CALCULATION POLICY

DATE: September 2022

Brierley Primary School

Little Bears @ Brierley

CALCULATION POLICY

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Please note that early learning in number and calculation in Reception follows the 'Development Matters'' EYFS document, and this calculation policy is designed to build on progressively from the content and methods established in the Early Years Foundation Stage.

Age stage expectations
The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, however it is vital that pupils are taught according to the stage that they are currently working at, being moved onto the next level as soon as they are ready or working at a lower stage until they are secure enough to move on.

Providing a context for calculation:
It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

Concreate, pictorial and abstract

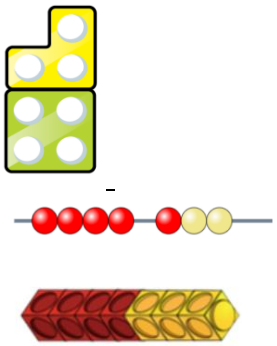
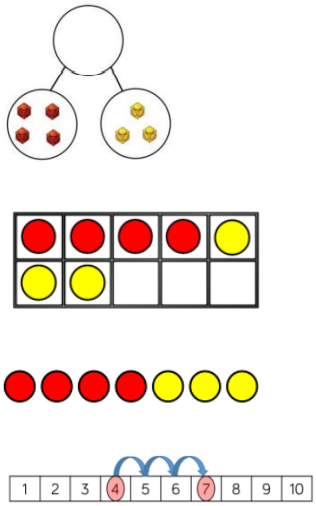
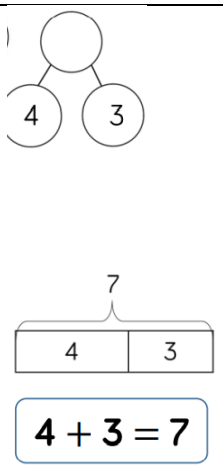
Brierley Primary School uses the concrete, pictorial and abstract approach to support children's understanding of addition, subtraction, multiplication and division concepts.

Concrete resources are also known as manipulatives. These are physical objects that children can pick up and manipulate to improve their maths knowledge. Once children are confidence with manipulatives, they will move onto pictorial approaches to solving calculations and problems. Using manipulatives and pictorial representations will prepare and support children's understanding of more abstract mathematical concepts.

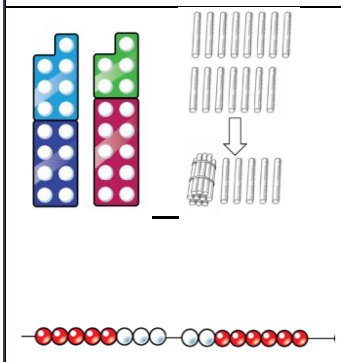
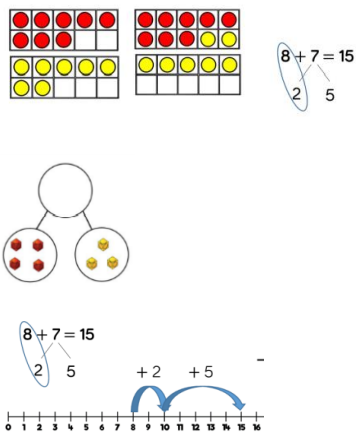
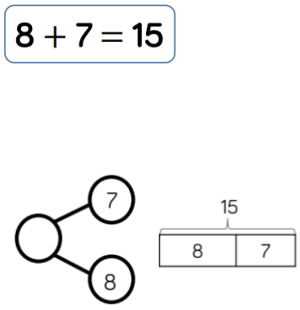
Year 1 Addition

Skill:

Add 1-digit numbers to 10

Concrete	Pictorial	Abstract
		
Numicon Beadstrings Multilink Counters	Part whole models Ten frames Picture representations of objects. Number tracks	Part whole models Number tracks Bar models

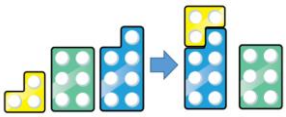
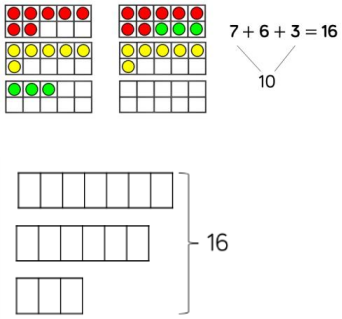
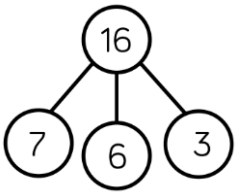
Add 1- and 2-digit numbers to 20

Concrete	Pictorial	Abstract
		
Numicon Straws Bead strings	Ten frames Part whole models Labelled number lines	Part whole models Bar models Number sentences

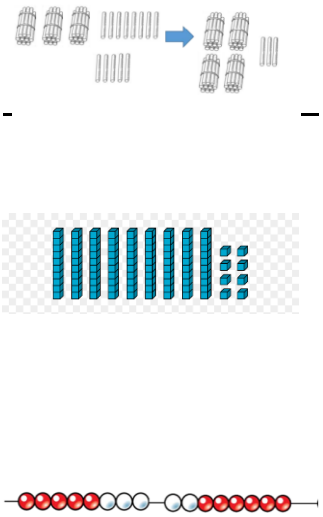
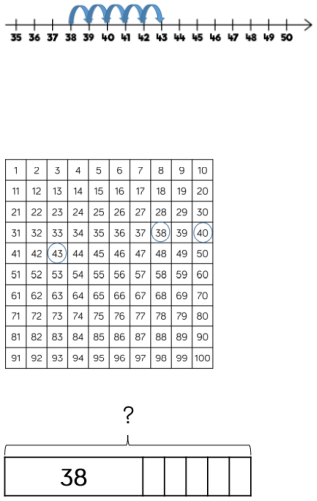
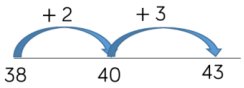
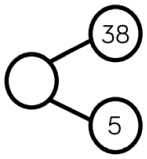
Year 2 Addition

Skill:

