Darley and Summerbridge Primary School Federation

Maths Curriculum Handbook

Contents Page

Priorities Identified for the improvement of the Maths Curriculum	How will this be achieved?	Success Criteria	From
Establish a dual-input structure in all classrooms to effectively differentiate lesson content and meet pupils' individual needs.	**Professional Development for Teachers** - Provide targeted training on effective differentiation strategies, including dual-input structures. - Share best practices and examples of dual-input lessons through staff meetings or CPD sessions. **Planning and Collaboration** - Encourage teachers to plan lessons collaboratively, focusing on identifying key concepts that require differentiation. - Develop clear lesson plans with two input levels and independent activities **Classroom Arrangement** - Seating plans and groupings to enable smooth delivery of differentiated inputs, such as through small groups or paired activities. - Establish routines that allow pupils to transition easily between different input groups. **Assessment and Feedback** - Use formative assessment to identify pupils' starting points and adjust inputs accordingly. - Regularly review pupil progress to ensure that dual inputs are meeting their needs and make necessary refinements. **Support from Teaching Assistants** - Train teaching assistants to deliver targeted support during one of the inputs, ensuring pupils who need additional help receive focused attention.	**Improved Pupil Outcomes**: Evidence from formative and summative assessments shows progress for all ability groups. **Increased Pupil Engagement**: Pupils are focused, actively participating, and report finding lessons appropriately challenging. **Consistent Implementation Across Classrooms**: Learning walks and observations confirm uniform use of the dual-input structure. **Reduced Learning Gaps**: Assessment data indicates narrowing gaps between lower-achieving pupils and their peers. **Positive Staff Feedback**: Teachers report confidence and satisfaction with the dual-input approach. **Effective Use of Resources**: Teachers utilise TAs, materials, and differentiated strategies effectively.	
Ensure consistency in the delivery of maths lessons using White Rose Maths (WRM) resources to support high-quality lesson inputs.	**Staff Training and Familiarisation** - Provide comprehensive training on the WRM scheme, ensuring all staff understand its structure, resources, and pedagogy. - Share exemplar lessons and model how to use WRM resources effectively in planning and delivery. **Standardised Planning Expectations** - Develop a consistent lesson planning format aligned with WRM principles, ensuring all teachers include fluency, reasoning, and problem-solving in their lessons.	**Improved Lesson Quality**: Observations and learning walks confirm high-quality, consistent lesson delivery aligned with WRM principles. **Pupil Progress and Engagement**: Assessment data and pupil feedback indicate improved understanding and active participation in maths lessons.	

Embed a robust formative and summative assessment strategy aligned with the planned curriculum, utilising WRM assessments.	**Effective Use of Formative Assessment** -Incorporate regular, low-stakes quizzes, questioning techniques, and whiteboard responses to check pupils' understanding during lessons. -Use WRM diagnostic questions and reasoning problems to gauge depth of understanding. **Standardised Summative Assessments** -Schedule WRM end-of-unit and termly assessments to evaluate pupils' mastery of the curriculum. -Ensure all year groups use the same format and grading criteria to maintain consistency and reliability. **Data Collection and Analysis** -Use assessment results to identify patterns of achievement and under performance at the class, year group, and individual levels. -Analyse data to inform planning, adjust teaching strategies, and target interventions. **Targeted Interventions** - Design catch-up sessions or tailored support based on assessment outcomes to address identified gaps. - Use WRM's small-step approach to revisit specific concepts and scaffold learning for those struggling. **Staff Training** - Provide training on effective formative assessment techniques and the use of WRM assessment tools. - Ensure staff are confident in interpreting data and using it to adapt instruction. **Regular Monitoring and Review** - Schedule regular moderation meetings to ensure consistency in marking and assessment judgements across year groups.	**Curriculum Alignment**: Assessment tasks closely reflect WRM's small steps and key objectives. **Improved Pupil Progress Tracking**: Regular analysis of formative and summative data shows progress across all ability groups. **Targeted Interventions**: Assessment outcomes inform timely and effective interventions for pupils not meeting expectations. **Consistency Across Year Groups**: Teachers use the same formative and summative tools, ensuring a uniform approach. **Teacher Confidence**: Staff demonstrate proficiency in using WRM assessments to inform planning and differentiation. **Pupil Engagement with Feedback**: Pupils understand their progress and next steps through consistent and actionable feedback.	
Implement a meaningful system for supporting and monitoring staff to deliver effective and impactful maths lessons.	**Professional Development** - Initial Training: Provide all staff with CPD on effective maths teaching strategies, focusing on the school's chosen approach (e.g., mastery, White Rose Maths). -Ongoing Support: Schedule regular workshops, peer observations, and coaching sessions to address emerging needs. **Collaborative Planning** - Facilitate regular planning meetings where staff can collaboratively design lessons, share resources, and address challenges. - Establish a planning framework to ensure lessons include fluency, reasoning, and problem-solving components. **Consistent Monitoring**	**Regular Observations**: learning walks show a consistent approach to the delivery of maths across the federation **Mentor-ing and Coaching**: Teacher feel supported and skilled to deliver high quality maths lessons to mixed age classes.	

	- Lesson Observations: Conduct regular observations, focusing on the quality of lesson delivery, engagement, and differentiation. - Learning Walks: Schedule informal learning walks to identify strengths and areas for improvement in real-time. - Pupil Voice: Collect feedback from pupils about their learning experience to assess the effectiveness of lessons.		
Develop a consistent approach to building fluency skills with a clear progression across all year groups.	**Define Fluency Expectations** - Clearly outline what fluency entails at each stage, including speed, accuracy, and flexibility in applying mathematical skills. - Establish year-group-specific benchmarks aligned with the national curriculum and mastery principles. **Curriculum Mapping** - Map fluency skills across year groups to ensure a logical progression of concepts, such as number bonds, times tables, and efficient calculation methods. - Integrate fluency objectives into the school's medium- and long-term plans. **Dedicated Fluency Sessions** - Schedule regular, short fluency sessions (e.g., daily 10–15-minute activities and a weekly fluency session in KS2) to build automatic key skills. - Use consistent strategies and resources, such as flashcards, quick-fire quizzes, and White Rose Maths (WRM) fluency tasks.	**Improved Pupil Fluency**: Regular assessments (formative and summative) show increased fluency in basic mathematical operations, with pupils achieving age-related expectations for fluency at each key stage. **Progress Tracking**: Monitoring of pupil progress over time reveals a clear and consistent improvement in fluency, particularly in core areas such as number bonds, multiplication tables, and mental arithmetic. **Consistency in Teaching**: Observations and learning walks confirm that all teachers are delivering fluency lessons with a clear structure and progression, following the mapped curriculum.	
Enhance the adaptation of WRM resources to address the needs of pupils in mixed-age classes.	**Adapt Resources** - Modify WRM lesson slides and worksheets to include tasks appropriate for both age groups. - Use mixed-age-friendly activities, such as open-ended tasks or investigations, that allow pupils to engage at different levels of complexity.	**Consistency in Teaching:** Books will show a consistent approach to the adaptation of the WRM resources to meet the needs of our pupils	
Provide WRM training for all staff to promote a consistent approach and equip them with the necessary skills to effectively implement the scheme.	**Engage External Expertise** - Invite WRM trainers or maths specialists to deliver professional development sessions. - Alternatively, identify an in-house expert who can lead training, ensuring it aligns with the school's context. **Provide Comprehensive Training** - Initial Workshop: Introduce the philosophy, structure, and key components of the WRM scheme. Highlight how fluency, reasoning, and problem-solving are integrated into lessons. - Hands-On Planning: Offer guided sessions where staff collaboratively plan lessons using WRM resources, ensuring consistency in approach. Effective Delivery: Focus on modelling lesson delivery, including using manipulative, scaffolding, and differentiation for diverse learners. Assessment Use: Train staff on incorporating WRM formative and	**CPD**: Teachers feel supported and skilled to deliver high quality maths lessons to mixed age classes.	

Maths Curriculum Intent Documents

Our Vision

"At Darley and Summerbridge Primary Schools, we aim to inspire a lifelong love of mathematics, equipping pupils with the confidence, resilience, and skills to explore mathematical concepts deeply and apply them in various contexts. By adopting the White Rose Maths approach, we commit to developing each child's fluency, reasoning, and problem-solving skills, ensuring a solid mathematical foundation for future learning."

Our mathematics curriculum is designed to:

Foster Fluency in Mathematical Fundamentals

Through the White Rose Maths approach, we ensure that pupils engage in varied and frequent practice of key mathematical concepts. Structured lesson sequences allow pupils to revisit and consolidate prior learning while building fluency in core operations. This progressive practice supports pupils in developing the ability to recall facts and apply methods accurately and efficiently, forming a solid base for tackling more advanced mathematical ideas.

Encourage Mathematical Reasoning

We believe that true understanding comes from exploring patterns, making connections, and justifying solutions. Using the White Rose Maths curriculum, pupils are encouraged to think critically and articulate their reasoning. We support them in following lines of enquiry, identifying relationships, and making generalisations, enabling them to confidently develop arguments, proofs, and justifications with mathematical language.

Build Problem-Solving Skills Through Mastery

White Rose Maths empowers pupils to apply their mathematical knowledge to a variety of contexts, both routine and non-routine. They learn to break down complex problems into manageable steps, exploring different strategies to find solutions. We nurture their ability to persevere and adapt, developing the confidence to approach challenges creatively and the resilience to try new approaches when faced with difficulties.

Promote Depth of Understanding for All Learners

The White Rose Maths mastery approach is built on the belief that every child can achieve in mathematics. By using concrete, pictorial, and abstract representations, we ensure all pupils develop a deep, conceptual understanding of mathematical concepts. The curriculum is inclusive, supporting those who need additional practice and offering challenges to deepen understanding for pupils who grasp concepts quickly.

Our Approach

To implement our intent, we ensure that:

Lesson Sequences Build on Prior Knowledge

We use carefully structured small steps, which are set out by the White Rose Maths progression documents, to ensure every concept is built on solid foundations, reducing cognitive overload and encouraging deep, sustainable understanding.

Concrete, Pictorial, and Abstract Representations

We use these representations to scaffold learning and develop a deep conceptual understanding that allows pupils to visualise and manipulate mathematical concepts confidently.

Assessment Informs Planning

Regular formative and summative assessments allow teachers to identify gaps, address misconceptions, and provide targeted interventions to ensure progress for all.We check pupils' prior knowledge from the previous year *before* starting a new unit. In this way, we are able to adapt our teaching to meet the needs of all pupils.

Impact

Through our implementation of the White Rose Maths curriculum, we aim for all pupils to leave Darley and Summerbridge Primary Schools with:

A secure understanding of mathematical concepts and the ability to apply these with confidence.

Strong problem-solving skills, demonstrating resilience and adaptability in unfamiliar contexts.

A love for mathematics and a belief in their own potential as mathematicians.

Our approach seeks to inspire pupils to see mathematics not only as an academic subject, but as a valuable tool for life.

Teaching Maths - The WRM Mastery Approach

Our teaching is based on the recommended National Curriculum and is then personalised to meet the needs of our learners.

To support consistency of our mastery approach, we follow the White Rose Maths schemes of work from Early Years, through to Year 6. This has helped to sequence the objectives for each individual year group and to ensure pace and progression within skills throughout school.

However, the learning suggested by White Rose Maths can – and should – be adapted if the teacher sees fit. It may be, for example, that the worksheet provided by White Rose Maths is seen to move on to quickly from fluency to reasoning, or have too many different types of problem for pupils to cope with in regard to their working memories. In such cases, teachers will use different resources (or make their own) in order to create a lesson that they feel most appropriate for their pupils.

White Rose must be our main resource, however we do also have access to the following schemes which run alongside WRM and complement the lessons:

Master the Curriculum

Pre School Maths Progression

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn Starters: Number songs	Colours • Red • Blue • Yellow	Colours • Green • Purple • Mix of colours	Match • Buttons and colours • Matching towers • Matching shoes	Match • Match number shapes • Match shapes • Pattern handprints – big and small	Sort • Colour • Size • Shape	Sort • What do you notice? • Guess the rule • Guess the rule	Number 1 • Subitising • Counting • Numeral	**Number 2** Subitising- dice pattern Subitising- random pattern Subitising – different sizes	**Number 2** • Counting • Numeral • Numeral	**Pattern** • Extend AB Colour patterns • Extend AB Outdoor Patterns • AB Movement Patterns	• Fix my Pattern • Extend ABC Colour patterns • Extend ABC Outdoor Patterns	Consolidation Activities - Winter activity week
Spring Starters: Number songs	Number 3 Subitising Subitising Subitising	Number 3 3 Little pigs 1:1 counting Numerals/Triangles	Number 4 1:1 counting Numerals Squares/rectangles	Number 4 Composition of 4 Composition of 4 Composition of 4	Number 5 1:1 counting Numerals Pentagon	Number 5 Composition of 5 Composition of 5 Composition of 5	Consolidate 1 - 5	Number 6 Introduce 10 frame	Height & Length • Tall and short • Long and short • Tall/long and short	Mass Relate to books 3 little pigs goldilocks	Capacity	Consolidation
Summer Starters – subitising and revision	Sequencing	Positional Language	More than/fewer than	Shape – 2D Revisit pattern from Autumn	Shape – 3D Revisit pattern from Autumn	Consolidation: More than/fewer one more and one less	Number composition 1 – 5 Revision	What comes after?	What comes before?	Numbers to 5	Consolidation / Activity weeks SUMMER	Consolidation / Activity weeks

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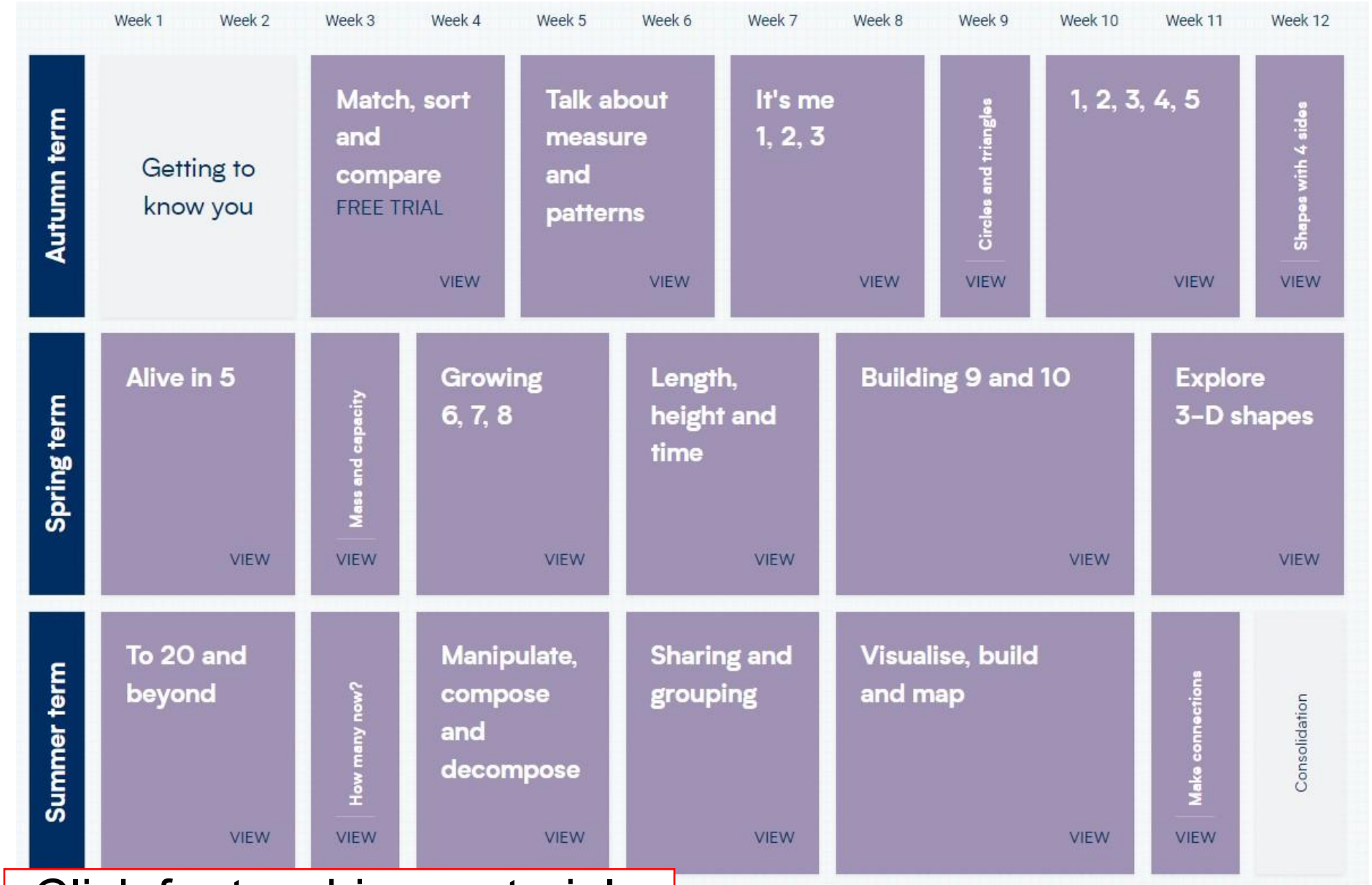
Reception Maths Progression



