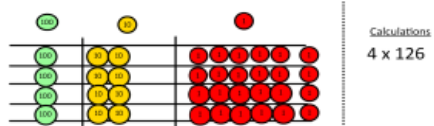| Multiplication			
Arrays – Showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences. 	Children should be able to model a multiplication calculation using an array. Arrays can be in different rotations to find **commutative** multiplication sentences. drawn $3 \times 5 = 15$ $5 \times 3 = 15$	Use an array to write multiplication sentences and reinforce repeated addition. e.g. $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$
Grid method – NOT in national curriculum	Show the link with arrays to first introduce the grid method. e.g. $13 \times 4 =$ 4 rows of 10 4 rows of 3 Move on to using Base 10 to move towards a more compact method. 4 rows of 13	Children can represent the work they have done with place value counters in a way that they understand. They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below. 	This can be followed by the formal written grid method. TO × TO 72×38 Children will approximate first; 72×38 is approximately $70 \times 40 = 2800$ <table><tr><td>×</td><td>70</td><td>2</td></tr><tr><td>30</td><td>2100</td><td>60</td></tr><tr><td>8</td><td>560</td><td>16</td></tr></table> 2100 + 560 + 60 + 16 2736

Multiplication			

Move on to *place value counters* to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows.

Calculations
4 x 126

Fill four rows with 126.

Calculations
4 x 126

Add them together making any appropriate exchanges (see addition section).

Grid method used for area work.

	10	8
10	100	80
3	30	24

Multiplication		

Column multiplication National Curriculum Guidance	***Short multiplication***		
	24 × 6 becomes	342 × 7 becomes	2741 × 6 becomes
	``` 2 4 × 6 ───── 1 4 4 2 ```	``` 3 4 2 × 7 ───── 2 3 9 4 2 1 ```	``` 2 7 4 1 × 6 ───── 1 6 4 4 6 4 2 ```
	Answer: 144	Answer: 2394	Answer: 16 446
	Long multiplication		
	24 × 16 becomes	124 × 26 becomes	124 × 26 becomes
	``` 2 2 4 × 1 6 ───── 2 4 0 1 4 4 ───── 3 8 4 ```	``` 1 2 1 2 4 × 2 6 ───── 2 4 8 0 7 4 4 ───── 3 2 2 4 1 1 ```	``` 1 2 1 2 4 × 2 6 ───── 7 4 4 2 4 8 0 ───── 3 2 2 4 1 1 ```
	Answer: 384	Answer: 3224	Answer: 3224
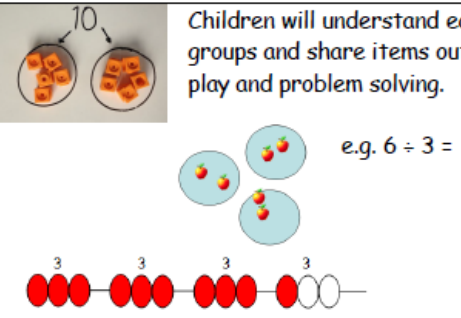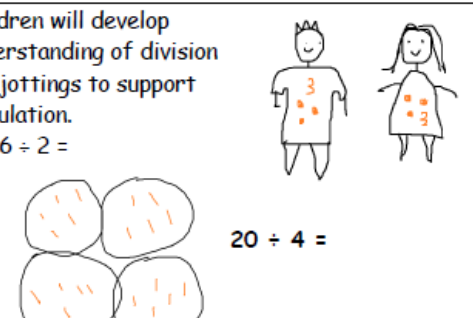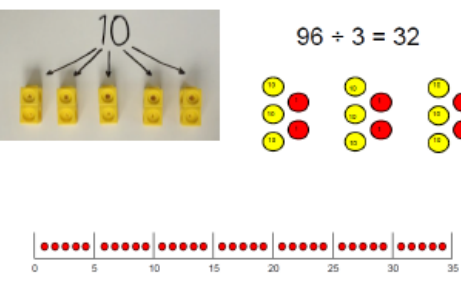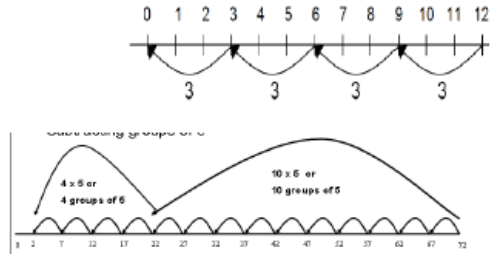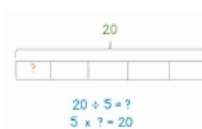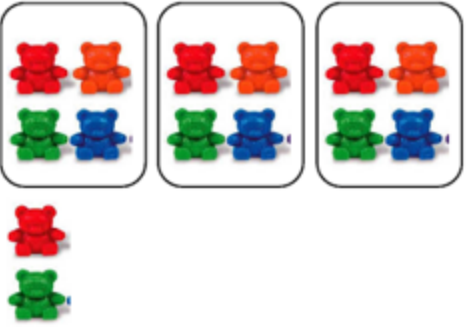
Division			
	Concrete	Pictorial	Abstract
Sharing into groups	Children will understand equal groups and share items out in play and problem solving. e.g. 6 ÷ 3 =	Children will develop understanding of division and use jottings to support calculation. e.g. 6 ÷ 2 = their and 20 ÷ 4 =	Share 9 buns between three people. $9 \div 3 = 3$ Using symbols to stand for unknown numbers to complete equations using inverse operations $\square \div 2 = 4$ $20 \div \square = 4$ $\square \div \square = 4$
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding. $96 \div 3 = 32$	Use a number line to show jumps in groups. The number of jumps equals the number of groups (repeated subtraction). For bar method, split it into the number of groups you are dividing by and work out how many would be within each group.	