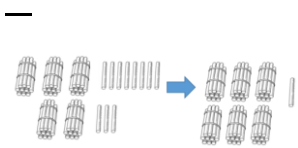
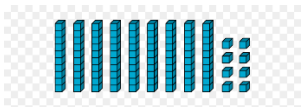
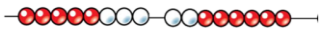
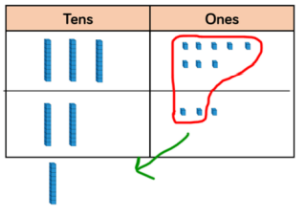
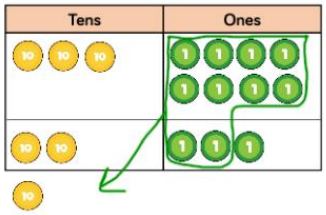
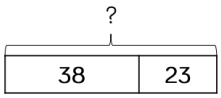
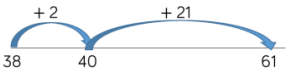
Add 3 1-digit numbers

Concrete	Pictorial	Abstract
		 7 + 6 + 3 = 16
Numicon Counters	Ten frames Bar models	Part whole models Representing as a calculation

Add 1 digit and 2-digit numbers to 100

Concrete	Pictorial	Abstract
		  38 + 5 = 43
Straws Base 10 Bead string	Labelled number line Hundred squares Bar modelling Part whole models with visual representations	Blank number lines Part whole models Number sentences

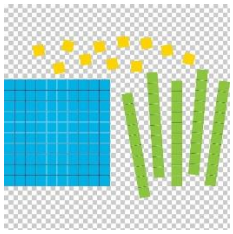
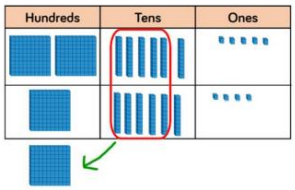
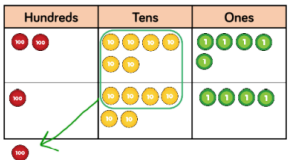
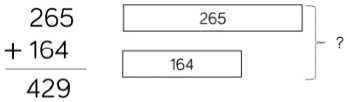
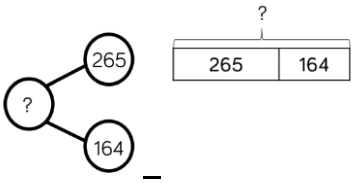
Add 2-digit numbers to 100

Concrete	Pictorial	Abstract
  	 	  38 + 23 = 61 38 + 23 61 1
Straws Base 10 Bead string	Place Value charts 10s and 1s counters Base 10 pictorial representations	Bar model Blank number line Number sentence Column addition

Year 3 Addition

Skill:

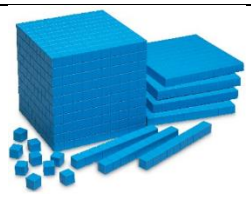
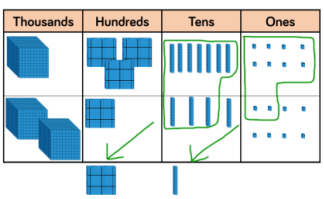
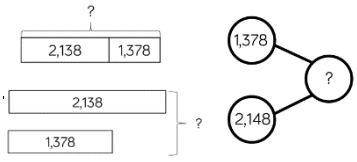
Add numbers with up to 3 digits

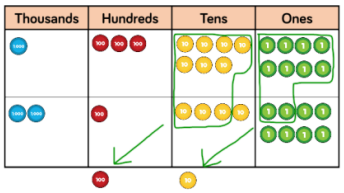
Concrete	Pictorial	Abstract
	 	265 + 164 429 1   265 + 164 = 429
Base 10	Base ten and place value charts Hundreds, tens and ones counters in place value charts Visual part whole models	Part whole models Bar models Number sentences Column addition

Year 4 Addition

Skill:

Add numbers with up to 4 digits

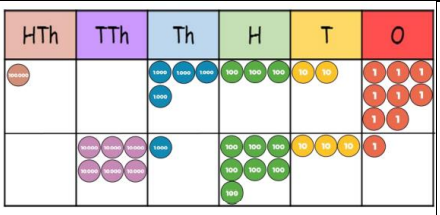
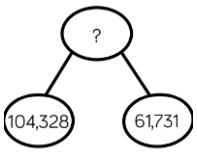
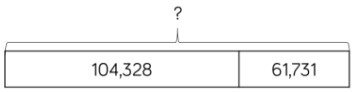
Concrete	Pictorial	Abstract
		

		1,378 + 2,148 = 3,526 1 3 7 8 + 2 1 4 8 3 5 2 6 1 1
Base 10	Place value diagrams with base 10 Thousands, hundreds, tens and one counters within a place value diagram Pictorial part whole models	Bar models and part whole models Number sentences Column addition

Year 5 and 6 Addition

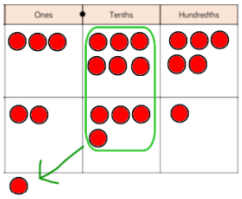
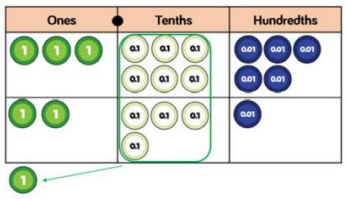
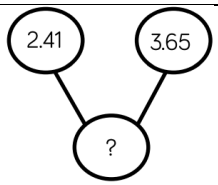
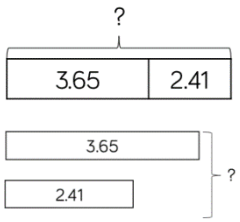
Skill:

Add numbers with more than 4 digits

Concrete	Pictorial	Abstract
–		 –  104,328 + 61,731 = 166,059 1 0 4 3 2 8 + 6 1 7 3 1 1 6 6 0 5 9 1

	Place value counters represented in a place value diagram	Part whole model and bar models Number sentences Column addition

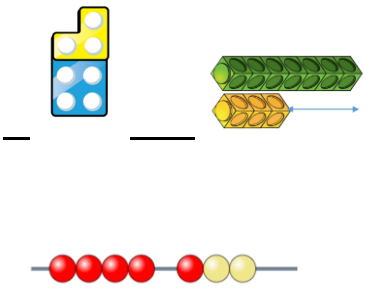
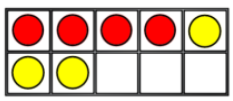
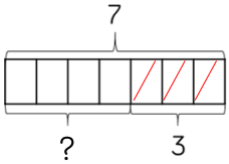
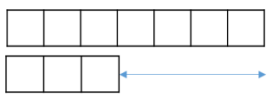
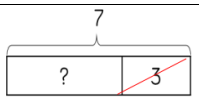
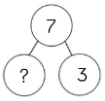
Add with up to 3 decimal places