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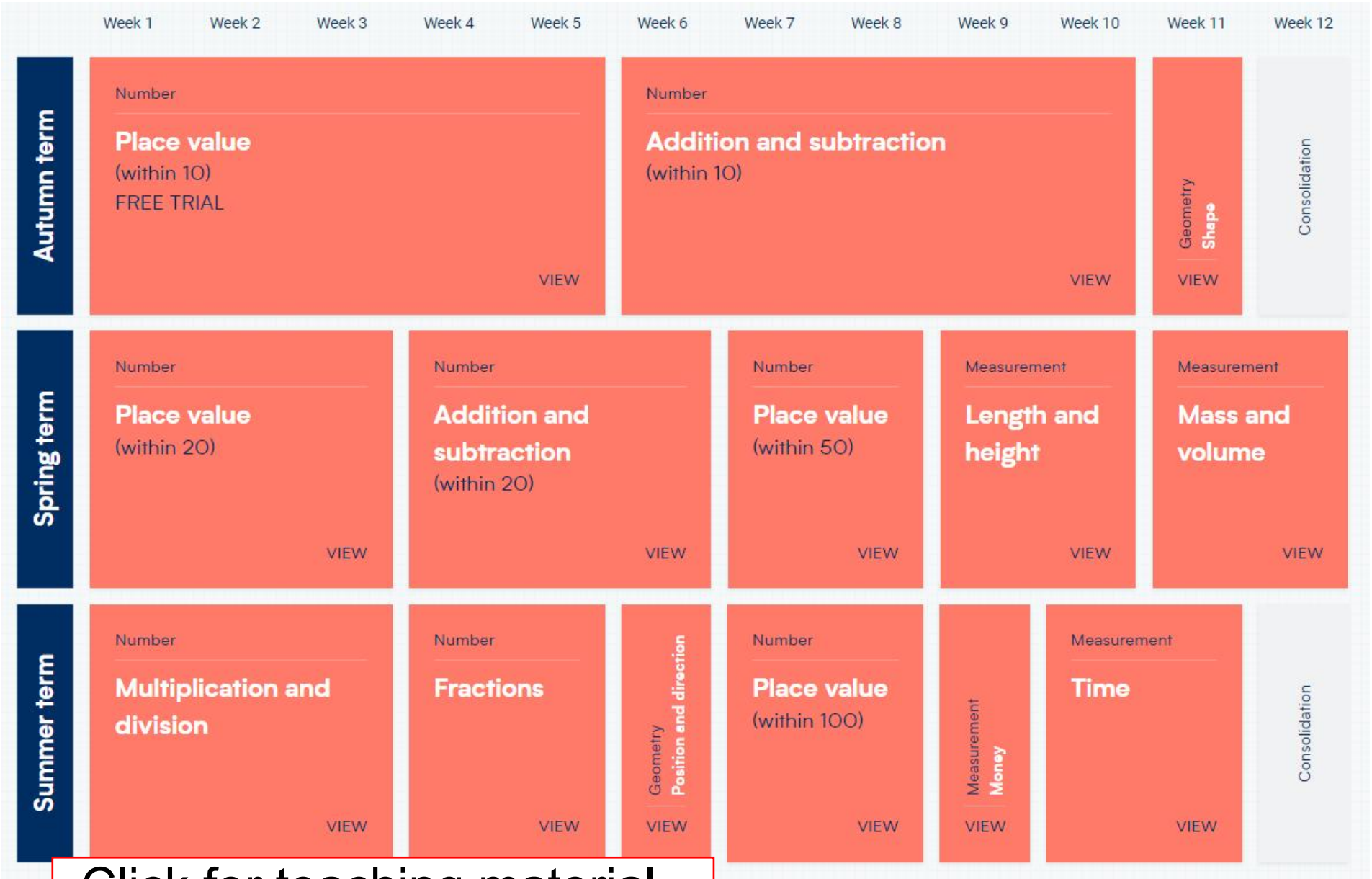
Year 1 Maths Progression



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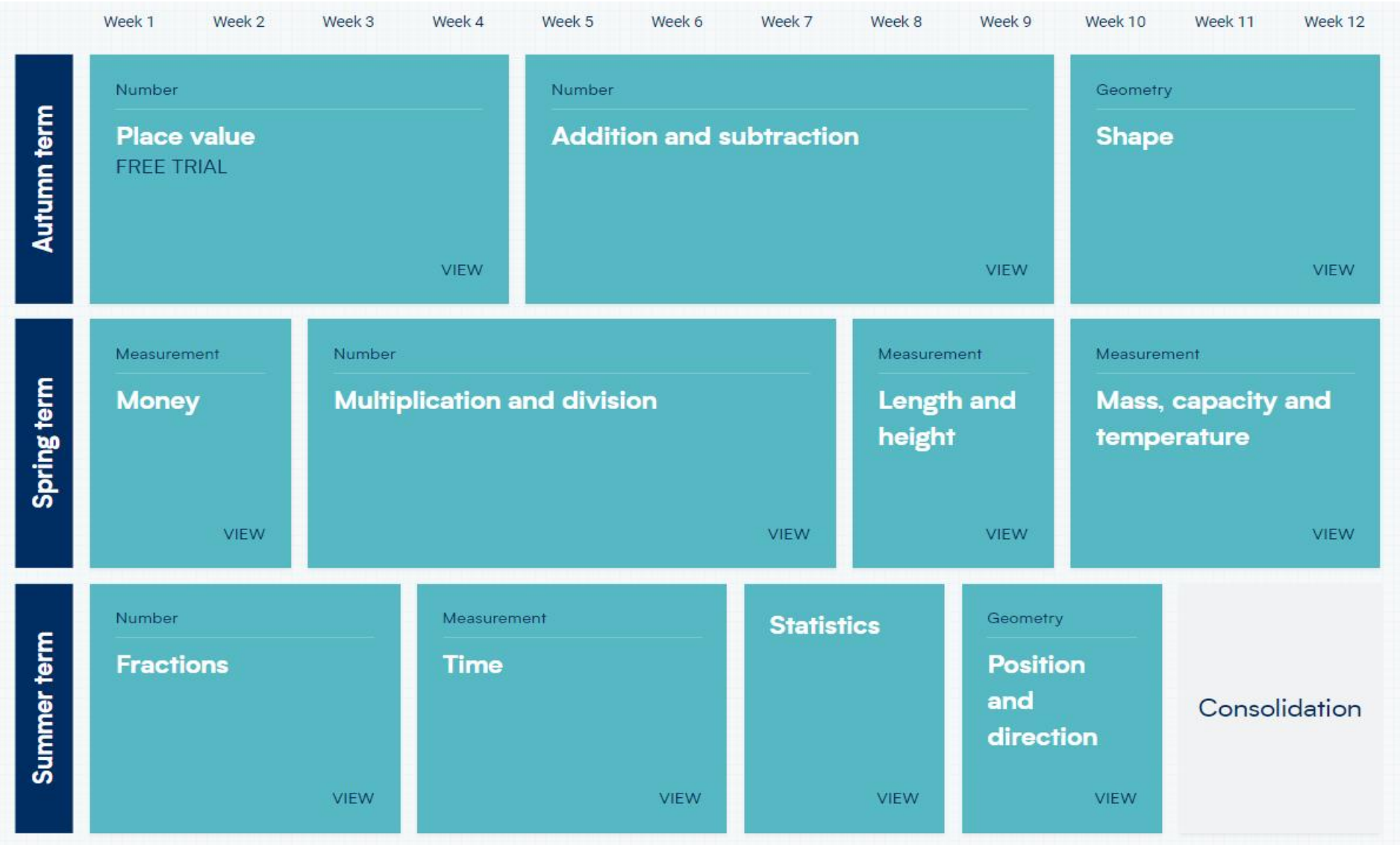
Year 2 Maths Progression



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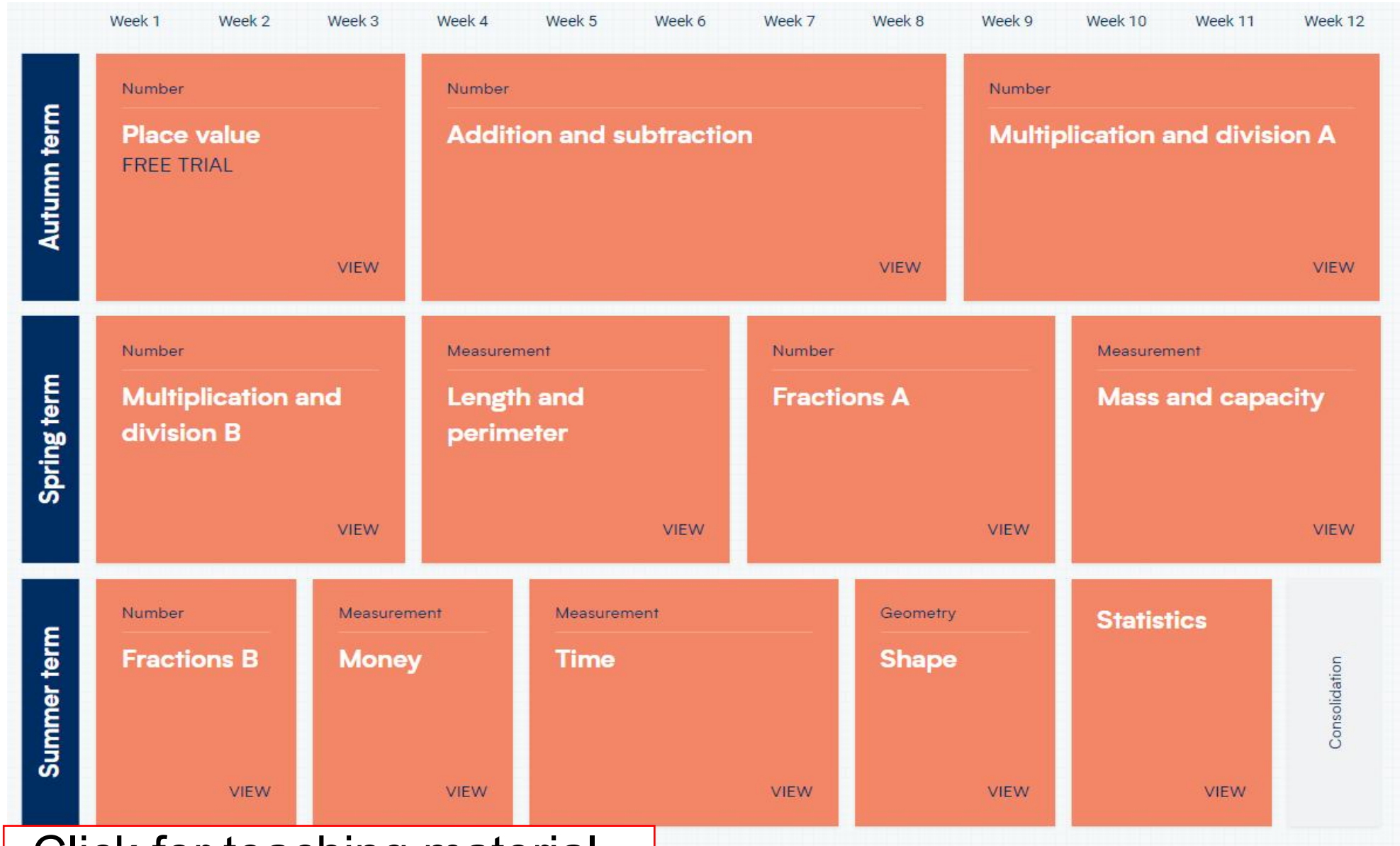
Year 3 Maths Progression



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Year 4 Maths Progression

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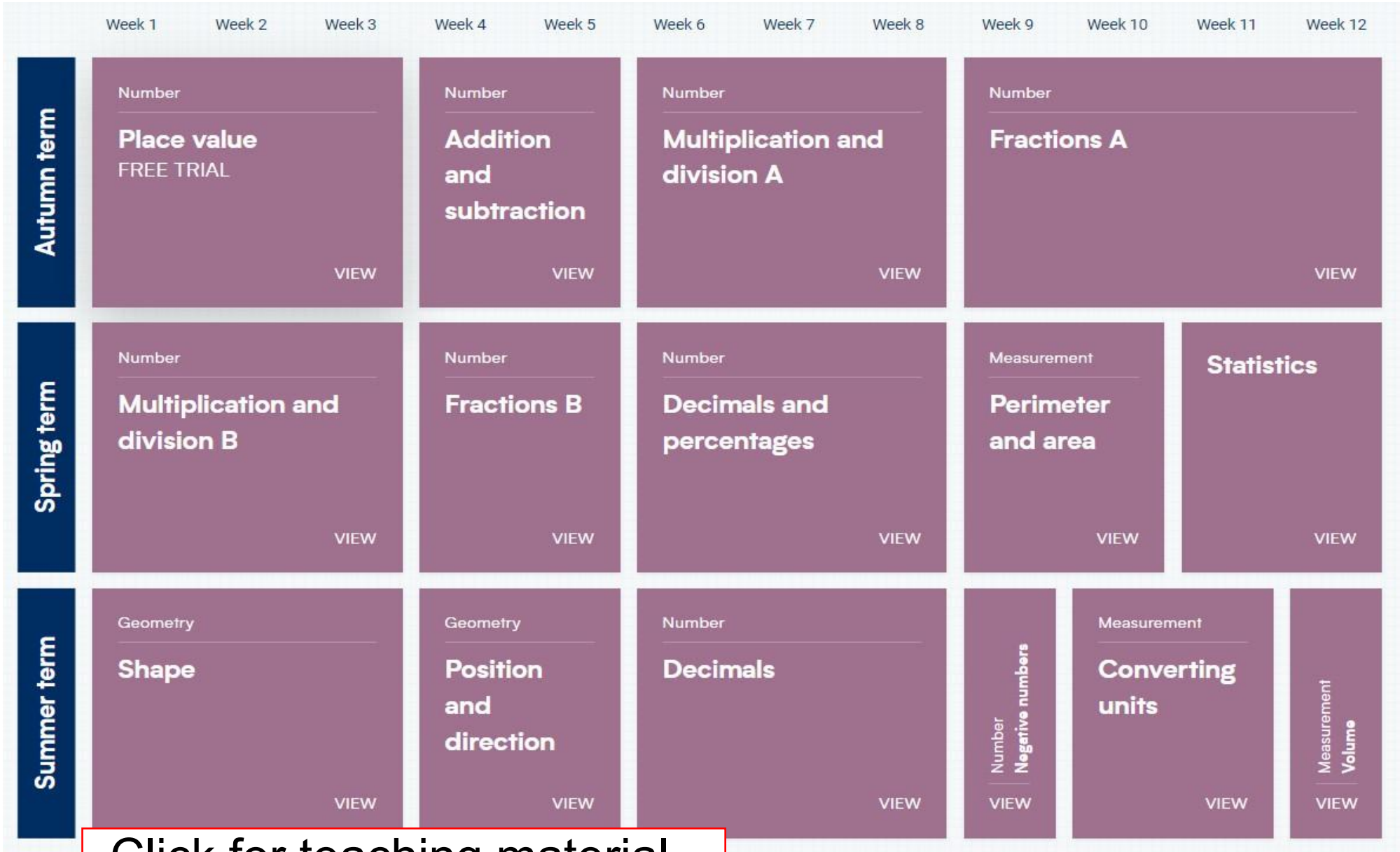
Year 5 Maths Progression



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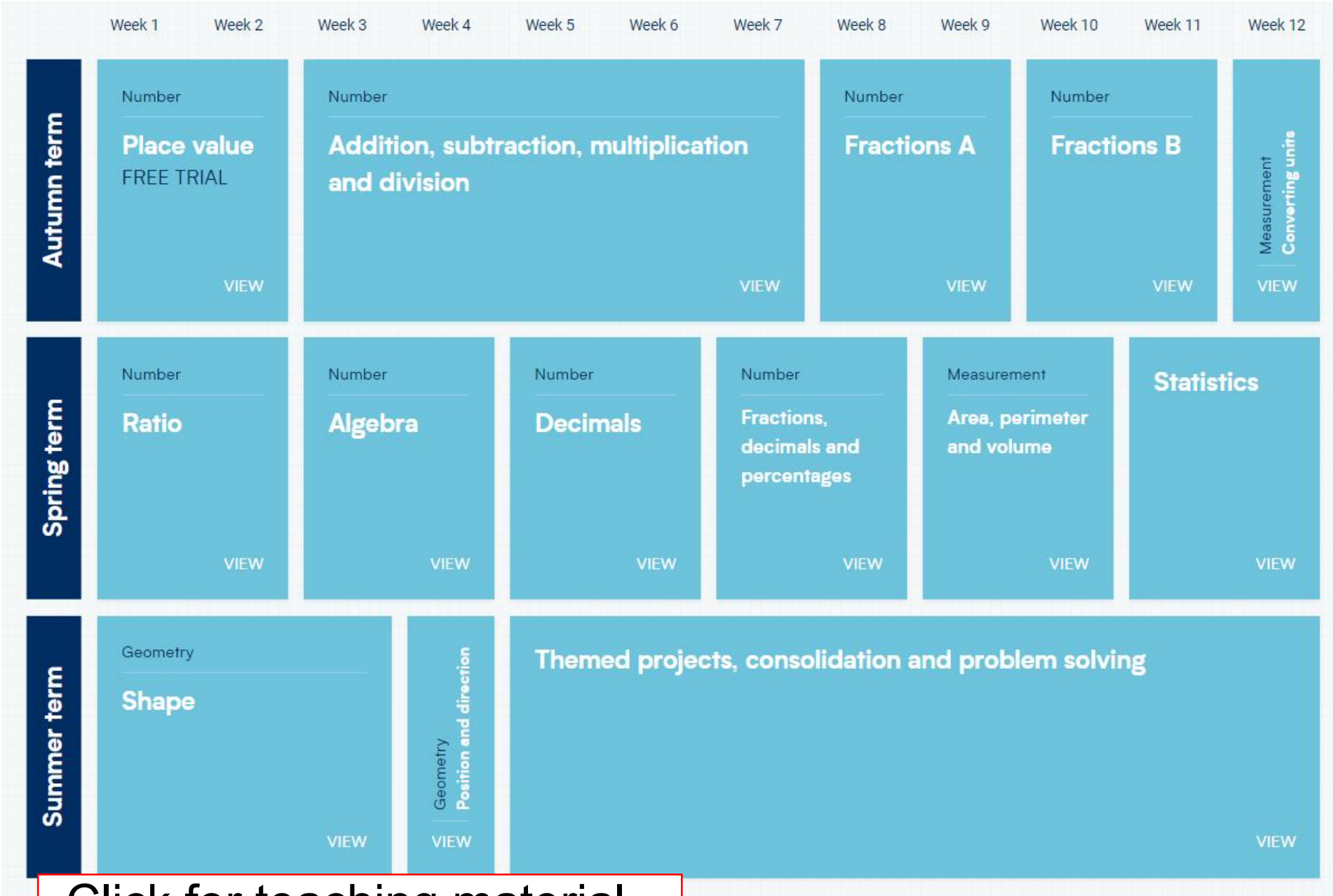
Year 6 Maths Progression