Division			
	Concrete	Pictorial	Abstract
Division with a remainder	Divide objects between groups and see how much is left over. E.g. 14 ÷ 3 = 4 remainder 2.	Children may use an empty number line to support their calculation. Children should also move onto calculations involving remainders. 13 ÷ 4 = 3 r 1 Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 32 ÷ 5 = 6r2
Short division	Use place value counters to divide using the bus stop method. Place the counters in the bus stop, partitioning the tens and ones. Then place them into groups. For example; 96 ÷ 3 = 3 rows of 30 and 3 rows of 2. 	42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over. 	

We exchange this ten for ten ones and then share the ones equally among the groups.

We look how much in 1 group so the answer is 14.

Short and long division	*Short division*		
National Curriculum Guidance	98 ÷ 7 becomes	432 ÷ 5 becomes	496 ÷ 11 becomes

98 ÷ 7 becomes

$$\begin{array}{r} 1\ \ 4 \\ 7\overline{)9\ \ ^2 8} \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 8\ \ 6\ \ r\,2 \\ 5\overline{)4\ \ 3\ \ ^3 2} \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 4\ \ 5\ \ r\,1 \\ 1\ 1\overline{)4\ \ 9\ \ ^5 6} \end{array}$$

Answer: $45\frac{1}{11}$

Division

National Curriculum Guidance	**Long division**

432 ÷ 15 becomes

```
              2   8   r 12
      ┌──────────────
  1 5 │ 4   3   2
      │ 3   0   0
      │ ─────────
      │ 1   3   2
      │ 1   2   0
      │ ─────────
      │     1   2
```

Answer: 28 remainder 12

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432 ÷ 15 becomes

```
              2   8
      ┌──────────────
  1 5 │ 4   3   2
      │ 3   0   0     15×20
      │ ─────────
      │ 1   3   2
      │ 1   2   0     15×8
      │ ─────────
      │     1   2
```

$$\frac{12}{15} = \frac{4}{5}$$

Answer: $28\frac{4}{5}$

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432 ÷ 15 becomes

```
              2   8 · 8
      ┌──────────────────
  1 5 │ 4   3   2 · 0
      │ 3   0   ↓   ↓
      │ ───────
      │ 1   3   2   ↓
      │ 1   2   0   ↓
      │ ─────────
      │     1   2   0
      │     1   2   0
      │     ─────────
      │             0
```

Answer: 28·8