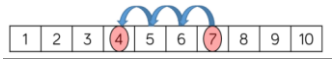
Concrete	Pictorial	Abstract
–	 	 –  $3.65 + 2.41 = 6.06$ 3.65 + 2.41 6.06 1
	Place value diagrams with counts and place value counters	Part whole models and bar models Number sentences Column addition

Year 1 Subtraction

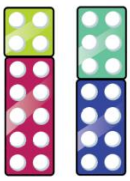
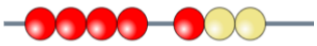
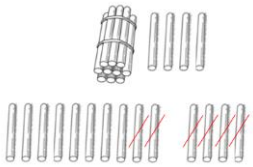
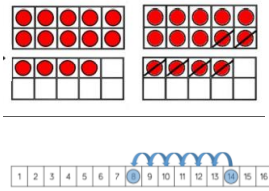
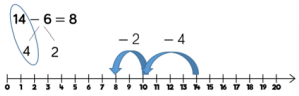
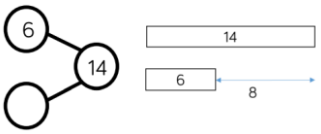
Skill:

Subtract 1-digit numbers within 10

Concrete	Pictorial	Abstract
	  	  – $7 - 3 = 4$

		
Multilink Numicon Bead string Counters	Ten frames Pictorial bar models Number tracks	Bar models Part whole models Number sentences

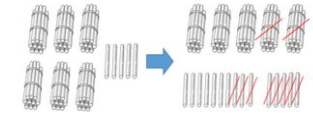
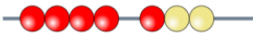
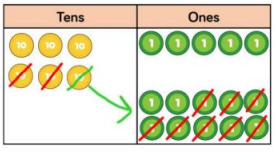
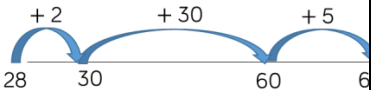
Subtract 1- and 2-digit numbers to 20

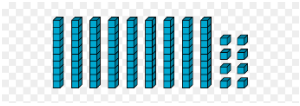
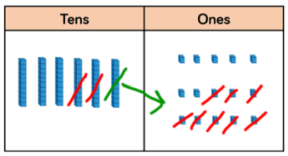
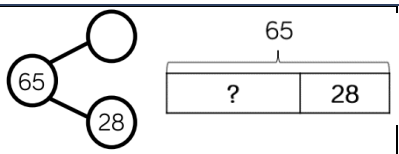
Concrete	Pictorial	Abstract
-   	  	 $14 - 6 = 8$
Numicon Bead strings Straws Multilink Counters	Ten frames Number tracks Labelled number lines	Part whole models Bar models Number sentences

Year 2 Subtraction

Skill:

Subtract 1- and 2-digit numbers to 100

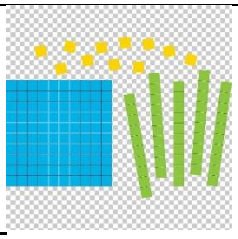
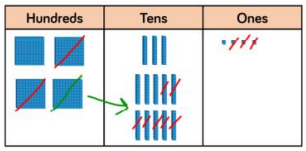
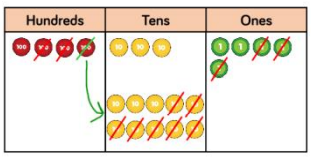
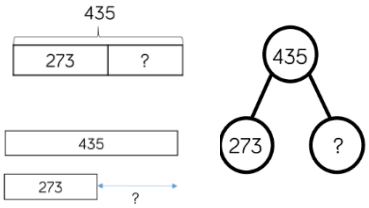
Concrete	Pictorial	Abstract
 - 		

		 65 − 28 = 37 5 1 65 − 28 37
Straws Bead strings Base 10	Place value counters and base 10 in place value charts	Blank number line to add on Part whole model and bar models Number sentences Column subtraction

Year 3 Subtraction

Skill:

Subtract numbers with up to 3 digits

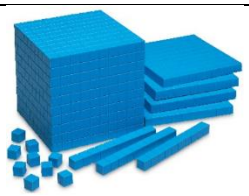
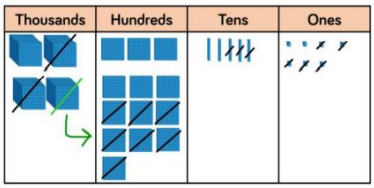
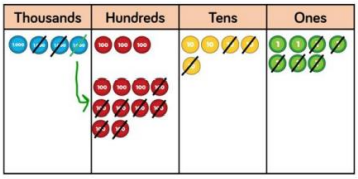
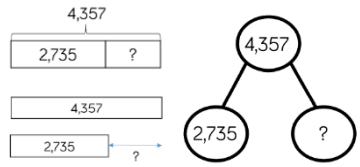
Concrete	Pictorial	Abstract
	 	 435 − 273 = 262 3 1 435 − 273 262
Base 10	Base 10 and place value counters in place value diagrams	Part whole models and bar models

		Number sentences Column subtraction

Year 4 Subtraction

Skill:

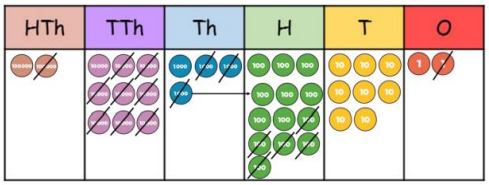
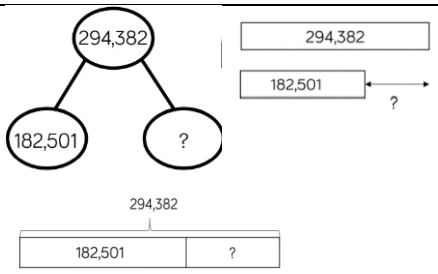
Subtract numbers up to 4 digits