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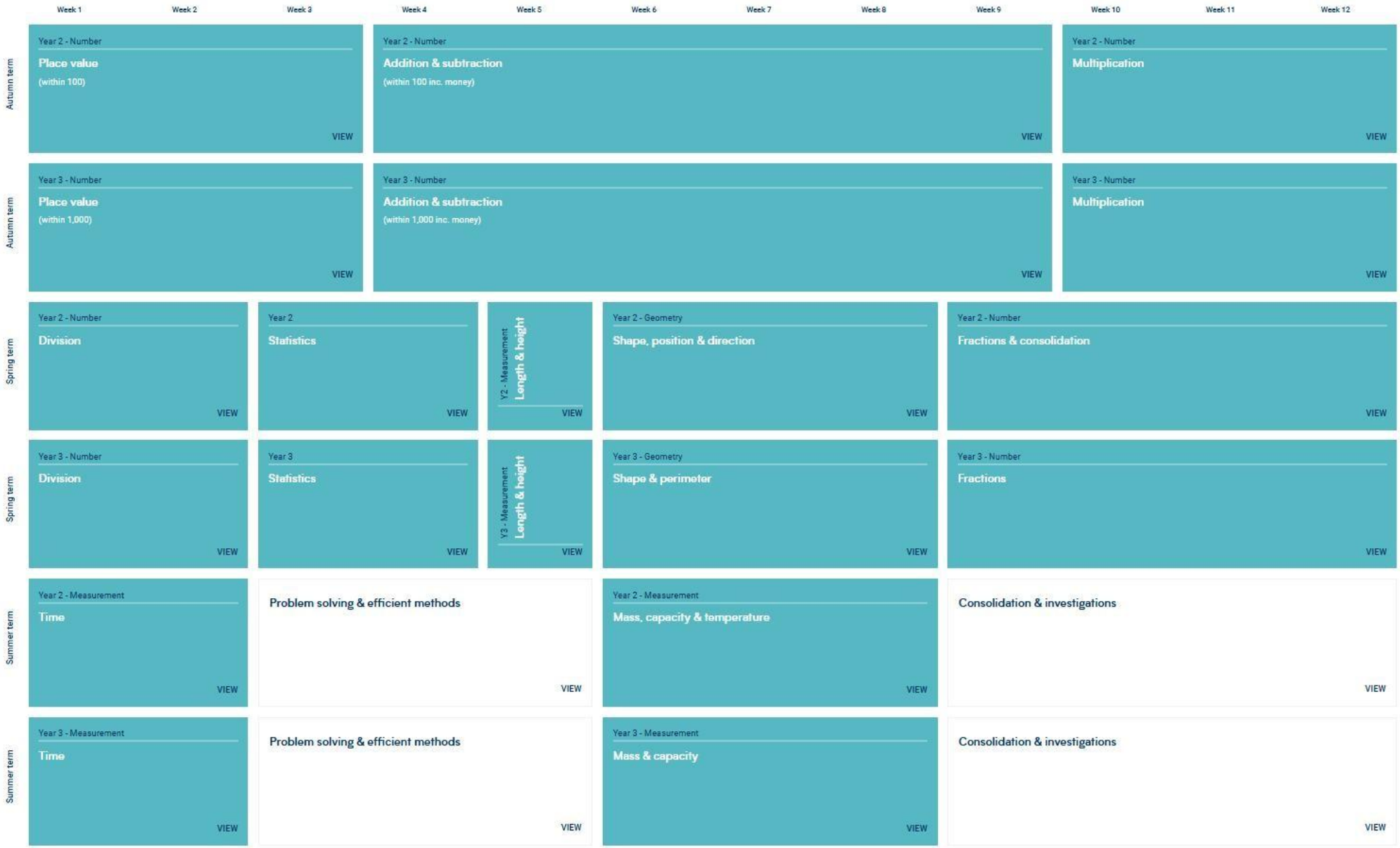
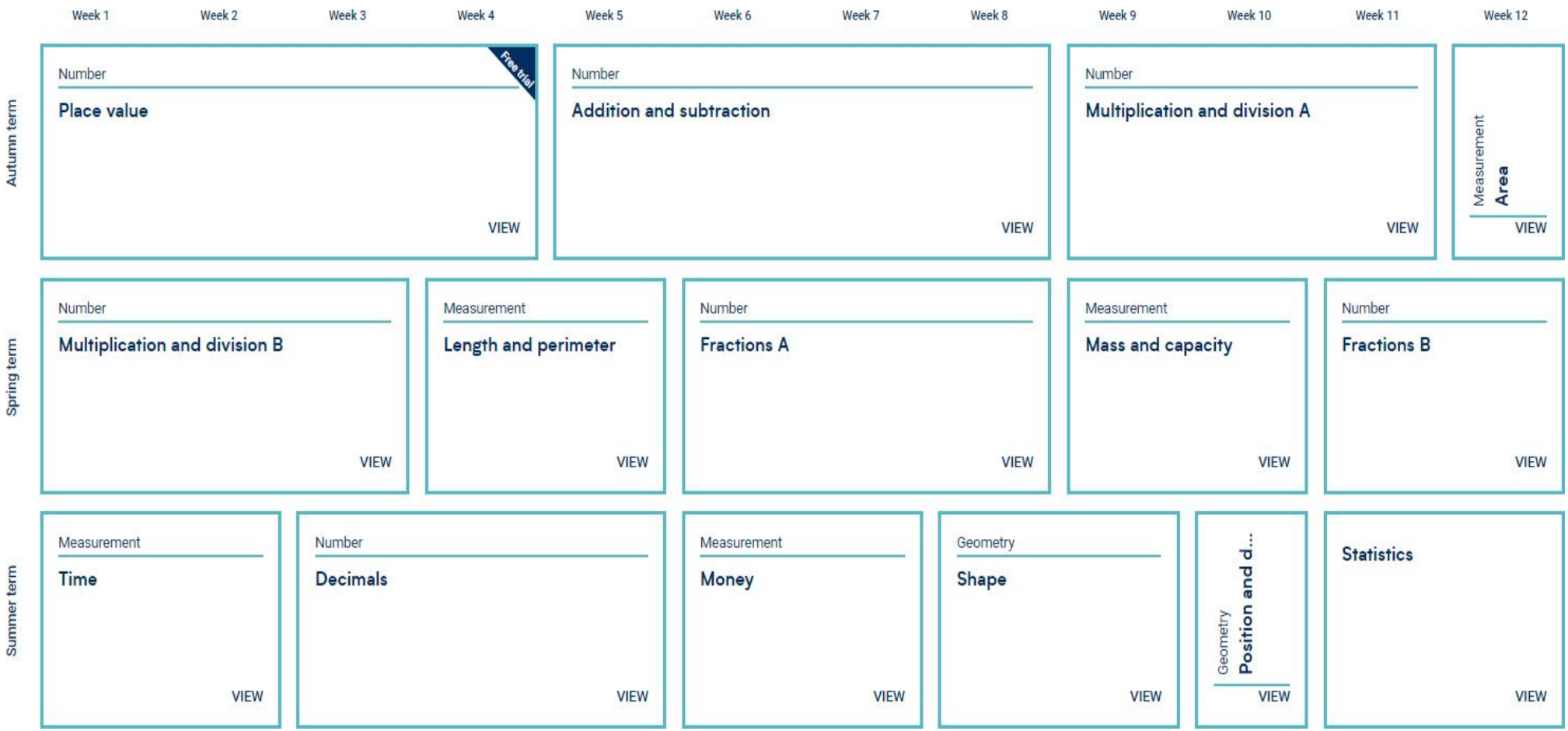
Mixed 2/3 Maths Progression



Mixed 3/4 Maths Progression



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Mixed 5/6 Maths Progression

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White Rose Maths Input Materials

Using the same resources across a school can create consistency, improve the quality of instruction, and support targeted interventions, benefiting both teachers and students.

Here are some key advantages:

Consistency Across Classrooms
When all teachers use the same resources, students experience a unified approach to learning, with common materials, language, and expectations across year groups. This consistency can reduce confusion, reinforce concepts, and support smooth transitions between classes and year groups.

Curriculum Alignment and Continuity
Shared resources help ensure that teachers follow a cohesive curriculum pathway, maintaining the progression of skills and knowledge as students move through the school. This continuity is especially helpful in addressing any learning gaps since teachers can clearly see where students have come from and what they need to achieve
next.

Improved Collaboration Among Teachers and Job Share Partners
Common resources enable teachers to collaborate more effectively, as they’ re working with the same materials. They can share best practices, discuss challenges, and jointly develop strategies to support all learners. This collaborative approach strengthens professional development within the school and promotes a unified teaching culture.

However, successful implementation of shared resources requires buy-in from teachers

Lesson Structure in Our Schools

Mixed Age Classes

Our school's current class structure, with mixed-age and mixed-key-stage groupings, presents unique challenges to implementing a mastery approach in mathematics. Traditional mastery schemes, such as White Rose Maths and NCETM resources, are designed for single-form, single-year classes, supporting a linear progression in which all students in a class move through concepts together.

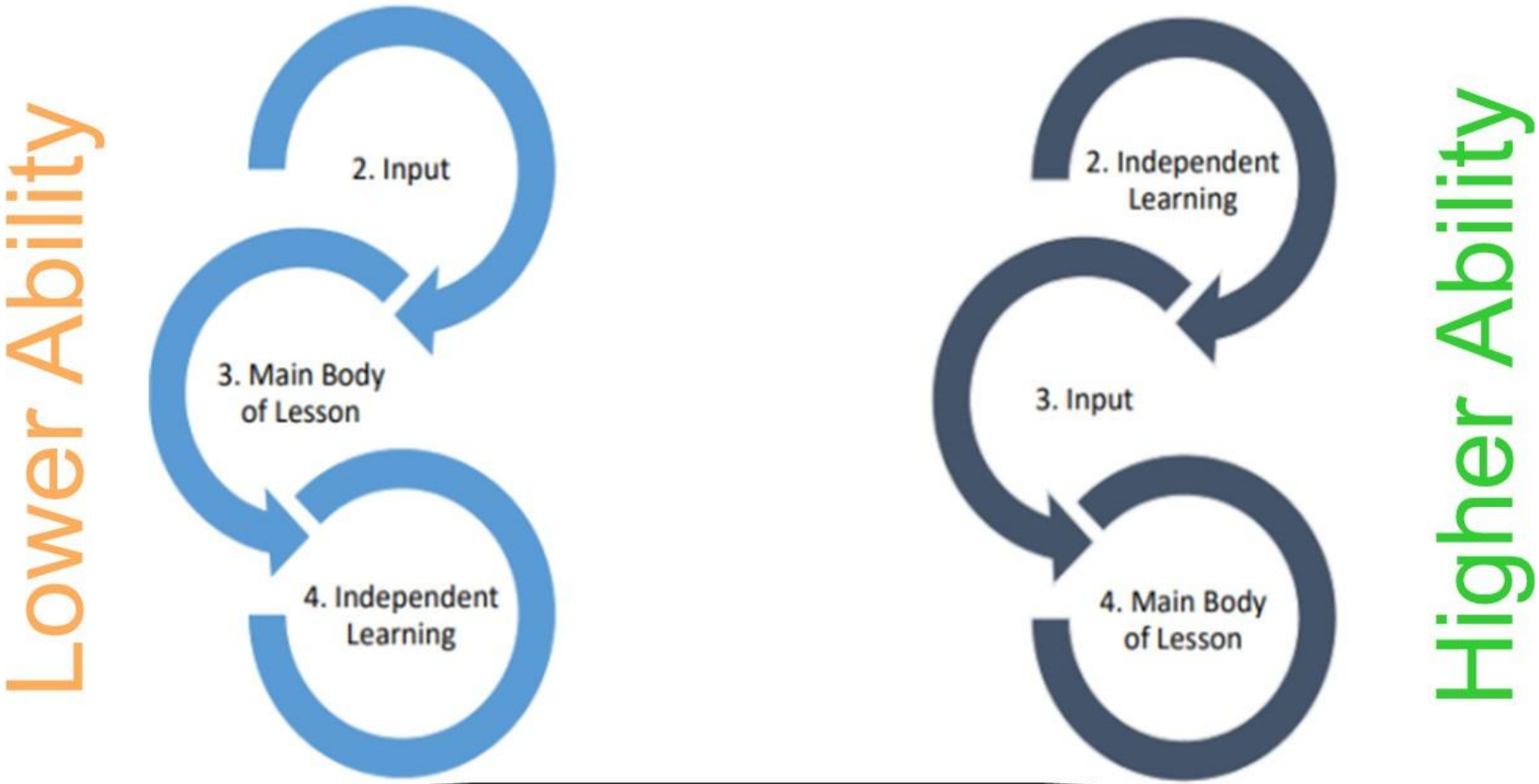
In mixed-age settings, however, even when guidance for two-year planning is available, the need for separate inputs for each year group can create a fragmented learning experience that is not ideal for mastery.

Specifically, our classes include groups spanning three year groups, some with both Key Stage 1 and Key Stage 2 students, and others blending EYFS with Key Stage 1 pupils. This wide range of developmental needs requires an approach beyond standard mastery planning, as different year groups may need varied conceptual introductions and support.

To navigate this, we may need to consider adapting resources, using differentiated tasks, and implementing flexible grouping strategies to ensure all students can progress in a way that aligns with mastery principles while acknowledging their individual learning stages.

To support this, we use the following lesson structure.

Recap Prior Learning



Plenary - Address Misconceptions

- Class Problem Solving

Independent Learning Tasks

To help us ensure that we meet the needs of all learners in our mixed age classes, it is crucial that we deliver two short inputs at different ability levels. This ensures that our learners are challenged and supported at ability levels.

Pupils are taught to complete a task independently and quietly, ensuring that the teachers input can be heard.

Independent Learning Tasks should consist of the following:

Flash back 4 - corresponding the the current WRM sequence of learning

Fluency Bee and deliberate practice - ***- Linked to number fact progression document***

Times tables practice activity

Independent task in the learning environment linked to current learning (EYFS only)

Independent Learning Examples

Flashback 4

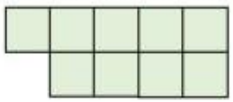
MA | Week 2 | Day 2

White Rose MATHS

8×9

1) Multiply 3 by 6

2) Work out the area of the shape.



3) Eva has £1,492
Ron has £3,219
How much more money does Ron have?

4) Calculate 35×4

Complete the calculations.

a) $3 \times 6 =$ ☐

b) $2 \times$ ☐ $= 12$

c) $6 \times 4 =$ ☐

d) ☐ $\div 6 = 1$

e) $11 \times 6 =$ ☐

f) ☐ $\times 6 = 30$

g) $6 \times 6 =$ ☐

h) ☐ $\div 6 = 7$

i) $6 \times$ ☐ $= 48$

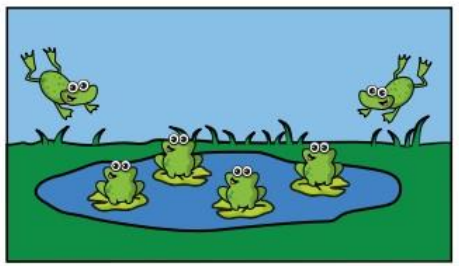
j) ☐ $\div 6 = 11$

k) $10 \times 6 =$ ☐

l) ☐ $\times 3 = 30$

Use the pictures to complete the calculations.

1



$4 + 2 =$ ☐

3

$4 +$ ☐ $=$ ☐

1.

	5	4	6	
−	2	2	1	

2.

	9	9	8	
−	5	0	7	

3.

	4	7	3	
−	3	3	3	

Fluency in Maths

Fluency in Maths is crucial to the successful and efficient application of maths facts to more complex reasoning problems. For this reason, we embed regular fluency practice into our maths learning.

EYFS and Year 1

- Daily counting
- Weekly Lessons using Fluency Bee to reinforce lessons where appropriate
- Focused interventions using Fluency Bee and following our number facts prgression.