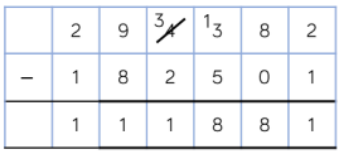
Concrete	Pictorial	Abstract
- 	 	 4,357 − 2,735 = 1,622 3 1 4357 − 2735 1622
Base 10	Base 10 and place value counters in diagrams	Part whole models and bar models Number sentences Column subtraction

Year 5 and 6 Subtraction

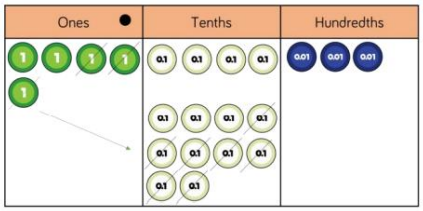
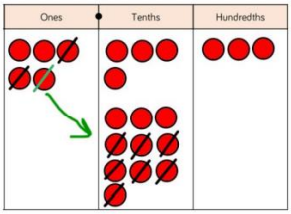
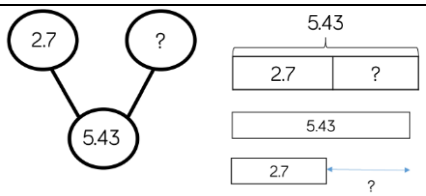
Skill:

Subtract numbers with more than 4 digits

Concrete	Pictorial	Abstract
-		

		294,382 – 182,501 = 111,881 
	Place value counters in a diagram	Part whole models and bar models Number sentences Column subtraction

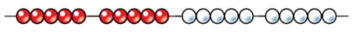
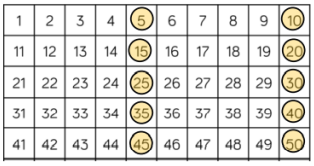
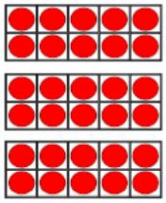
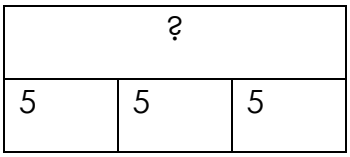
Subtract with up to 3 decimal places

Concrete	Pictorial	Abstract
-	 	 5.43 – 2.7 = 2.73 4 1 5.43 – 2.7 2.73
	Place value counters and plain counters in place value diagrams	Bar models and part whole models Number sentences Column subtraction

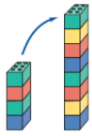
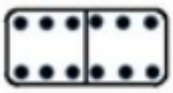
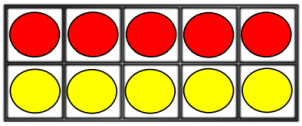
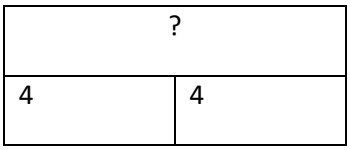
Year 1 Times Tables

Skill:

Count groups of the same number of objects and add them together

Concrete	Pictorial	Abstract
  	  	2 + 2 + 2 + 2 = 8 
Numicon Bead string Multilink Group objects	Labelled number line Number tracks 10 frames	Bar models Number sentences

Solve simple problems involving doubling

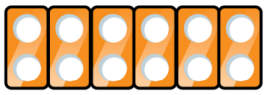
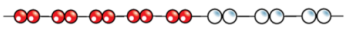
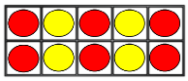
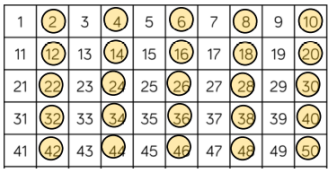
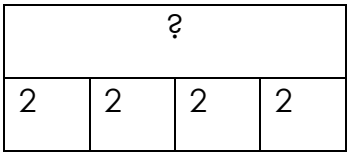
Concrete	Pictorial	Abstract
   	  	Double 3 3 + 3 = 
Multilink Numicon Counters	Pictorial representations of doubles: dominoes, ten	Part whole models and bar models Number sentences

Mirrors	frames, ladybirds, number lines	

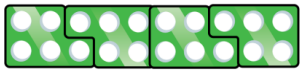
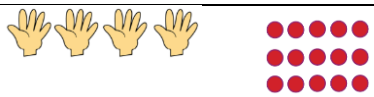
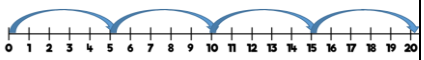
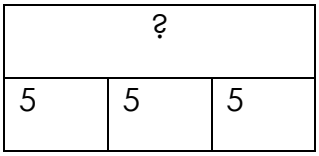
Year 2 Times Tables

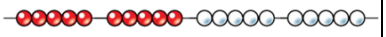
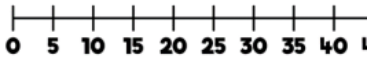
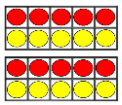
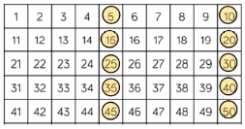
Skill:

2 times table

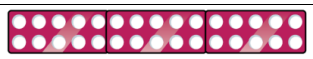
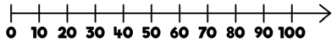
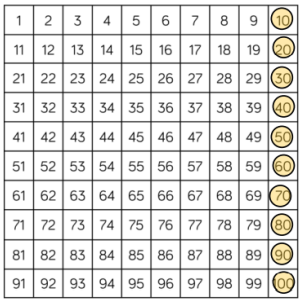
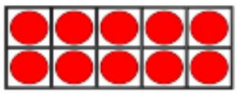
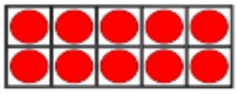
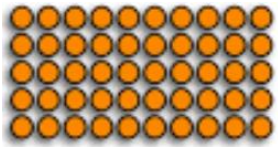
Concrete	Pictorial	Abstract
   	   	 2 + 2 + 2 + 2 = 8 4 x 2 = 8
Numicon Pairs of objects 2p coins Bead strings	Labelled number line Ten frames Hundred squares Arrays	Bar model Number sentences

5 x table

Concrete	Pictorial	Abstract
 	 	 5 + 5 + 5 =

 	  	3 x 5 =
Numicon 5p coins Multilink Beadstring	Pictorial representations of 5 Arrays Hundred squares Ten frames Labelled number line	Bar models Number sentences

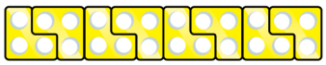
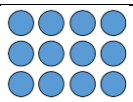
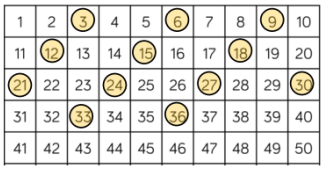
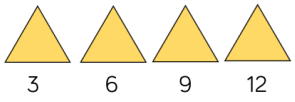
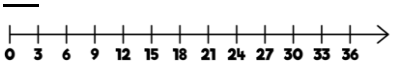
10 x table

Concrete	Pictorial	Abstract
   	    	? | 10 | 10 | 10 | 10 10 + 10 + 10 + 10 = 4 x 10 =
Numicon Coins Beadstring Base 10 Multilink Counters	Labelled number lines Hundred squares Ten frames Arrays Equal groups of	Bar model Number sentence s

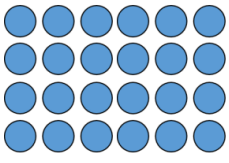
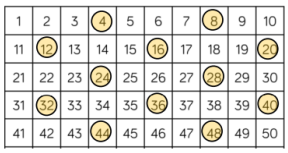
Year 3 Times Tables

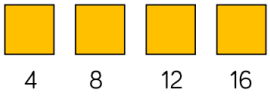
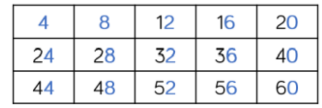
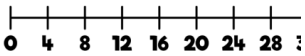
Skill:

3 x Table

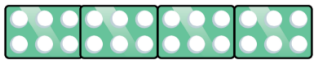
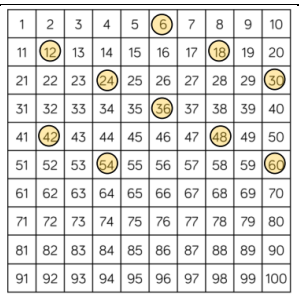
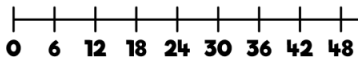
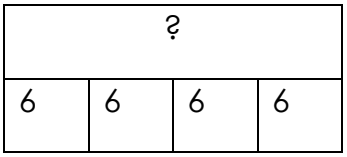
Concrete	Pictorial	Abstract
  	   	? | 3 | 3 | 3 | 3 | 3 3 + 3 + 3 + 3 + 3 5 x 3 =
Numicon Bead string Counters Multilink	Arrays Hundred squares Pictorial representations such as triangles (3 sides) Labelled number lines	Bar models Number sentences

4 x table

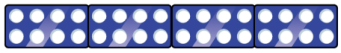
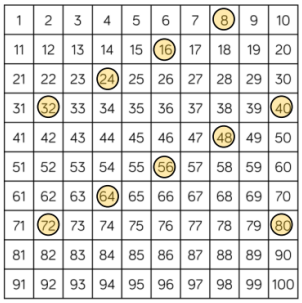
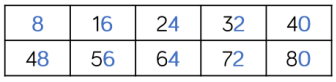
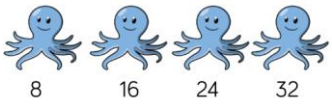
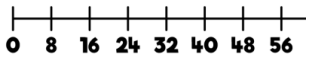
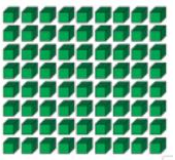
Concrete	Pictorial	Abstract
 	 	? | 4 | 4 | 4 4 + 4 + 4 = 12 3 x 4 = 12

	   	
Numicon Bead string Multilink Counters	Arrays Hundred squares Pictorial patterns Labelled number lines	Bar model Number sentences

6 x table

Concrete	Pictorial	Abstract
   	   	 6 + 6 + 6 + 6 = 24 4 x 6 = 24
Numicon Bead string Multilink Counters Egg boxes	Arrays Hundred squares Pictorial patterns Labelled number lines	Bar model Number sentences

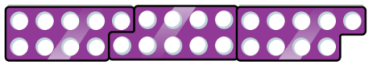
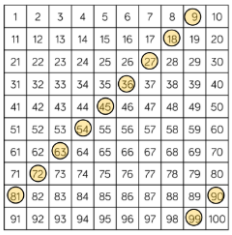
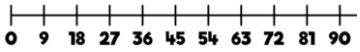
8 x tables

Concrete	Pictorial	Abstract
  	    	32 8 8 8 8 8 + 8 + 8 + 8 = 32 4 x 8 = 32
Numicon Bead string Multilink Counters	Arrays Hundred squares Pictorial patterns Labelled number lines	Bar model Number sentences

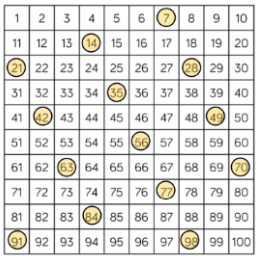
Years 3- and 4-Times Tables

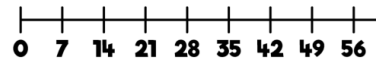
Skill

9 x table

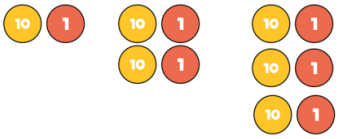
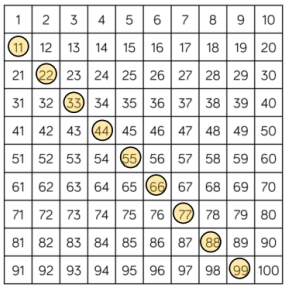
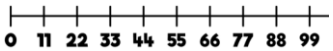
Concrete	Pictorial	Abstract
  	 9 18 27 36 45 54 63 72 81 90  	? 9 9 9 9 + 9 + 9 = 3 x 9 = 27
Numicon Bead string Multilink Counters	Arrays Hundred squares Pictorial patterns Labelled number lines	Bar model Number sentences

7 x table

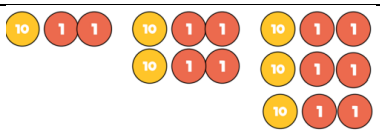
Concrete	Pictorial	Abstract
 	 7 14 21 28 35 42 49 56 63 70	21 7 7 7 7 + 7 + 7 = 21