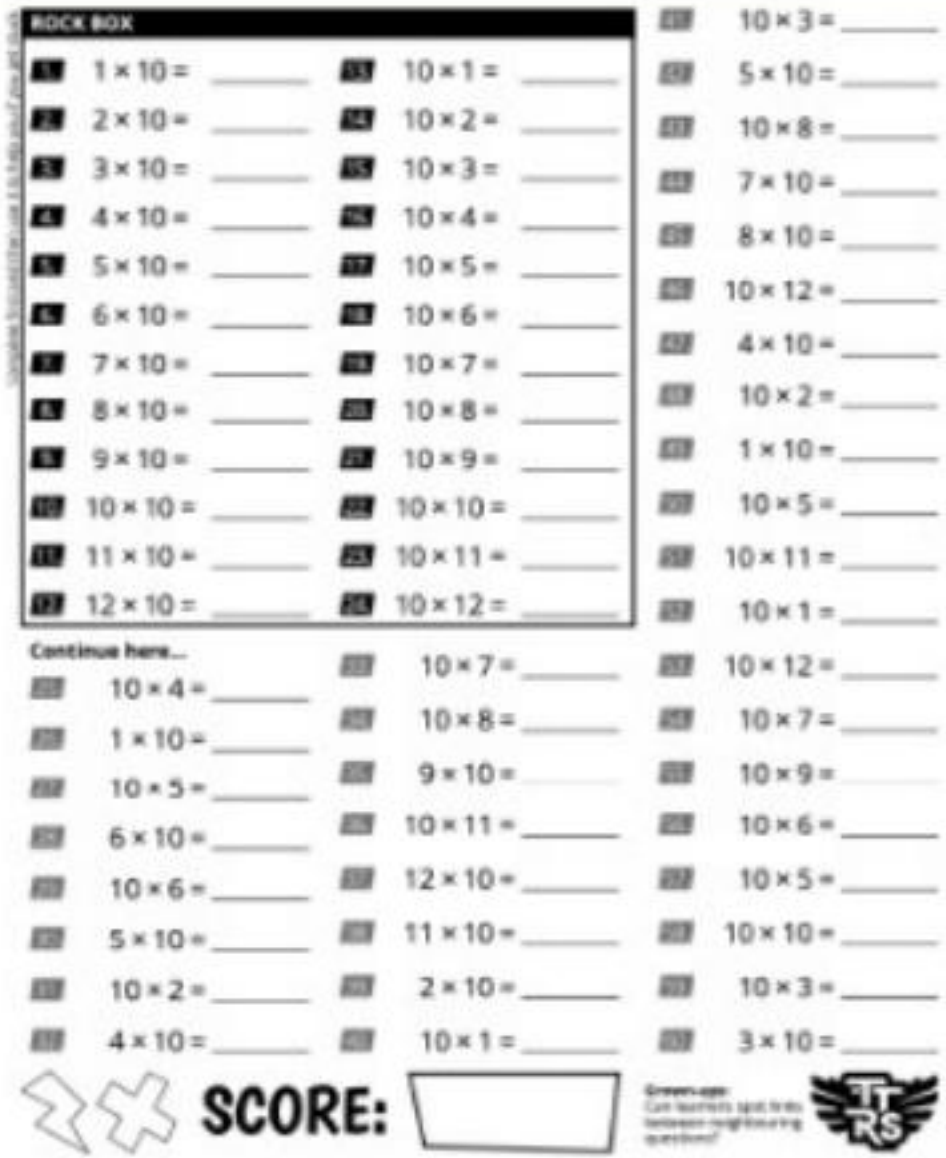
LKS2

- Weekly lesson focusing on times table fluency
- Weekly lesson using Fluency Bee or 'Deliberate Practice' activities - corresponding to our number fact progression
- Regular TTRS Practice (Daily for year 4)

UKS2

- Weekly lesson focusing on times table fluency and arithmetic practice
- Daily fluency practice task (Flash Back 4 and Arithmetic Challenges)

Example only



92 divided by 10	$\frac{1}{3}$ of 24 =	3.45 + 3.09 =
68 divided by 100	2637 - 1000 =	$\frac{7}{12} - \frac{5}{12}$ = Simplify if possible
	7624 - 683 =	23 x 6 =
421 x 4 =	753 x 9 =	246 x 7 =
$\frac{17}{20} - \frac{11}{20}$ =	3.9 + 0.7 =	5.23 - 0.08 =

Number Fact Progression Overview

National Curriculum for Mathematics in England : Summary of Aims:

- Become **fluent** in the fundamentals of mathematics, developing conceptual understanding and the ability to recall knowledge and facts accurately and rapidly
- **Reason mathematically** by making connections, following a line of enquiry and developing a justified argument
- **Solve problems** by applying mathematical skills, knowledge and understanding to a variety of routine and non-routine problems, including in real-life contexts

Focus of number study in Key stage 1 (Year 1 and Year 2)	Focus of number study in Lower Key stage 2 (Year 3 and Year 4)	Focus of number study in Upper Key stage 2 (Year 5 and Year 6)
Develop confidence and mental fluency with whole numbers, counting and place value. Work with numerals, words and the four arithmetic operations (+, -, x, ÷) using visual prompts and practical resources. Use a range of measures such as length, mass, capacity, volume, time, and money	Become increasingly fluent with whole numbers and the four arithmetic operations (+, -, x, ÷), including known number facts and the concept of place value. Develop efficient written and mental methods Perform calculations accurately with increasingly large whole numbers Solve a range of problems including with simple fractions and decimals	Extend understanding of the number system and place value to include larger integers (whole numbers). Develop connections between multiplication, division, fractions, decimals, percentages, and ratio Begin to use algebraic techniques to solve simple arithmetic problems
By the end of Year 2: • Recall and use number bonds to 20 • Recall and use multiplication and division facts for the 2x, 5x and 10x tables. • Identify odd and even numbers • Use and understand place value, • Read and spell age appropriate mathematical vocabulary	**By the end of Year 4:** • Add and subtract numbers up to 4-digits using formal and informal methods • Recall and use all multiplication and division facts up to and including the 12x table. • Know and use common equivalences between fractions and decimals • Read and spell age appropriate mathematical vocabulary correctly.	**By the end of Year 6:** • Be fluent in written methods for the four arithmetic operations (+, -, x, ÷), including formal methods such as column addition and subtraction, long and short multiplication and division. • Calculate with integers and fractions • Read and spell age appropriate mathematical vocabulary correctly.

Number Facts Progression Reception

Number Facts: Number and place value

- Know the sequence of counting in ones from 1 to 20 (by rote)
- Recognise numerals 0 - 9
- Accurately count up to 20 objects
- Place numbers to 20 in order
- Verbally count beyond 20 by patterning
- Recognise even and odd numbers up to 10

Number Facts: Fractions

- Develop an awareness of halving through practical experiences.

Number Facts: Early Calculation

- Be able to recognise numbers within numbers up to 10 (so 7 is made from 5 and 2)
- Know number bonds to 5
- Use the language of 'more' and 'fewer' to compare two sets of objects.
- Find the total number of items in two groups by counting all of them.
- Say the number that is one more than a given number to 20.
- Say the number that is one less than a given number to 20.
- Recognise when a quantity or items is reduced or increased by one.
- Subtract a quantity within 20. Say how many are left by counting (or counting back)
- Double small numbers (e.g. the amount shown on two dice)
- Share objects equally, or fairly, by putting them in equal sized groups

Number facts: Measure

- Develop an awareness of measure through practical experiences (e.g. length, weight/mass, capacity, distance, height) in readiness for more precise measuring in KS1
- Develop an awareness of time passing, in preparation for telling the time.
- Begin to use the language of time (next, before) to sequence personal events
- Develop their use and understanding of positional language.
- Explore 2-D and 3-D shape (e.g. through constructions and patterns)

Number Fact Progression - Year 1

Number Facts: Number and place value

- Know the sequence of counting in multiples of 2.
- Know the sequence of counting in multiples of 10.
- Know the sequence of counting in multiples of 5.
- Say one more or one less than any number up to 20.

Number Facts: Addition and subtraction

- Know the number bonds and related subtraction facts for all numbers to 5

For example:

4 + 0 = 4	4 – 0 = 4
3 + 1 = 4	4 – 1 = 3
2 + 2 = 4	4 – 2 = 2
1 + 3 = 4	4 – 3 = 1
0 + 4 = 4	4 – 4 = 0

- Know the number bonds for all numbers to 10 and the related subtraction facts.
- Know the number bonds for all numbers to 20 and the related subtraction facts.

For example

10 + 2 = 12	12 – 2 = 10
9 + 3 = 12	12 – 3 = 9
8 + 4 = 12	12 – 4 = 8

- Recognise that 'teens' numbers comprise one ten and some ones.

Number facts: Measure

- Say the days of the week and the months of the year in the correct order.
- Recognise the coins and notes of the realm and starting with 1p, 2p, 5p, 10p, 20p.
- Apply number bond knowledge to coins
  10p + 1p = 11p
  10p +2p = 12p

Number Facts: Fractions

Know that……

½ + ½ = 1 whole

¼ + ¼ + ¼ + ¼ = 1 whole

Number Fact Progression - Year 2

Number Facts: Number and place value

- Know the sequence of counting in multiples of 3.
- Count in steps of 10 from any number.

Number Facts: Addition and subtraction

- Know number bonds and related subtraction facts to 20
- Derive number bonds to 100 using multiples of 10, relating this to known number bonds to 10 (from Y1)
- Add and subtract numbers to 100 using informal methods, manipulative resources and visual representations,

Number facts: Multiplication and division

- Know the 2x, 5x and 10x times table and the related division facts.
- Recognise odd and even numbers.

Number Facts: Measure

- 100p = £1 50p+50p= £1
- 100 cm = 1metre
- One hour = 60 minutes
- $\frac{1}{2}$ an hour = 30 minutes
  $\frac{1}{4}$ of an hour = 15 minutes
  $\frac{3}{4}$ of an hour = 45 minutes
- There are 24 hours in a day
- Recite the months of the year in the correct order

Number Facts: Fractions

- $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$ whole
  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$
- 1 whole $- \frac{1}{4} = \frac{3}{4}$
- $\frac{2}{4} = \frac{1}{2}$
- Halve all even numbers to 20

Number Fact Progression - Year 3

Number Facts: Number and place value

- Know the sequence of counting in 50's.
- Know the sequence of counting in 100's

Number Facts: Measure

- 60 seconds = 1 minute
- How many days in each month / year / leap year.
- Find complements to 60.
- 50p x 2 = £1.00 £50 x 2 = £100
  25 p x 4 = £1.00 £25 x 4 = £100
  20p x 5 = £1.00 £20 x 5 = £100
- 1000 g = 1kg 1000ml = 1l
  1000 m = 1km
- 1000 ÷ 2 = 500 1000 ÷ 4 = 250
  $\frac{1}{2}$ l/kg/km = 500
  $\frac{1}{4}$ l/kg/km = 250
  $\frac{3}{4}$ l/kg/km = 750

Number Facts: Fractions

- $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$
- $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5}$ = 1 whole
- $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{6}{6}$ = 1 whole
- $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{7}{7}$ = 1 whole
- $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{8}{8}$ = 1 whole
- $\frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} + \frac{1}{9} = \frac{9}{9}$ = 1 whole
- $\frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} + \frac{1}{10} = \frac{10}{10}$ = 1 whole
- Understand fraction facts related to whole number facts

1 + 5 = 6 (Year1) linked to $\frac{1}{6} + \frac{5}{6} = \frac{6}{6}$ (Year 3)

Number facts: Addition and subtraction

- Know or derive all the complements to 100
  $x + y = 100$; x =? and y = ?
- Know pairs of multiples of 100 that total 1000
  1 + 9 = 10 (Year 1)
  10 + 90 = 100 (Year 2)
  100 + 900 = 1000 (Year 3)
- Add and subtract numbers with up to 3 digits (e.g. 253 + 75 = 328)

Number Facts: Multiplication and division

- Know the 3x, 4x and 8x table and the related division facts
- Understand that doubling means x 2
- Understand that halving means ÷ 2
- Know that…
  50 x 2 = 100 ; 25 x 4 = 100 ; 20 x 5 = 100

Number Fact Progression - Year 4

Number Facts: Number and place value

- Know the sequence of counting in multiples of 25.

Number Facts: Measure

- £5.00 x 2 = £10.00
  £50 x 2 = £100
  £500 x 2 = £1000
  £2.50 x 4 = £10.00
  £25 x 4 = £100
  £250 x 4 = £1000
  £2.00 x 5 = £10.00
  £20 x 5 = £100
  £200 x 5 = £1000
- 10cm = $\frac{1}{10}$ m 1cm = $\frac{1}{100}$ m
- 100g = $\frac{1}{10}$ kg
  1.1 kg = 1kg 100g = 1kg + $\frac{1}{10}$ kg
- 48 hours = 2 days
  120 minutes = 2 hours
  90 minutes = 1 $\frac{1}{2}$ hours

Number Facts: Fractions

- 100 ÷ 10 = 10 1000 ÷ 10 = 100
  10 ÷ 10 = 1 1 ÷ 10 = $\frac{1}{10}$
- 1 ÷ 10 = $\frac{1}{10}$ = 0.1 2 ÷ 10 = $\frac{2}{10}$ = 0.2
  3 ÷ 10 = $\frac{3}{10}$ = 0.3 4 ÷ 10 = $\frac{4}{10}$ = 0.4
  5 ÷ 10 = $\frac{5}{10}$ = 0.5 6 ÷ 10 = $\frac{6}{10}$ = 0.6
  7 ÷ 10 = $\frac{7}{10}$ = 0.7 8 ÷ 10 = $\frac{8}{10}$ = 0.8
  9 ÷ 10 = $\frac{9}{10}$ = 0.9 10 ÷ 10 = $\frac{10}{10}$ = 1.0
- $\frac{1}{4}$ = 0.25 $\frac{1}{2}$ = 0.5
  $\frac{3}{4}$ = 0.75

Number facts: Addition and subtraction

- Know or derive all the complements to 10,000 using multiples of 1000 and related subtraction facts
  $x + y = 10{,}000$; x =? and y = ?

  1 + 9 = 10 (Year 1)
  10 + 90 = 100 (Year 2)
  100 + 900 = 1000 (Year 3)
  1000 + 9000 = 10,000 (Year 4)
- Mentally add and subtract numbers with up to 2 digits reliably

Number Facts: Multiplication and division

- Know the 6x, 7x, 9x, 11x, and 12x tables and the related division facts
- Know that…
  500 x 2 = 1000 1000 ÷ 2 = 500
  250 x 4 = 1000 1000 ÷ 4 = 250
  200 x 5 = 1000 1000 ÷ 5 = 200

Number Fact Progression - Year 5

Number facts: Addition and subtraction; multiplication and division

- Derive new facts from known facts:
  For example:
  12 x 5 = 60 — 60 ÷ 5 = 12
  5.2 x 5 = 6.0 — 6 ÷ 5 = 1.2
  5 x 7 = 35 — 5 x 0.7 = 3.5
  5 x 0.07 = 0.35
- Square numbers:
  1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144
- Prime numbers:
  2, 3, 5, 7, 11, 13, 17, 19
- Associated facts
  10,000 = 9500 = 500
  10,000 = 5000 + 5000
  10,000 = 2500 + 2500 + 2500 + 2500
  10,000 ÷ 2 = 5000
  10,000 ÷ 4 = 2500
  10,000 ÷ 5 = 2000
  10,000 ÷ 10 = 1000
  10,000 ÷ 100 = 100

Number Facts: Fractions

- $1 \div 100 = \frac{1}{100} = 0.01$ — $2 \div 100 = \frac{2}{100} = 0.02$
  $3 \div 100 = \frac{3}{100} = 0.03$ — $4 \div 100 = \frac{4}{100} = 0.04$
  $5 \div 100 = \frac{5}{100} = 0.05$ — $6 \div 100 = \frac{6}{100} = 0.06$
  $7 \div 100 = \frac{7}{100} = 0.07$ — $8 \div 100 = \frac{8}{100} = 0.08$
  $9 \div 100 = \frac{9}{100} = 0.09$ — $10 \div 100 = \frac{10}{100} = \frac{1}{10} = 0.1$
- $10\% = 0.1 = \frac{1}{10} = \frac{10}{100} = \frac{100}{1000}$
  $50\% = 0.5 = \frac{1}{2} = \frac{5}{10} = \frac{50}{100}$
  $25\% = 0.25 = \frac{1}{4} = \frac{25}{100}$
  $75\% = 0.75 = \frac{3}{4} = \frac{75}{100}$
  $20\% = 0.2 = \frac{1}{5} = \frac{2}{10} = \frac{20}{100}$
  $40\% = 0.4 = \frac{2}{5} = \frac{4}{10} = \frac{40}{100}$

Number Facts: Measure

- 1mm = $\frac{1}{10}$ cm
- 1mm = $\frac{1}{1000}$ m
- 1 kg ≈ 2.2 lbs
- 1 L ≈ 1.76 pints
- 1m ≈ 39.4 inches
- 1cm ≈ 2.54 inches

≈ means 'approximately equal to'

Number Facts: Geometry

- 360 ÷ 4 = 90 — $\frac{1}{4}$ of 360 = 90
- 360 ÷ 2 = 180 — $\frac{1}{2}$ of 360 = 180
- $\frac{3}{4}$ of 360 = 270
- complements such as
  70 + 110 = 180
  95 + 85 = 180
- multiples: 90 , 180 , 270 , 360 , 450 , 540

Number Fact Progression - Year 6

Number facts: Ratio and proportion

- Derive new % facts from known facts:
  For example:
  1% doubled will give 2% of a quantity
  10% halved will give 5% of a quantity
  100% is the whole amount, so twice as much is the same as 200%

- Fluency with multiplication and division facts up to 12 x 12 and derive others beyond known facts.
- For example:
  24 : 48 simplifies to 1:2 with a common factor of 24
  (24 x 1 and 24 x 2)

Number Facts: Fractions

- 12.5% = 0.125 = $\frac{1}{8}$ 25% = 0.25 = $\frac{2}{8}$ = $\frac{1}{4}$
  37.5% = 0.375 = $\frac{3}{8}$ 50% = 0.5 = $\frac{4}{8}$ = $\frac{1}{2}$
  62.5% = 0.625 = $\frac{5}{8}$ 75% = 0.75 = $\frac{6}{8}$ = $\frac{3}{4}$
  82.5% = 0.825 = $\frac{7}{8}$ 100% = 1.0 = $\frac{8}{8}$
  112.5% = 1.125 = $\frac{9}{8}$ 125% = 1.25 = $\frac{10}{8}$

- 33.$\dot{3}$% = 0.333… = $\frac{1}{3}$
  66.$\dot{6}$% = 0.666… = $\frac{2}{3}$
  100 % = 1.0 = $\frac{3}{3}$
  133.$\dot{3}$% = 1.333… = $\frac{4}{3}$
  266.$\dot{6}$% = 2.666… = $\frac{8}{3}$

0.$\dot{3}$ = 0.3333333…… a recurring decimal continually repeats and does not terminate

Number Facts: Measure

- 1 km ≈ $\frac{5}{8}$ mile
- 1 mile ≈ $\frac{8}{5}$ km (or 1.6 km)
- Area of a triangle = $\frac{1}{2}$ x base x height
- Area of a rectangle = length x width
- Area of a parallelogram
  = length x perpendicular height
- Volume of a cuboid
  = length x width x height

≈ means 'approximately equal to'

Number Facts: Geometry

- Diameter = 2 x radius
- Radius = $\frac{1}{2}$ x diameter

Home Learning in Maths

To support our maths curriculum and encourage an engagement in maths at home, we have access to a couple of different resources:

Numbots: Numbots is an engaging online platform designed to develop fundamental arithmetic skills, such as addition and subtraction, in younger children. Its gamified approach captures students' interest, helping them build a solid foundation in number sense, calculation skills, and confidence in maths. The programme’s progressive difficulty also makes it useful for individualised practice, catering to varied learning paces.