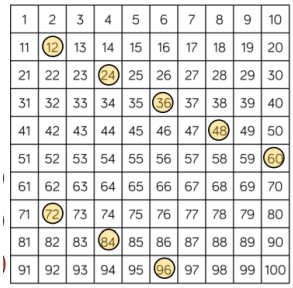
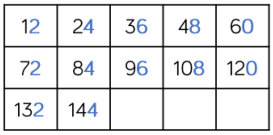
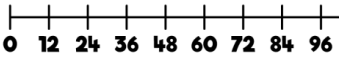
	 	3 x 7 – 21
Numicon Bead string Multilink Counters	Arrays Hundred squares Pictorial patterns Labelled number lines	Bar model Number sentences

11 x table

Concrete	Pictorial	Abstract
 	  11 22 33 44 55 66 77 88 99 110 121 132 	44 11 11 11 11 11 + 11 + 11 + 11 = 4 x 11 =
Base 10 Multilink	Place value counters Hundred squares Pictorial patterns Labelled number line	Bar model Number sentences

12 x table

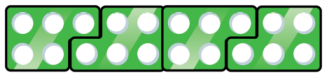
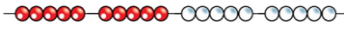
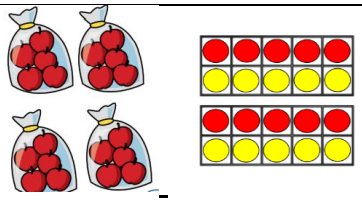
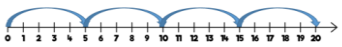
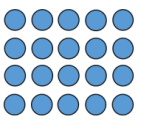
Concrete	Pictorial	Abstract
		36 12 12 12

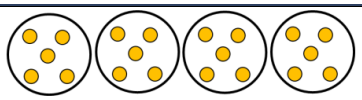
	   	12 + 12 + 12 = 36 3 x 12 = 36
Base 10 Multilink	Place value counters Hundred squares Pictorial patterns Labelled number line	Bar model Number sentences

Year 1 and 2 Multiplication

Skill:

Solve 1 step problems using multiplication

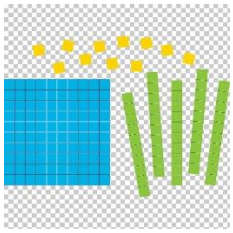
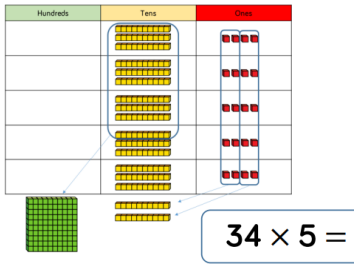
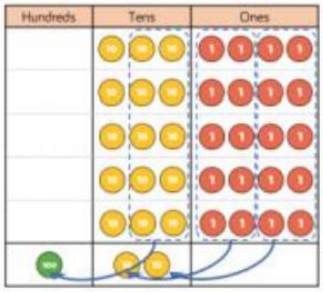
Concrete	Pictorial	Abstract
  	  	One bag holds 5 apples. How many apples do 4 bags hold? 5 + 5 + 5 + 5 = 20 4 × 5 = 20 5 × 4 = 20

		
Numicon Multiilink Real life objects Bead strings	Pictorial representations Equal groups of Arrays Labelled number line Ten frames	Written representations of a problem Number sentences

Year 3 Multiplication

Skill:

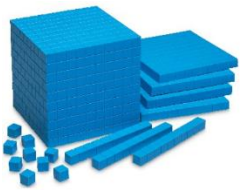
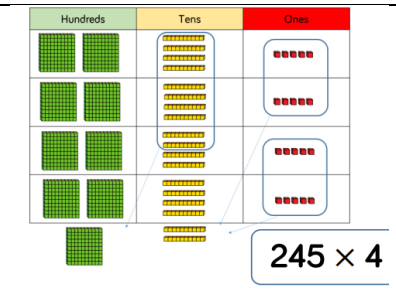
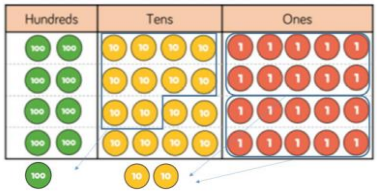
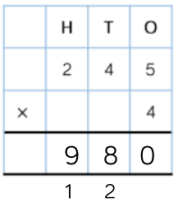
Multiply 2-digit numbers by 1 digit

Concrete	Pictorial	Abstract
	 -  -	x | 30 | 4 5 | | H T O 3 4 × 5 2 0 (5 × 4) + 1 5 0 (5 × 30) 1 7 0 H T O 3 4 × 5 1 7 0 1 2
Base 10	Base 10 and place value counters represented on a place value grid	Grid method to partition numbers Expanded column Column

Year 4 Multiplication

Skill:

Multiply 3-digit numbers by 1 digit

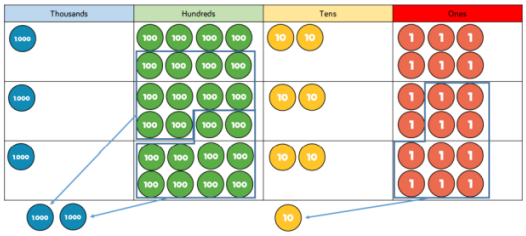
Concrete	Pictorial	Abstract
	 	 $245 \times 4 = 980$
Base 10	Base 10 and place value counters in diagrams	Column multiplication

Year 5 and 6 Multiplication

Skill:

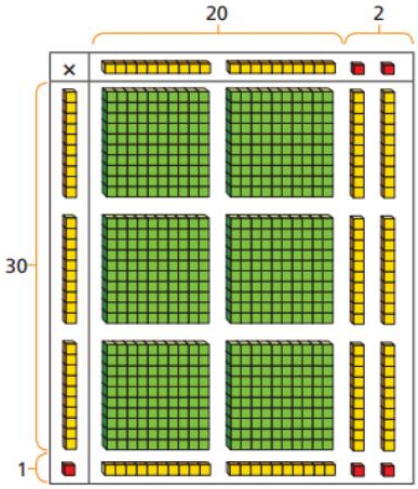
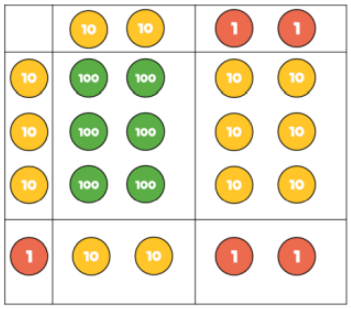
Multiply 4-digit numbers by 1-digit numbers