Times Tables Rock Stars (TTRS): TTRS is a highly interactive tool aimed at boosting multiplication and division fluency through a game-based approach. By incorporating speed and accuracy challenges, it helps children quickly recall times tables, a crucial skill for later mathematical concepts. TTRS also promotes friendly competition, motivating children to practice regularly and build long-term retention.

CPG Maths Practice Booklets: The CPG Maths Practice Booklets are comprehensive resources aligned with the national curriculum, offering targeted practice across a range of topics. These booklets allow children to consolidate their classroom learning through structured exercises, making them ideal for both independent study and guided support.

Home Learning In Maths

EYFS and Year 1

Numbots (30 minutes per week)

Year 2, 3, 4

TTRS (30 minutes per week)

Year 5 and 6

TTRS - *As required*
CGP Maths Books
SAT practice Books for year 6 pupils

Assessment in Maths

In our federation, we use a variety of assessment methods to track pupil progress and adapt teaching to meet their needs. This includes ongoing formative assessment, pre- and post-unit assessments, and end-of-term summative assessments

Ongoing Formative Assessment

Formative assessment is integrated into daily teaching through strategies like questioning, observation, and marking. It gives teachers real-time feedback on student understanding, allowing them to address any misconceptions, extend learning for higher achievers, and support those who need extra help.

Pre- and Post-Unit Assessments

Pre-assessments at the start of each unit identify prior knowledge and gaps, helping teachers tailor lessons accordingly. Post-assessments at the end of each unit measure growth and highlight areas that may need further review, supporting mastery of key concepts.

Summative End-of-Term Assessments

Summative assessments at the end of each term give a broader view of progress, helping teachers and school leaders assess curriculum effectiveness and plan for the future. These results are also shared with parents to keep them informed about their child’s development.

Summary

This balanced approach to assessment—ongoing, pre/post-unit, and termly—allows us to adapt teaching based on student needs, support continuous progress, and make informed decisions to benefit all learners.

Ongoing Formative Assessment

Effective feedback serves two essential purposes: it guides pupils on how to improve and informs teachers on how best to support them. When provided during lessons, feedback can prevent misconceptions from taking root, enabling students to make immediate corrections and continue building a strong understanding. It also helps pupils identify their strengths and areas for growth, while highlighting topics that may require further teaching.

In our curriculum, we aim to foster both a "deep understanding" and "deeper learning."

By helping pupils to learn more and remember more, we're equipping them with a lasting foundation of knowledge that they can build upon throughout their education and beyond.

Formative Assessment in our federation consist of :

- Targeted questioning to check understanding

- Use white boards to check understanding and encourage whole class participation

- Observing pupils watching their approaches

- Marking within the lesson with the pupils where possible (group marking or one-to-one)

Pre and Post Assessment for Learning

Pre- and post-unit assessments in maths are effective because they enable teachers to tailor instruction to meet student needs, track progress, and support mastery learning. Here are some key benefits:

Identifying Prior Knowledge and Gaps

A pre-assessment helps teachers determine what students already know about a topic and identify any gaps or misconceptions. This insight enables teachers to adjust their planning, focusing on specific areas where students need more support rather than spending time on concepts they already understand.

Personalised Instruction

By understanding each student' s starting point, teachers can provide differentiated support. For instance, they can group students by ability for targeted activities or plan interventions for those who need extra help. This personalised approach enhances engagement and helps each student make meaningful progress.

Focused Teaching

Knowing which skills are weaker or need reinforcement allows teachers to allocate instructional time more effectively. Teachers can prioritise critical concepts that need more attention, enhancing the efficiency and impact of their teaching.

Monitoring Progress and Measuring Growth

Post-assessment reveals how much students have learned during the unit. Comparing pre- and post -assessment results shows growth, allowing teachers to celebrate progress and highlight areas where further practice may be needed. This tracking is essential for mastery learning, as it helps ensure students achieve a solid understanding before moving to the next topic.

Marking and Feedback in Maths

The marking of pupils' work in mathematics aims to support their learning, address misconceptions promptly, and provide constructive feedback. Our marking approach focuses on immediate impact, promotes pupil engagement, and encourages self-reflection to foster a positive learning environment.

Key Principles

Immediate Feedback

Peer marking and teacher marking are prioritised during lessons to ensure misconceptions are addressed promptly.
Feedback should be constructive and aligned with the lesson objectives.
Consistency

Summative marking adheres to the school-wide marking system:

Clouds : Positive comments celebrating achievements and strengths.
Ladders : Next steps or errors requiring attention to help pupils improve.
Encouraging Effort and Neatness

Pupils are encouraged to produce neat work and give their best effort.

Effort and presentation are assessed with a score out of three at the end of each lesson:
3 = Excellent effort and neat presentation.
2 = Satisfactory effort and presentation, with room for improvement.
1 = Improvement needed in effort and/or presentation.

Summative End of Unit Checks

Summative end-of-unit checks in maths offer several key benefits for primary education, helping both teachers and students understand progress and identify next steps in learning.

We believe that they are import because:

- Measures mastery of maths concepts

- Identifies areas needing review and additional support

- Tracks progress over time for informed adjustments

- Prepares students for cumulative learning in maths

- Provides clear feedback for parents and guardians

- Supports teacher reflection and future planning

- Boosts student confidence by highlighting progress

Pupils in Reception and Year 1 complete the end of unit checks only - these are used alongside teacher judgements of lesson engagement to inform pupil's outcomes.

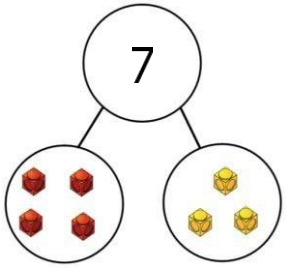
Pupils in KS2 complete a standardised assessment in both arithmetic and reasoning (mirroring the end of Key Stage Assessments

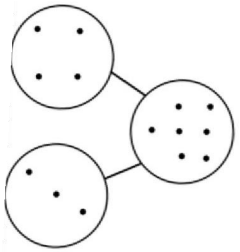
Darley and Summerbridge

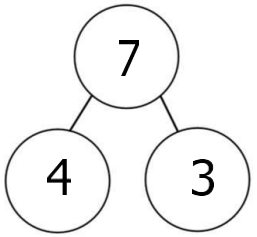
Calculation Policy

Addition and Subtraction

Part-Whole Model

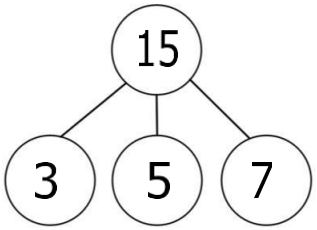


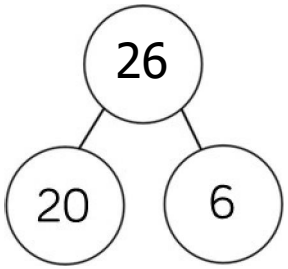


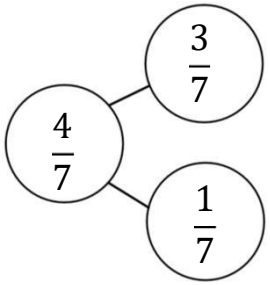


$7 = 4 + 3$
$7 = 3 + 4$

$7 - 3 = 4$
$7 - 4 = 3$







Benefits

This part-whole model supports children in their understanding of aggregation and partitioning. Due to its shape, it can be referred to as a cherry part-whole model.

When the parts are complete and the whole is empty, children use aggregation to add the parts together to find the total.

When the whole is complete and at least one of the parts is empty, children use partitioning (a form of subtraction) to find the missing part.

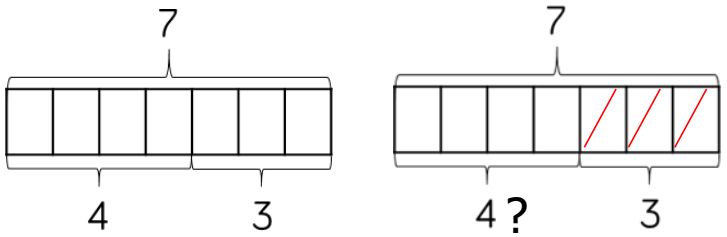
Part-whole models can be used to partition a number into two or more parts, or to help children to partition a number into tens and ones or other place value columns.

In KS2, children can apply their understanding of the part-whole model to add and subtract fractions, decimals and percentages.

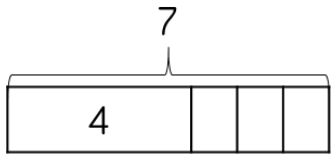
Bar Model (single)

Concrete

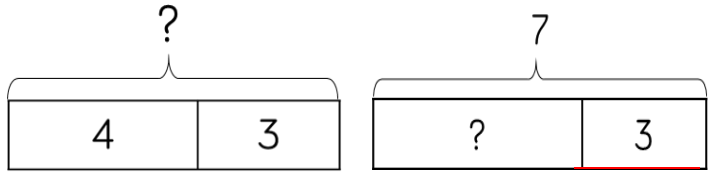
Discrete

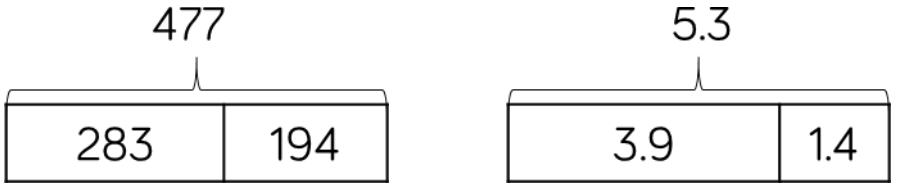


Combination



Continuous





Benefits

The single bar model is another type of a part-whole model that can support children in representing calculations to help them unpick the structure.

Cubes and counters can be used in a line as a concrete representation of the bar model.

Discrete bar models are a good starting point with smaller numbers. Each box represents one whole.

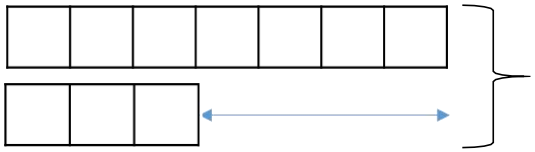
The combination bar model can support children to calculate by counting on from the larger number. It is a good stepping stone towards the continuous bar model.

Continuous bar models are useful for a range of values. Each rectangle represents a number. The question mark indicates the value to be found.

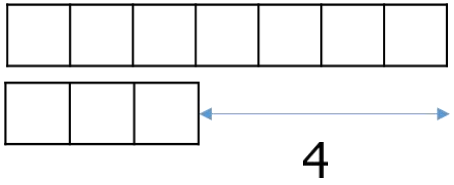
In KS2, children can use bar models to represent larger numbers, decimals and fractions.

Bar Model (multiple)

Discrete

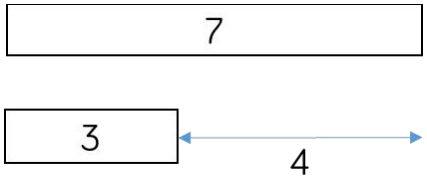


$7 + 3 = 10$

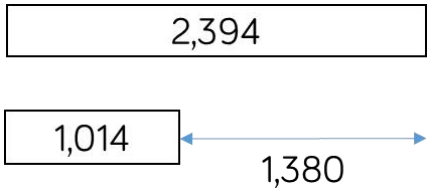


$7 - 3 = 4$

Continuous



$7 - 3 = 4$



$2{,}394 - 1{,}014 = 1{,}380$

Benefits

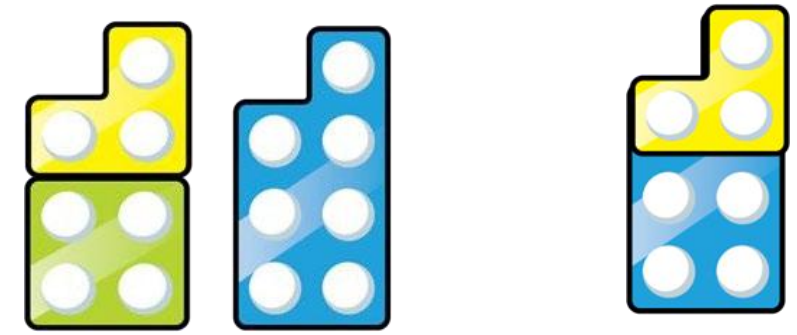
The multiple bar model is a good way to compare quantities whilst still unpicking the structure.

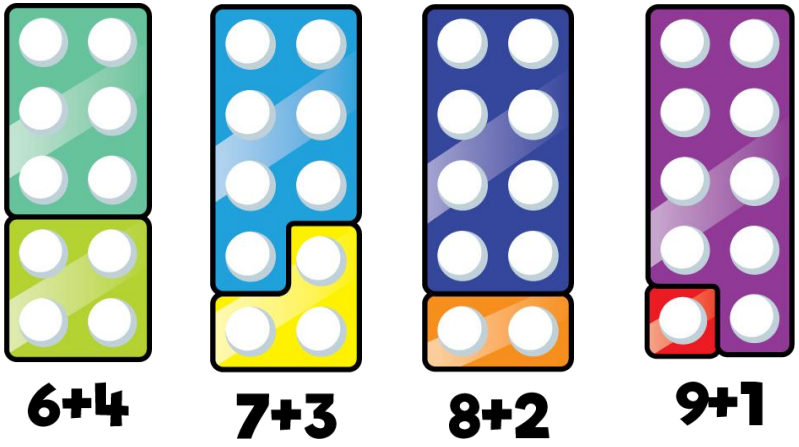
Two or more bars can be drawn, with a bracket labelling the whole positioned on the right hand side of the bars. Smaller numbers can be represented with a discrete bar model whilst continuous bar models are more effective for larger numbers.

Multiple bar models can also be used to represent the difference in subtraction. An arrow can be used to model the difference.

When working with smaller numbers, children can use cubes and a discrete model to find the difference. This supports children to see how counting on can help when finding the difference.

Number Shapes





Benefits

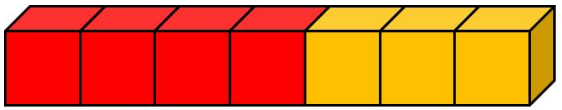
Number shapes can be useful to support children to subitise numbers as well as explore aggregation, partitioning and number bonds.

When adding numbers, children can see how the parts come together making a whole. As children use number shapes more often, they can start to subitise the total due to their familiarity with the shape of each number.

When subtracting numbers, children can start with the whole and then place one of the parts on top of the whole to see what part is missing. Again, children will start to be able to subitise the part that is missing due to their familiarity with the shapes.

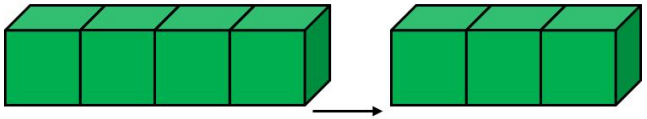
Children can also work systematically to find number bonds. As they increase one number by 1, they can see that the other number decreases by 1 to find all the possible number bonds for a number.

Cubes

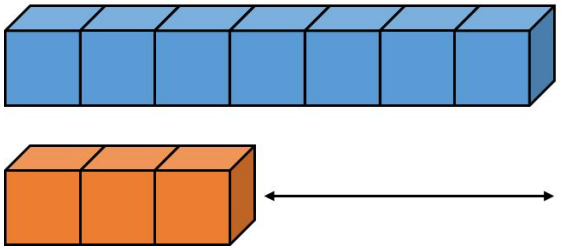


$7 = 4 + 3$

$7 = 3 + 4$



$7 - 3 = 4$



$7 - 3 = 4$

Benefits

Cubes can be useful to support children with the addition and subtraction of one-digit numbers.

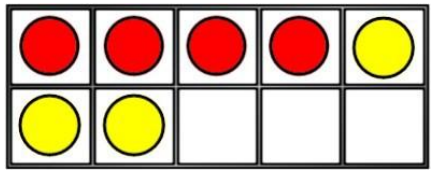
When adding numbers, children can see how the parts come together to make a whole. Children could use two different colours of cubes to represent the numbers before putting them together to create the whole.

When subtracting numbers, children can start with the whole and then remove the number of cubes that they are subtracting in order to find the answer. This model of subtraction is reduction, or take away.

Cubes can also be useful to look at subtraction as difference. Here, both numbers are made and then lined up to find the difference between the numbers.

Cubes are useful when working with smaller numbers but are less efficient with larger numbers as they are difficult to subitise and children may miscount them.

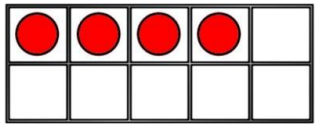
Ten Frames (within 10)



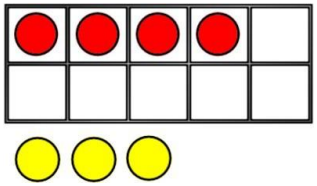
$4 + 3 = 7$
$3 + 4 = 7$
$7 - 3 = 4$
$7 - 4 = 3$

4 is a part.
3 is a part.
7 is the whole.

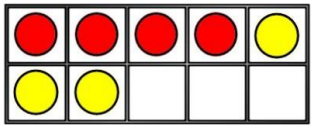
First



Then

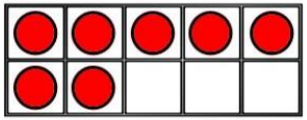


Now

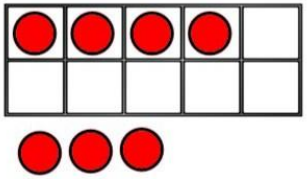


$4 + 3 = 7$

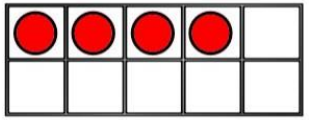
First



Then



Now



$7 - 3 = 4$

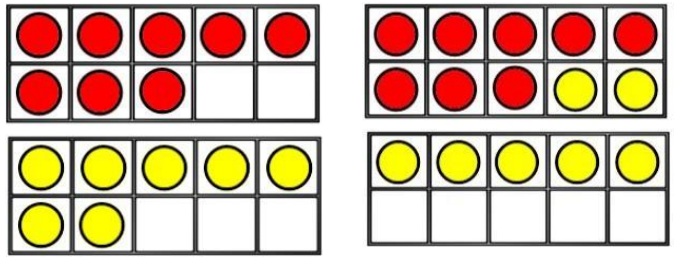
Benefits

When adding and subtracting within 10, the ten frame can support children to understand the different structures of addition and subtraction.

Using the language of parts and wholes represented by objects on the ten frame introduces children to aggregation and partitioning.
Aggregation is a form of addition where parts are combined together to make a whole. Partitioning is a form of subtraction where the whole is split into parts. Using these structures, the ten frame can enable children to find all the number bonds for a number.

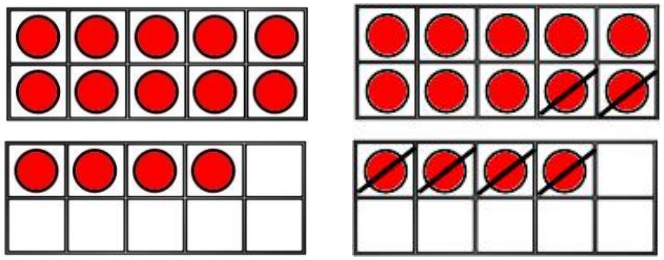
Children can also use ten frames to look at augmentation (increasing a number) and take-away (decreasing a number). This can be introduced through a first, then, now structure which shows the change in the number in the 'then' stage. This can be put into a story structure to help children understand the change e.g. First, there were 7 cars. Then, 3 cars left. Now, there are 4 cars.

Ten Frames (within 20)



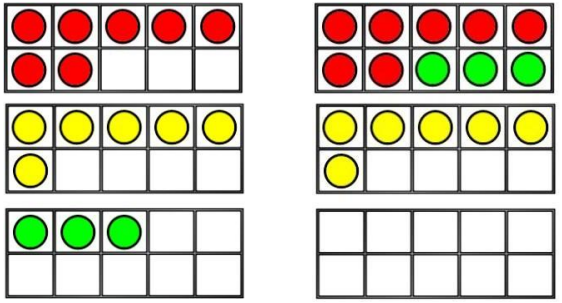
$$8 + 7 = 15$$

$$2 \quad 5$$



$$14 - 6 = 8$$

$$4 \quad 2$$



$$7 + 6 + 3 = 16$$

$$10$$

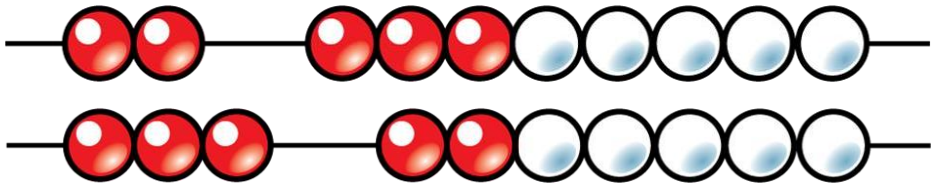
Benefits

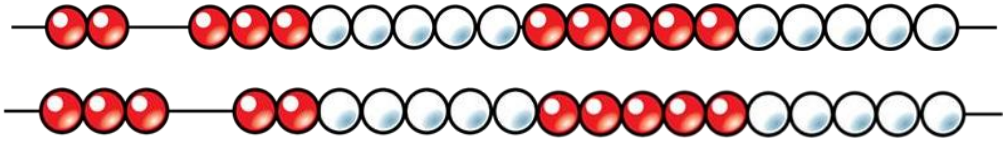
When adding two single digits, children can make each number on separate ten frames before moving part of one number to make 10 on one of the ten frames. This supports children to see how they have partitioned one of the numbers to make 10, and makes links to effective mental methods of addition.

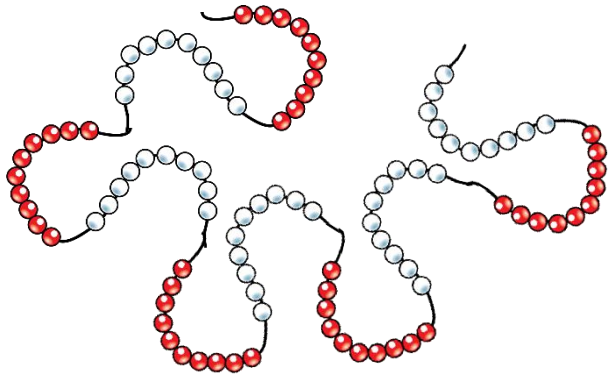
When subtracting a one-digit number from a two-digit number, firstly make the larger number on 2 ten frames. Remove the smaller number, thinking carefully about how you have partitioned the number to make 10, this supports mental methods of subtraction.

When adding three single-digit numbers, children can make each number on 3 separate 10 frames before considering which order to add the numbers in. They may be able to find a number bond to 10 which makes the calculation easier. Once again, the ten frames support the link to effective mental methods of addition as well as the importance of commutativity.

Bead Strings







Benefits

Different sizes of bead strings can support children at different stages of addition and subtraction.

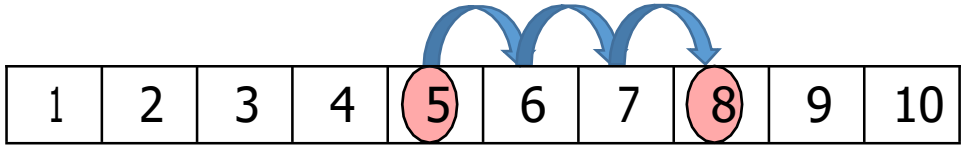
Bead strings to 10 are very effective at helping children to investigate number bonds up to 10.
They can help children to systematically find all the number bonds to 10 by moving one bead at a time to see the different numbers they have partitioned the 10 beads into e.g. $2 + 8 = 10$, move one bead, $3 + 7 = 10$.

Bead strings to 20 work in a similar way but they also group the beads in fives. Children can apply their knowledge of number bonds to 10 and see the links to number bonds to 20.

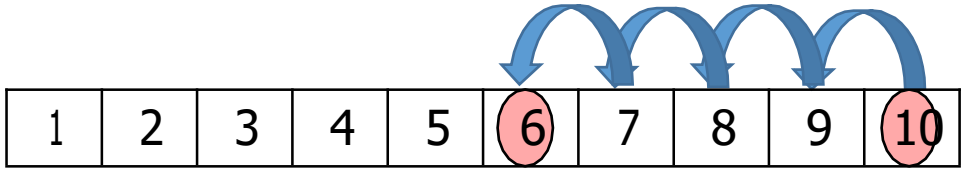
Bead strings to 100 are grouped in tens and can support children in number bonds to 100 as well as helping when adding by making ten. Bead strings can show a link to adding to the next 10 on number lines which supports a mental method of addition.

Number Tracks

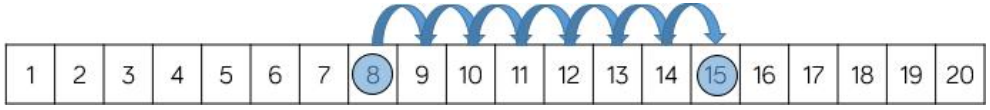
$5 + 3 = 8$



$10 - 4 = 6$



$8 + 7 = 15$



Benefits

Number tracks are useful to support children in their understanding of augmentation and reduction.

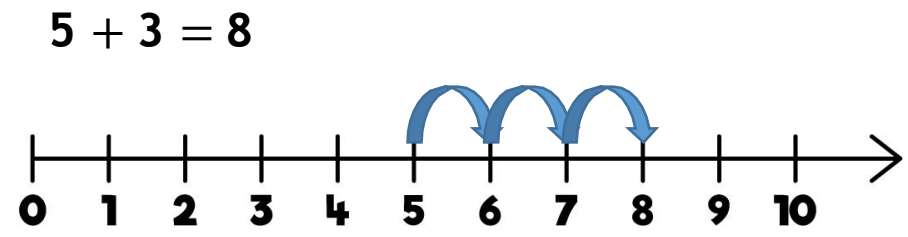
When adding, children count on to find the total of the numbers. On a number track, children can place a counter on the starting number and then count on to find the total.

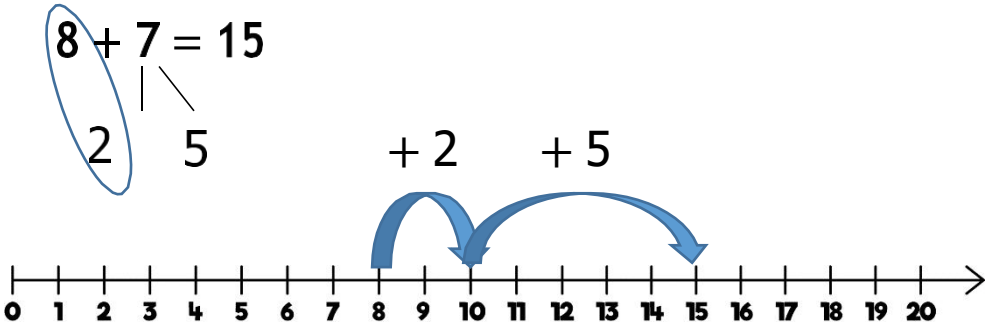
When subtracting, children count back to find their answer. They start at the minuend and then take away the subtrahend to find the difference between the numbers.

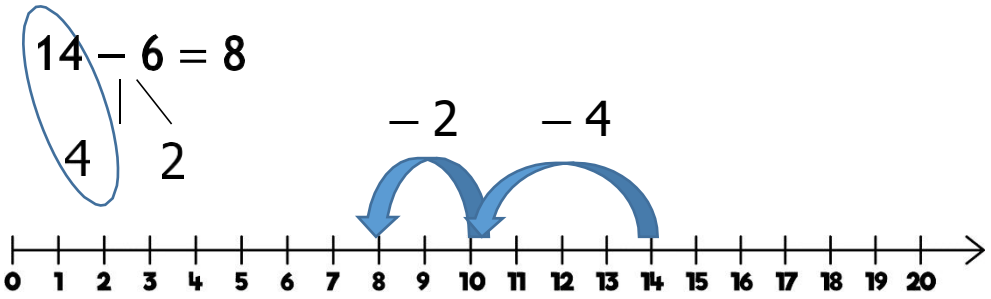
Number tracks can work well alongside ten frames and bead strings which can also model counting on or counting back.

Playing board games can help children to become familiar with the idea of counting on using a number track before they move on to number lines.

Number Lines (labelled)







Benefits

Labelled number lines support children in their understanding of addition and subtraction as augmentation and reduction.

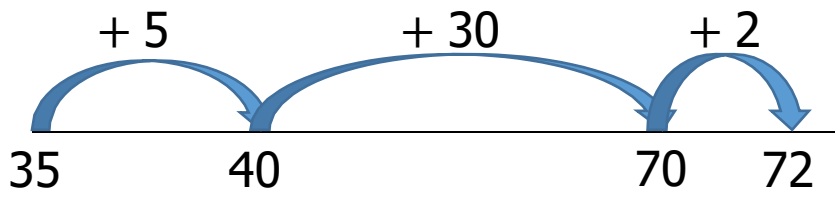
Children can start by counting on or back in ones, up or down the number line. This skill links directly to the use of the number track.

Progressing further, children can add numbers by jumping to the nearest 10 and then jumping to the total. This links to the making 10 method which can also be supported by ten frames. The smaller number is partitioned to support children to make a number bond to 10 and to then add on the remaining part.

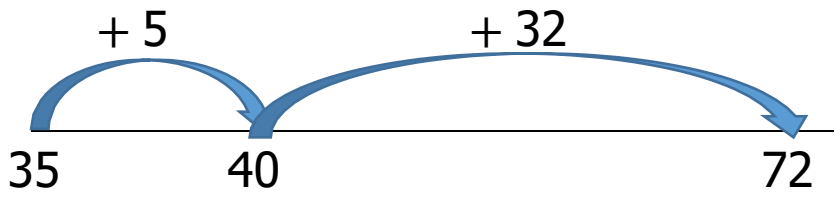
Children can subtract numbers by firstly jumping to the nearest 10. Again, this can be supported by ten frames so children can see how they partition the smaller number into the two separate jumps.

Number Lines (blank)

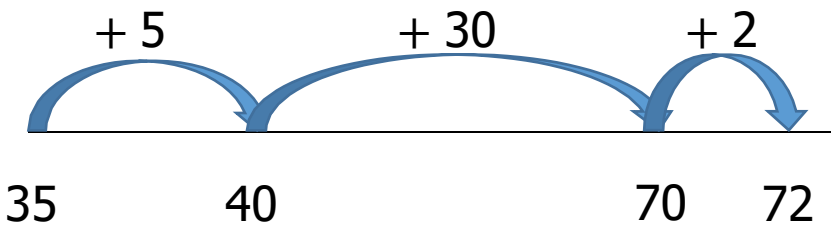
35 + 37 = 72



35 + 37 = 72



72 − 35 = 37



Benefits

Blank number lines provide children with a structure to add and subtract numbers in smaller parts.

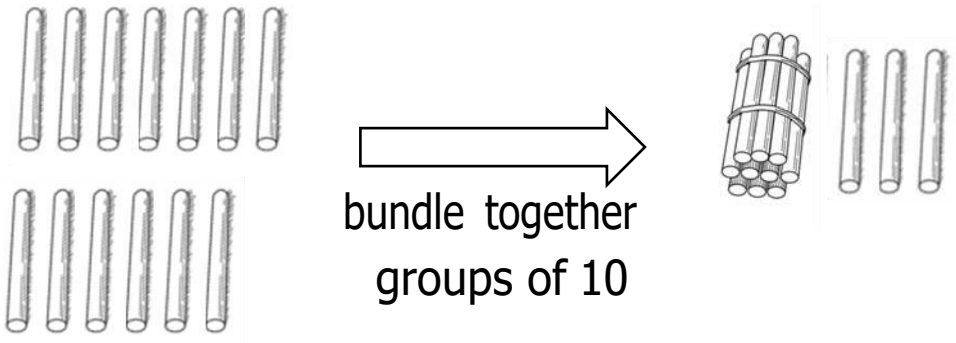
Developing from labelled number lines, children can add by jumping to the nearest 10 and then adding the rest of the number either as a whole or by adding the tens and ones separately.

Children may also count back on a number line to subtract, again by jumping to the nearest 10 and then subtracting the rest of the number.

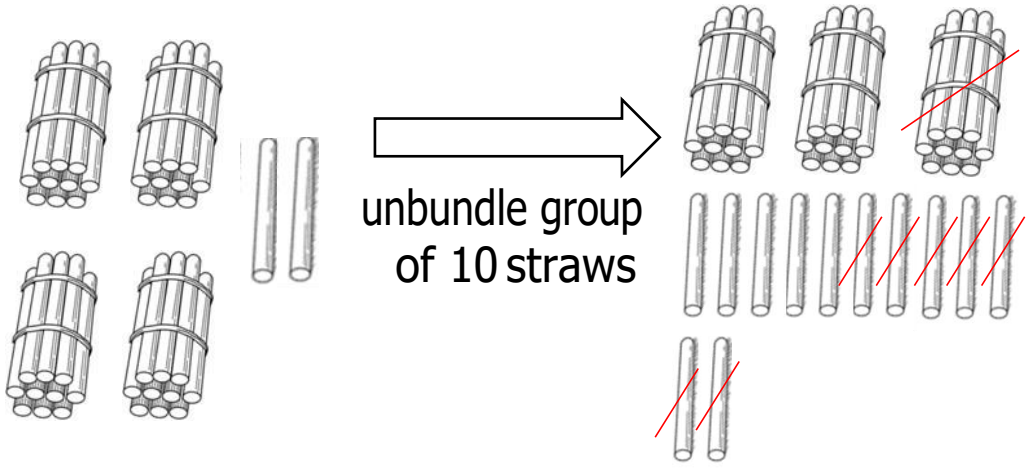
Blank number lines can also be used effectively to help children subtract by finding the difference between numbers. This can be done by starting with the smaller number and then counting on to the larger number. They then add up the parts they have counted on to find the difference between the numbers.

Straws

$7 + 6 = 13$



$42 - 17 = 25$



Benefits

Straws are an effective way to support children in their understanding of exchange when adding and subtracting 2-digit numbers.

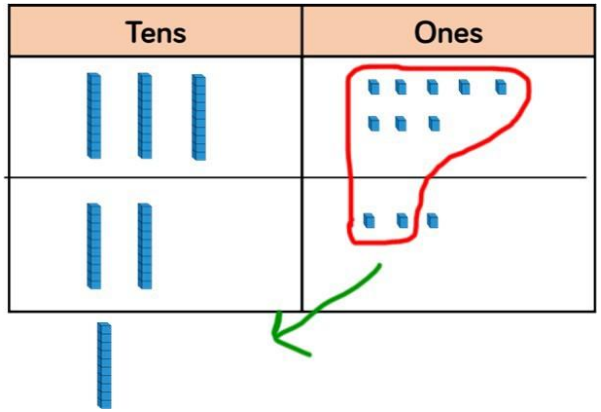
Children can be introduced to the idea of bundling groups of ten when adding smaller numbers and when representing 2-digit numbers. Use elastic bands or other ties to make bundles of ten straws.

When adding numbers, children bundle a group of 10 straws to represent the exchange from 10 ones to 1 ten. They then add the individual straws (ones) and bundles of straws (tens) to find the total.

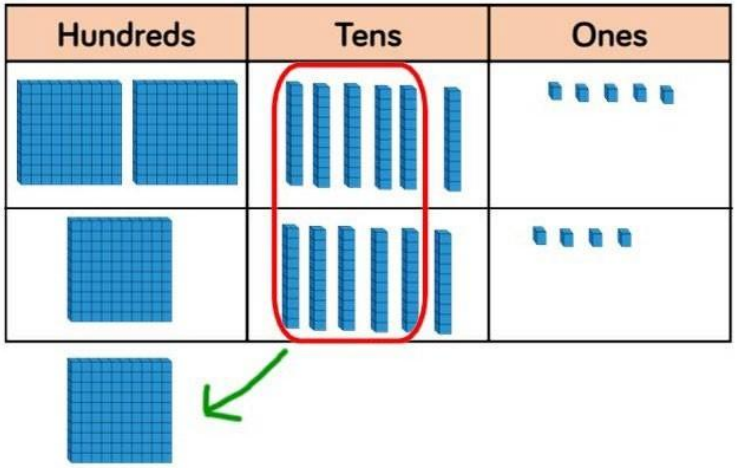
When subtracting numbers, children unbundle a group of 10 straws to represent the exchange from 1 ten to 10 ones.