Concrete	Pictorial	Abstract

		$1{,}826 \times 3 = 5{,}478$ Th H T O 1 8 2 6 × 3 5 4 7 8 2 1
	Place value counters in diagrams	Column multiplication

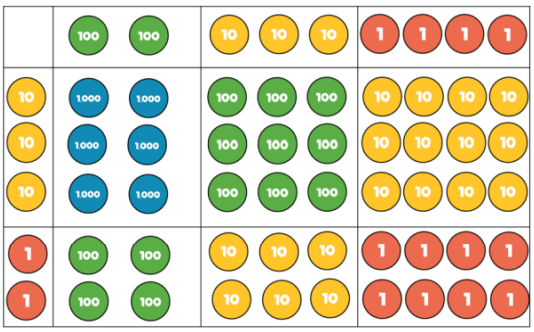
Skill:

Multiply 2-digit numbers by 2-digit numbers

Concrete	Pictorial	Abstract
	 	$22 \times 31 = 682$ × 20 2 30 600 60 1 20 2 H T O 2 2 × 3 1 2 2 6 6 0 6 8 2

	Place value counters and base 10 diagrams	Grid multiplication Column multiplication

Multiply 3-digit numbers by 2-digit numbers

Concrete	Pictorial	Abstract
		$234 \times 32 = 7{,}488$ × | 200 | 30 | 4 30 | 6,000 | 900 | 120 2 | 400 | 60 | 8 Th H T O 2 3 4 × 3 2 4 6 8 1 7 1 0 2 0 7 4 8 8
	Place value counters in a grid	Grid multiplication Column multiplication

Multiply 4 digit numbers by 2 digit numbers

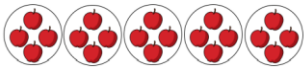
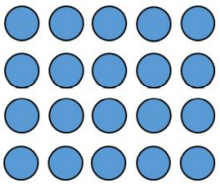
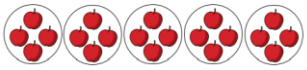
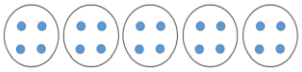
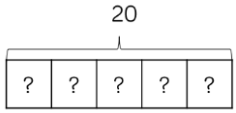
Concrete	Pictorial	Abstract
		$2{,}739 \times 28 = 76{,}692$

		<table><tr><td>TTh</td><td>Th</td><td>H</td><td>T</td><td>O</td></tr><tr><td></td><td>2</td><td>7</td><td>3</td><td>9</td></tr><tr><td>×</td><td></td><td></td><td>2</td><td>8</td></tr><tr><td>2 2</td><td>1 5</td><td>9 3</td><td>1 7</td><td>2</td></tr><tr><td>5 1</td><td>4</td><td>7 1</td><td>8</td><td>0</td></tr><tr><td>7</td><td>6</td><td>6</td><td>9</td><td>2</td></tr><tr><td></td><td></td><td>1</td><td></td><td></td></tr></table>
		Column multiplication

Year 1 and 2 Division

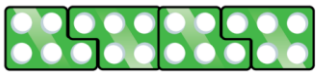
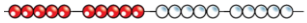
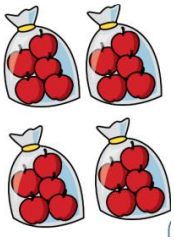
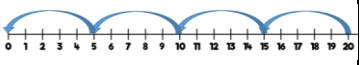
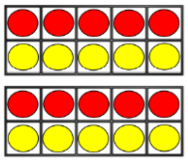
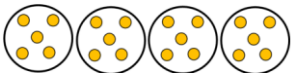
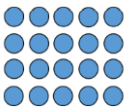
Skill:

Solve 1 step problems using division (sharing)

Concrete	Pictorial	Abstract
 	  	 There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag? $20 \div 5 = 4$
Sharing real life objects Multilink	Arrays Pictorial representations Sharing counters into bowls	Bar model Written representation of problem Number sentence

Solve 1-step problems using division (grouping)

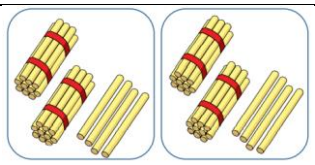
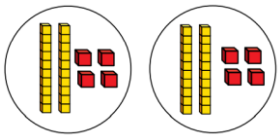
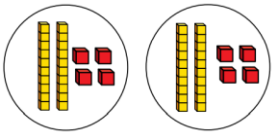
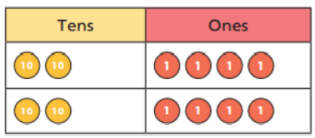
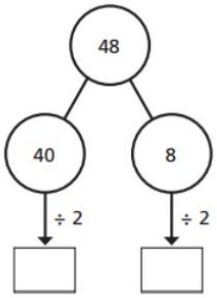
Concrete	Pictorial	Abstract

  	    	There are 20 apples altogether. They are put in bags of 5. How many bags are there? $20 \div 5 = 4$
Bead strings Numicon Multilink	Arrays Pictorial representations Bowls Labelled number line Ten frames	Written representation of problem Number sentence

Year 2 and 3 Division

Skill:

Divide 2 digits by 1 digit (Sharing with no exchange)

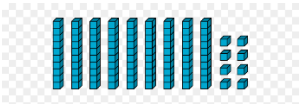
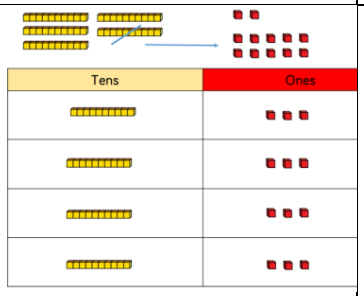
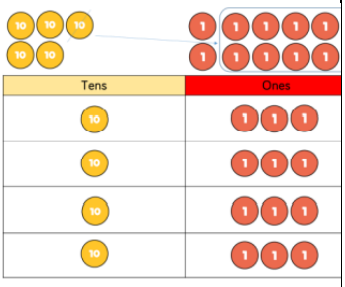
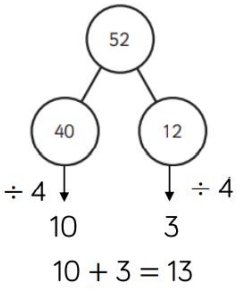
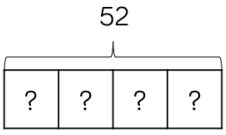
Concrete	Pictorial	Abstract
 	 	 48 40 8 ÷ 2 ÷ 2 **48 ÷ 2 = 24**