Straws provide a good stepping stone to adding and subtracting with Base 10/Dienes.

Base 10/Dienes (addition)



$$\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline \end{array}$$
1



$$\begin{array}{r} 265 \\ +\ 164 \\ \hline 429 \\ \hline \end{array}$$
1

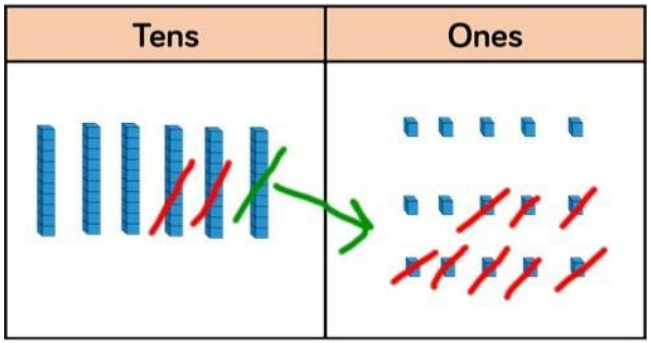
Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

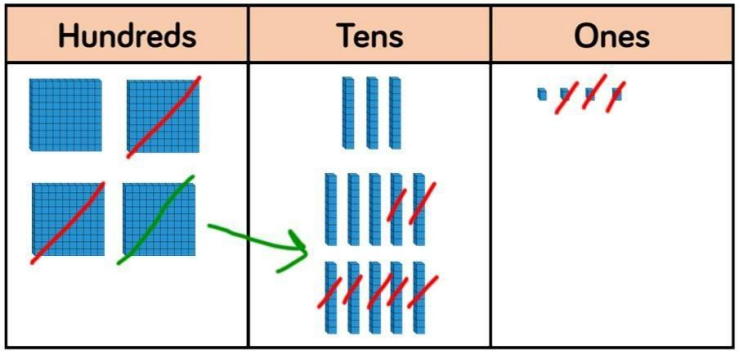
Children should first add without an exchange before moving on to addition with exchange.. The representation becomes less efficient with larger numbers due to the size of Base 10. In this case, place value counters may be the better model to use.

When adding, always start with the smallest place value column. Here are some questions to support children.
How many ones are there altogether?
Can we make an exchange? (Yes or No)
How many do we exchange? (10 ones for 1 ten, show exchanged 10 in tens column by writing 1 in column)
How many ones do we have left? (Write in ones column)
Repeat for each column.

Base 10/Dienes (subtraction)



$$\begin{array}{r} {\scriptstyle 5\ 1} \\ 65 \\ -\ 28 \\ \hline 37 \end{array}$$



$$\begin{array}{r} {\scriptstyle 3\ 4^{1}\ 1\ 3\ 5} \\ -\ 2\ 7\ 3 \\ \hline 1\ 6\ 2 \end{array}$$

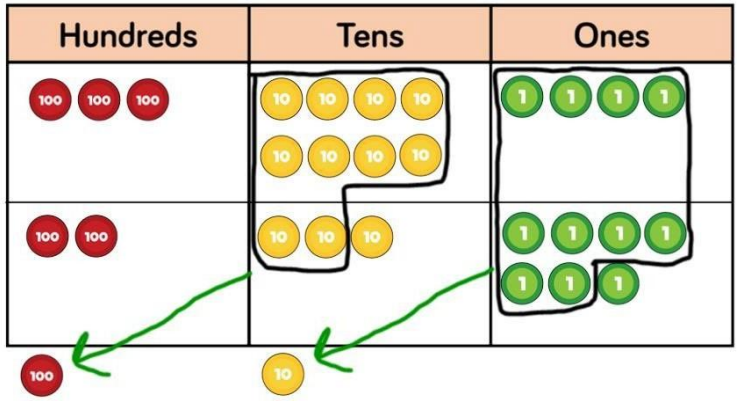
Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column subtraction. It is important that children write out their calculations alongside using or drawing Base 10 so they can see the clear links between the written method and the model.

Children should first subtract without an exchange before moving on to subtraction with exchange. When building the model, children should just make the minuend using Base 10, they then subtract the subtrahend. Highlight this difference to addition to avoid errors by making both numbers. Children start with the smallest place value column. When there are not enough ones/tens/hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange 1 ten for 10 ones. They can then subtract efficiently.

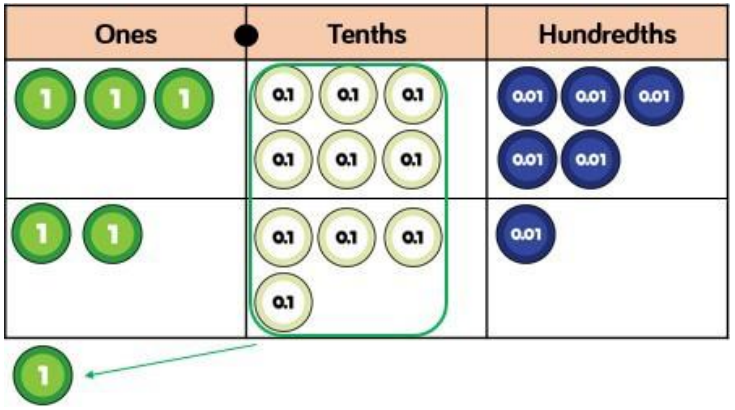
This model is efficient with up to 4-digit numbers. Place value counters are more efficient with larger numbers and decimals.

Place Value Counters (addition)



$$\begin{array}{r} 384 \\ +237 \\ \hline 621 \\ \hline \end{array}$$

1 1



$$\begin{array}{r} 3.65 \\ +\ 2.41 \\ \hline 6.06 \\ \hline \end{array}$$

1

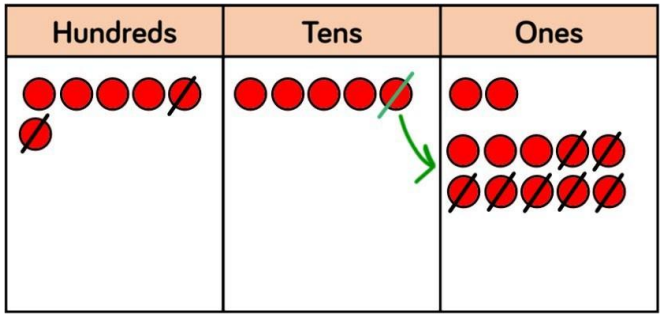
Benefits

Using place value counters is an effective way to support children's understanding of column addition. It is important that children write out their calculations alongside using or drawing counters so they can see the clear links between the written method and the model.

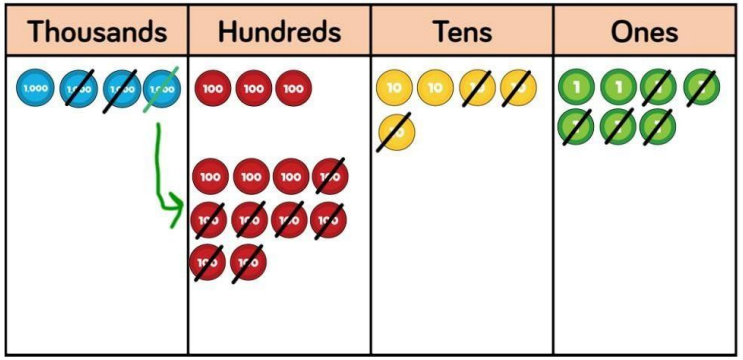
Children should first add without an exchange before moving on to addition with exchange. Different place value counters can be used to represent larger numbers or decimals. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.

When adding money, children can also use coins to support their understanding. It is important that children consider how the coins link to the written calculation especially when adding decimal amounts.

Place Value Counters (Subtractio



$$\begin{array}{r} {\scriptstyle 4\ 1} \\ 6\underline{5}2 \\ -\ 207 \\ \hline 445 \end{array}$$



$$\begin{array}{r} {\scriptstyle 3}4{\scriptstyle 1}357 \\ -\ \overline{2}735 \\ \hline 1622 \end{array}$$

Benefits

Using place value counters is an effective way to support children's understanding of column subtraction. It is important that children write out their calculations alongside using or drawing counters so they can see the clear links between the written method and the model.

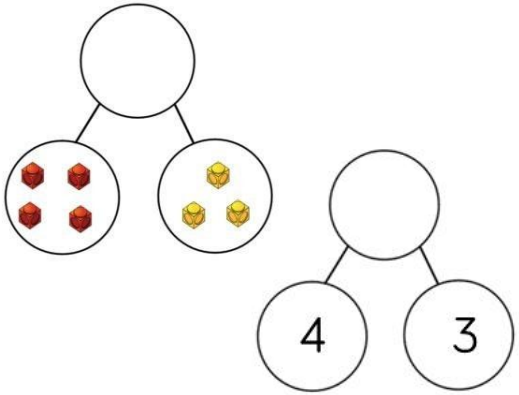
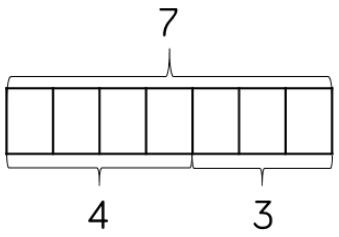
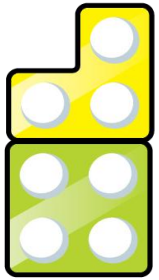
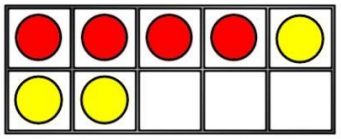
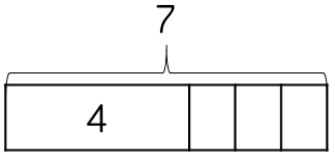
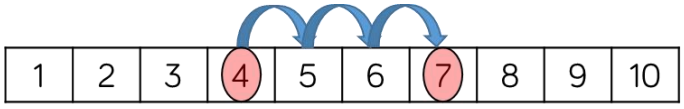
Children should first subtract without an exchange before moving on to subtraction with exchange. If you don't have place value counters, use normal counters on a place value grid to enable children to experience the exchange between columns.

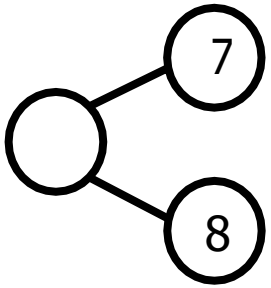
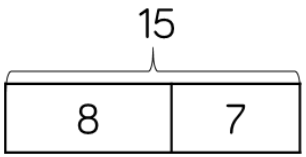
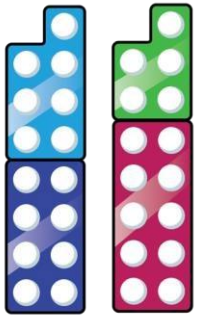
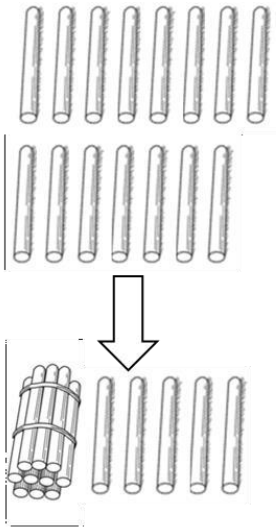
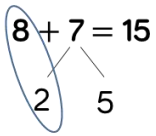
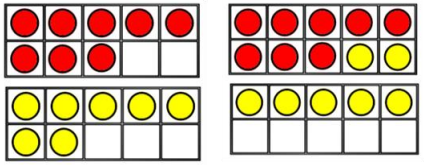
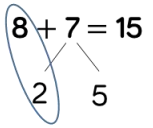
When building the model, children should just make the minuend using counters, they then subtract the subtrahend. Children start with the smallest place value column. When there are not enough ones/tens/hundreds to subtract in a column, children need to move to the column to the left and exchange e.g. exchange 1 ten for 10 ones. They can then subtract efficiently.

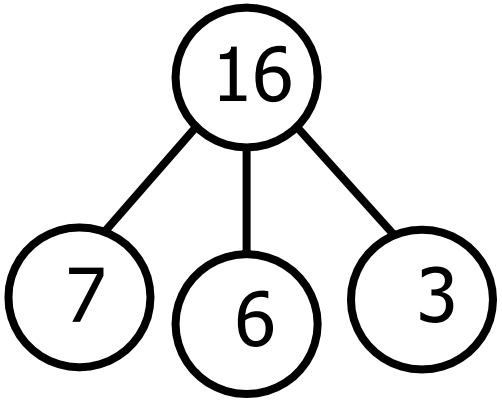
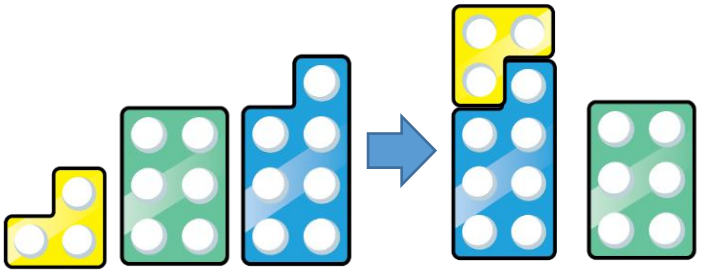
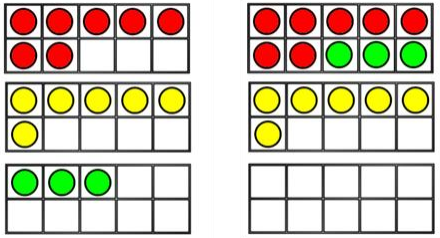
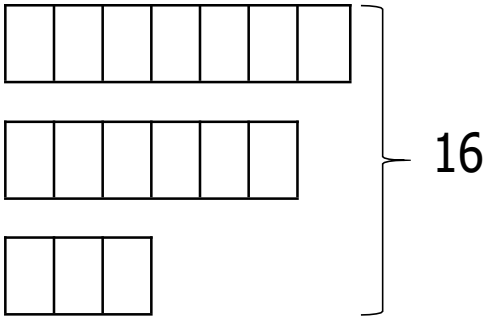
Addition

Skill	Year	Representations and models	
Add two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Add 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead strings (20) Number tracks Number lines (labelled) Straws
Add three 1-digit numbers	2	Part-whole model Bar model	Ten frames (within 20) Number shapes
Add 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square

Skill	Year	Representations and models	
Add two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws	Base 10 Place value counters
Add with up to 3-digits	3	Part-whole model Bar model	Base 10 Place value counters Column addition
Add with up to 4-digits	4	Part-whole model Bar model	Base 10 Place value counters Column addition
Add with more than 4 digits	5	Part-whole model Bar model	Place value counters Column addition
Add with up to 3 decimal places	5	Part-whole model Bar model	Place value counters Column addition

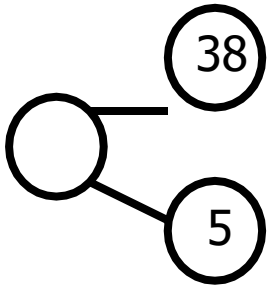
Skill: Add 1-digit numbers within 10	Year: 1
   $4 + 3 = 7$     	When adding numbers to 10, children can explore both aggregation and augmentation. The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation. The combination bar model, ten frame, bead string and number track all support augmentation.

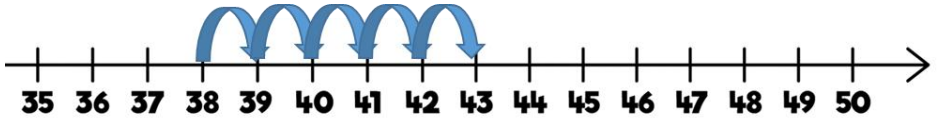
Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
    $8 + 7 = 15$     	When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. In Year 1, this is only done just by counting on. From Year 2, use different manipulatives can be used to represent this exchange alongside number lines to support children in understanding how to partition their jumps.