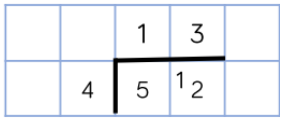
Straws Base 10	Picture representations using base 10 Place value counters in diagram	Part whole model Number sentence

Year 3 and 4 Division

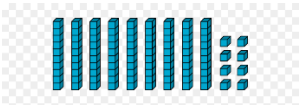
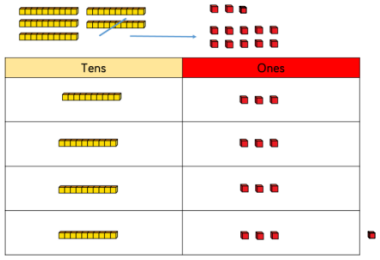
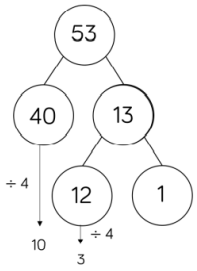
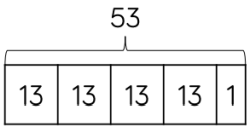
Skill:

Divide 2 digits by 1 digit

Concrete	Pictorial	Abstract
	  	 10 + 3 = 13  52 ÷ 4 = 13

		
Base 10	Place value counters and base 10 in diagrams	Part whole models Bar models Number sentences Bus stop division

Divide 2 digit by 1 digit with remainders

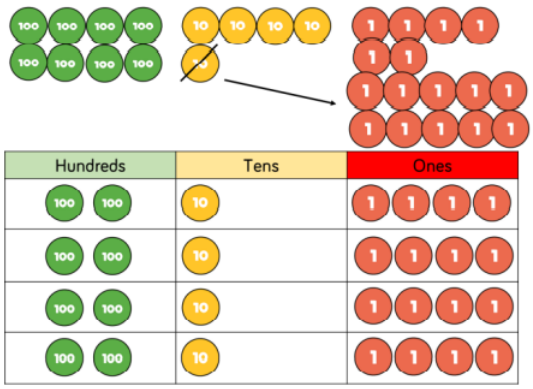
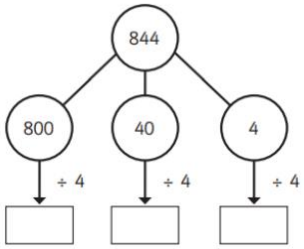
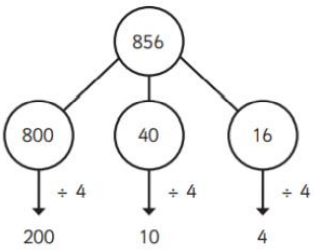
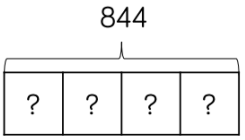
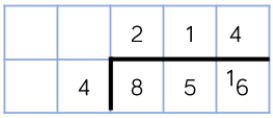
Concrete	Pictorial	Abstract
	 	  $53 \div 4 = 13\ r1$
Base 10	Place value counters and base 10 in diagrams	Part whole models Bar models Number sentences Bus stop division

Year 3 and 4 Division

Skill:

Divide 3 digits by 1 digit

Concrete	Pictorial	Abstract

		844 ÷ 4 = 211    
	Place value counters and base 10 in diagrams	Part whole models Bar models Number sentences Bus stop division

Year 5 and 6 division

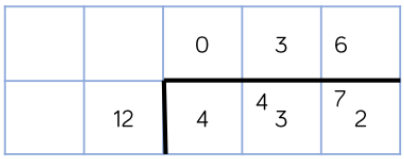
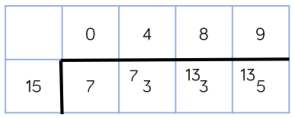
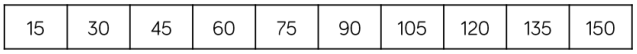
Skill

Divide 4 digits by 1 digit

Concrete	Pictorial	Abstract

		
		Bus stop division

Divide multi-digits by 2 digits (Short division)

Concrete	Pictorial	Abstract
		432 ÷ 12 = 36  **7,335 ÷ 15 = 489**  
		Bus stop division Write out multiples to support

Divide multi-digits by 2 digits (Long division)

Concrete	Pictorial	Abstract

		0	3	6		
1	2	4	3	2	(×30)	
	–	3	6	0		
			7	2	(×6)	
	–		7	2		
				0		

$12 \times 1 = 12$
$12 \times 2 = 24$
$12 \times 3 = 36$
$12 \times 4 = 48$
$12 \times 5 = 60$
$12 \times 6 = 72$
$12 \times 7 = 84$
$12 \times 8 = 96$
$12 \times 7 = 108$
$12 \times 10 = 120$

$432 \div 12 = 36$

$7{,}335 \div 15 = 489$

	0	4	8	9		
15	7	3	3	5		
–	6	0	0	0	(×400	
	1	3	3	5		
–	1	2	0	0	(×80)	
		1	3	5		
–		1	3	5	(×9)	
				0		

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

$372 \div 15 = 24\ r12$

			2	4	r	1	2
1	5	3	7	2			
	–	3	0	0			
			7	2			
	–		6	0			
			1	2			

$1 \times 15 = 15$
$2 \times 15 = 30$
$3 \times 15 = 45$
$4 \times 15 = 60$
$5 \times 15 = 75$
$10 \times 15 = 150$

			2	4	$\frac{4}{5}$
1	5	3	7	2	
	–	3	0	0	
			7	2	
	–		6	0	
			1	2	

$372 \div 15 = 24\frac{4}{5}$

Review: September 2023