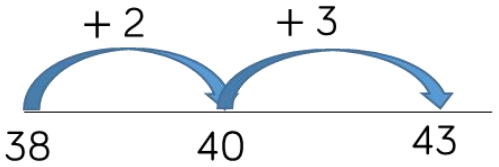
Skill: Add three 1-digit numbers	Year: 2
  $7 + 6 + 3 = 16$  $7 + 6 + 3 = 16$ 10 	When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

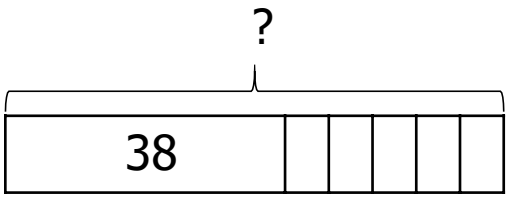
Skill: Add 1-digit and 2-digit numbers to 100

Year: 2/3

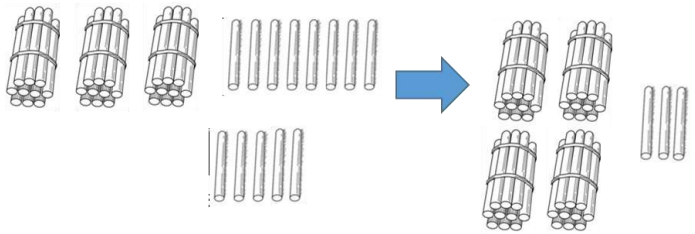








38 + 5 = 43

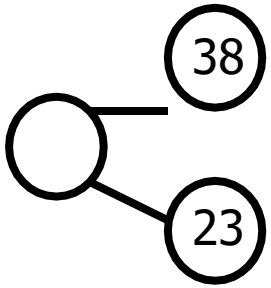
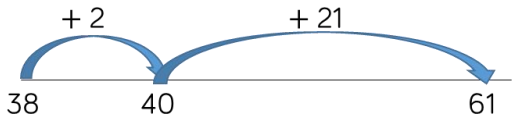
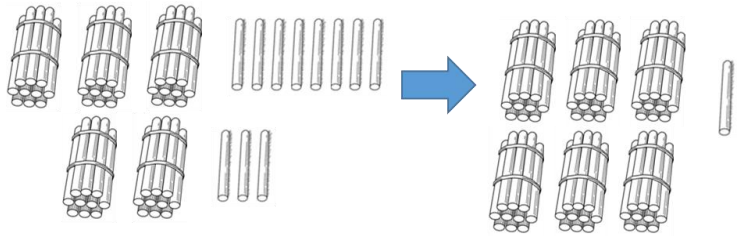
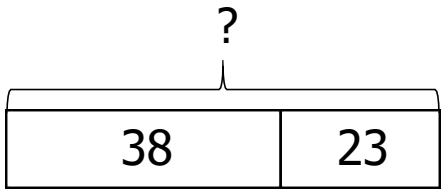
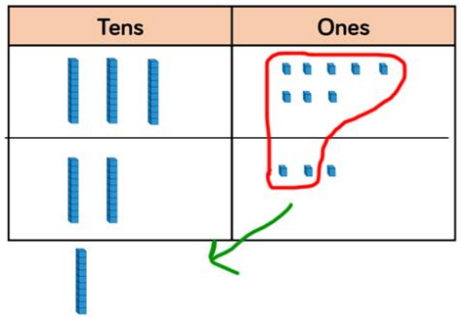
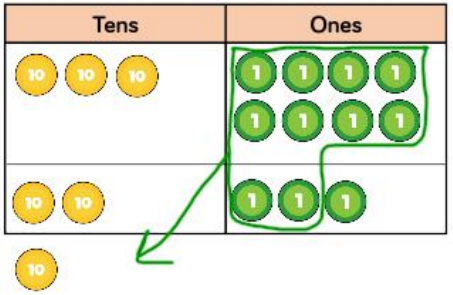


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

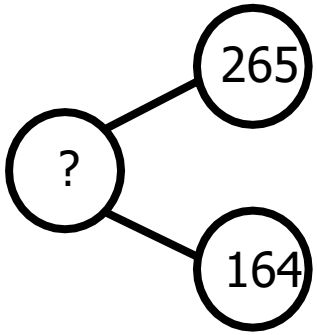
They should also apply their knowledge of number bonds to add more efficiently e.g. 8 + 5 = 13 so 38 + 5 = 43.

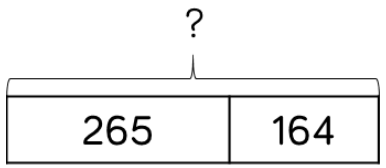
Hundred squares and straws can support children to find the number bond to 10.

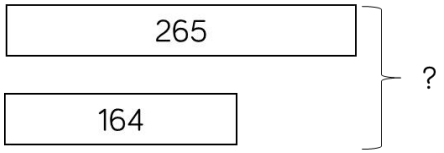
Skill: Add two 2-digit numbers to 100	Year: 2/3
    **38 + 23 = 61**  38 + 23 61 1 	Children can use a blank number line and other representations to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

Skill: Add numbers with up to 3 digits

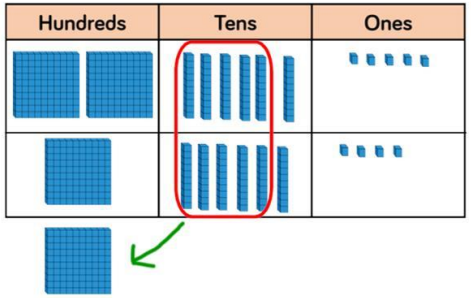
Year: 3



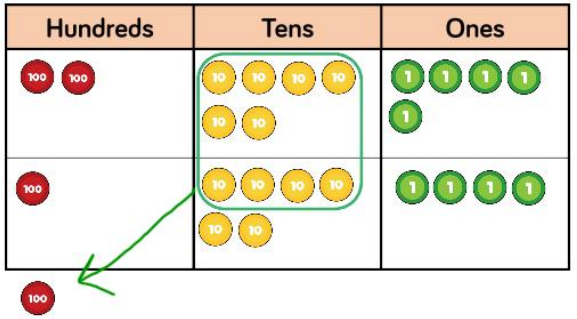




$$265 + 164 = 429$$



$$\begin{array}{r} 265 \\ +\ 164 \\ \hline 429 \\ \hline 1 \end{array}$$



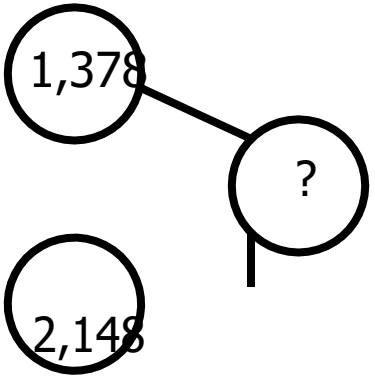
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

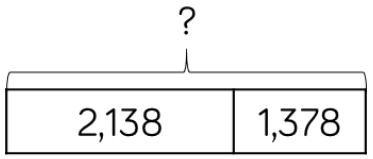
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Add numbers with up to 4 digits

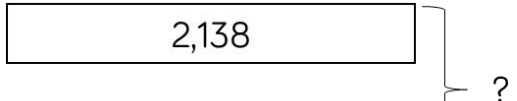
Year: 4



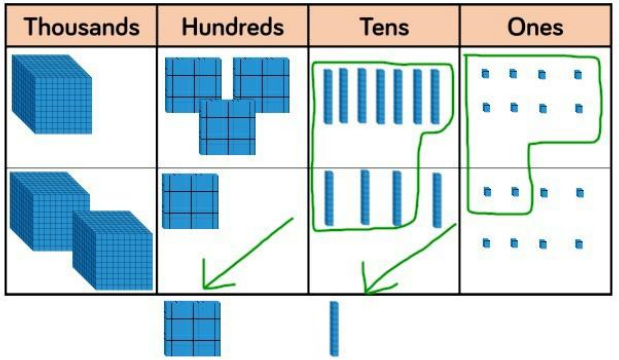


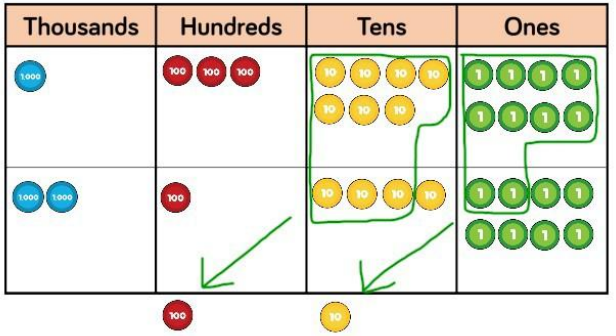
	1	3	7	8
+	2	1	4	8
	3	5	2	6

1 1



1,378 + 2,148 = 3,526





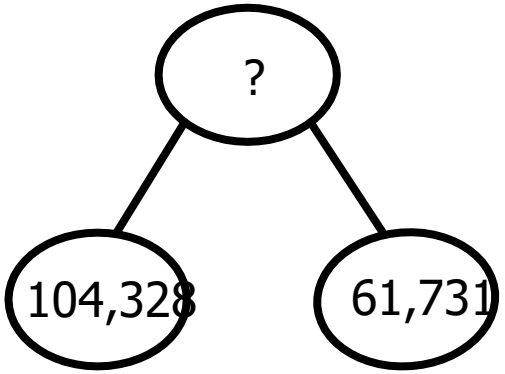
Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits.

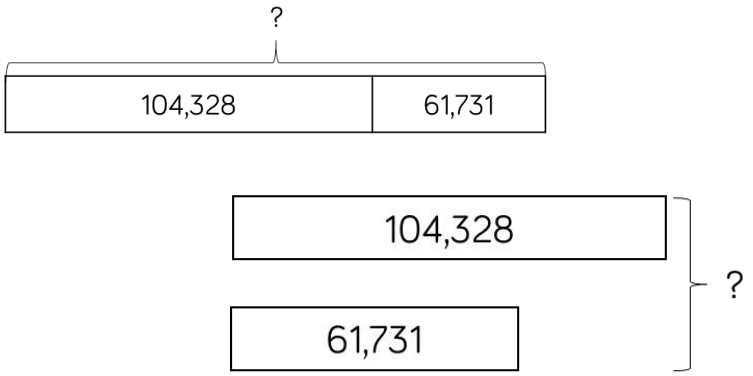
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

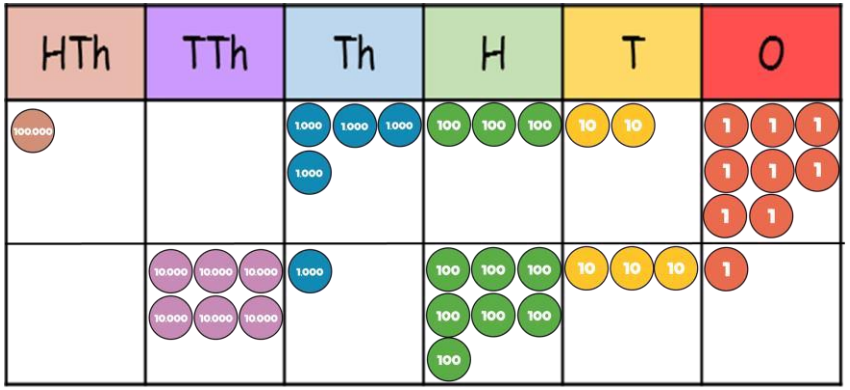
Skill: Add numbers with more than 4 digits

Year: 5/6





104,328 + 61,731 = 166,059



1	0	4	3	2	8
+	6	1	7	3	1
1	6	6	0	5	9

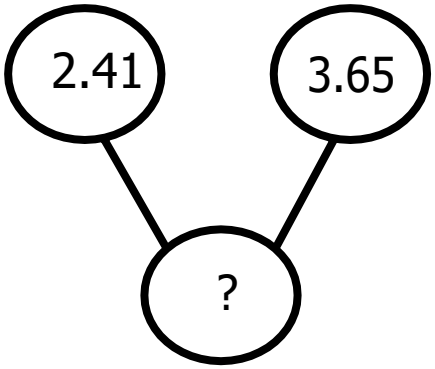
1

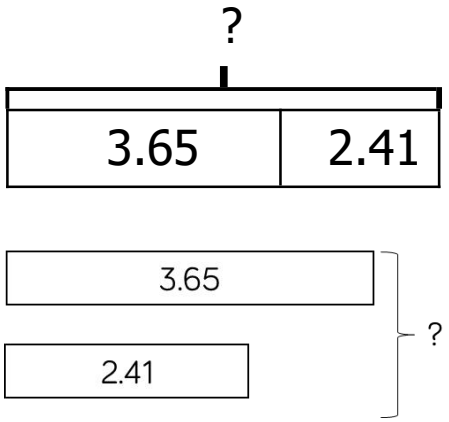
Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

Skill: Add with up to 3 decimal places

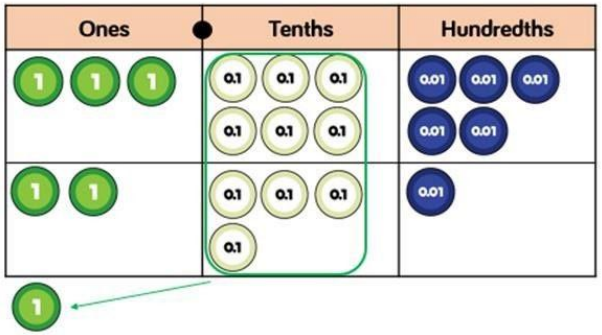
Year: 5

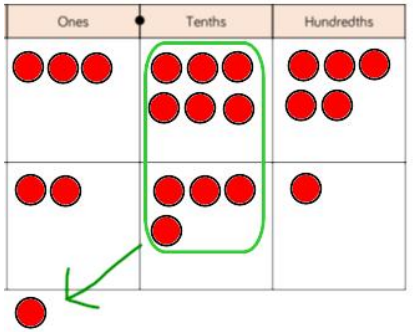




$$\begin{array}{r} 3.65 \\ +\ 2.41 \\ \hline 6.06 \\ \hline 1 \end{array}$$

3.65 + 2.41 = 6.06





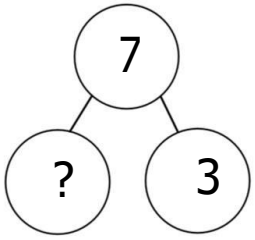
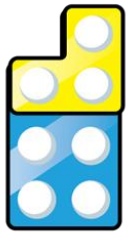
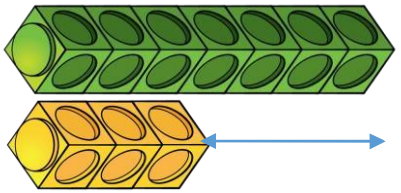
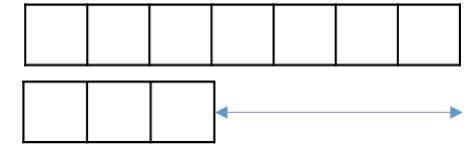
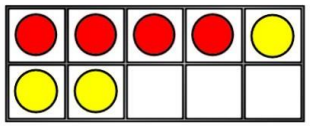
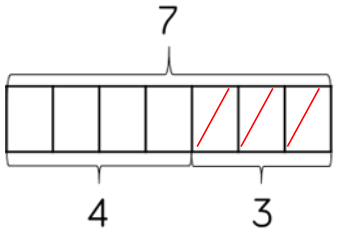
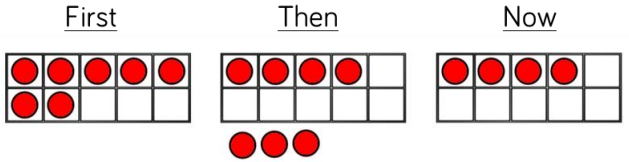
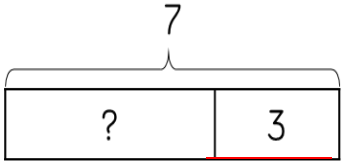
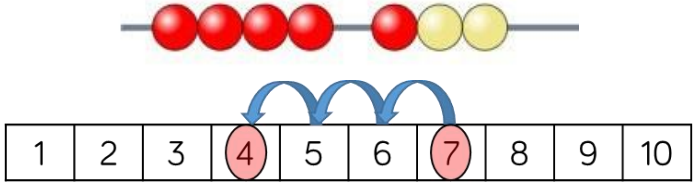
Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

Subtraction

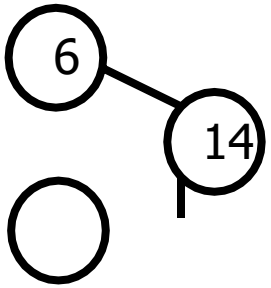
Skill	Year	Representations and models	
Subtract two 1-digit numbers to 10	1	Part-whole model Bar model Number shapes	Ten frames (within 10) Bead strings (10) Number tracks
Subtract 1 and 2-digit numbers to 20	1	Part-whole model Bar model Number shapes Ten frames (within 20)	Bead string (20) Number tracks Number lines (labelled) Straws
Subtract 1 and 2-digit numbers to 100	2	Part-whole model Bar model Number lines (labelled)	Number lines (blank) Straws Hundred square
Subtract two 2-digit numbers	2	Part-whole model Bar model Number lines (blank) Straws	Base 10 Place value counters

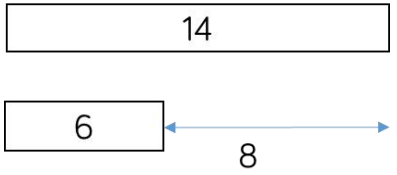
Skill	Year	Representations and models	
Subtract with up to 3-digits	3	Part-whole model Bar model	Base 10 Place value counters Column subtraction
Subtract with up to 4-digits	4	Part-whole model Bar model	Base 10 Place value counters Column subtraction
Subtract with more than 4 digits	5	Part-whole model Bar model	Place value counters Column subtraction
Subtract with up to 3 decimal places	5	Part-whole model Bar model	Place value counters Column subtraction

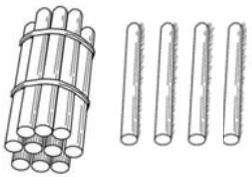
Skill: Subtract 1-digit numbers within 10	Year: 1
     $7 - 3 = 4$    	Part-whole models, bar models, ten frames and number shapes support partitioning. Ten frames, number tracks, single bar models and bead strings support reduction. Cubes and bar models with two bars can support finding the difference.

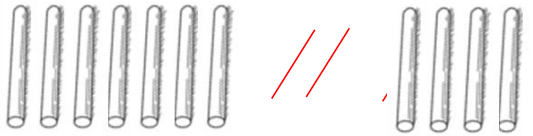
Skill: Subtract 1 and 2-digit numbers to 20

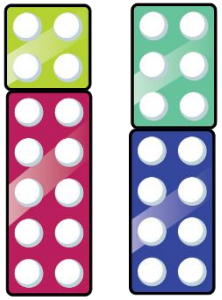
Year: 1/2



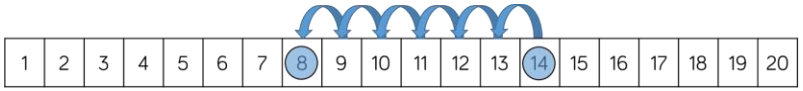


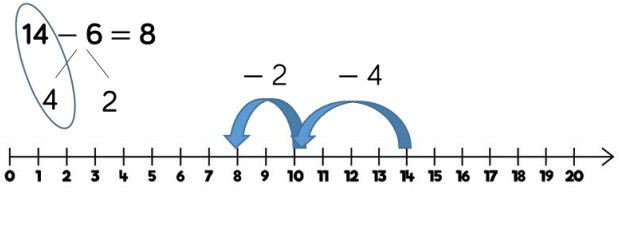


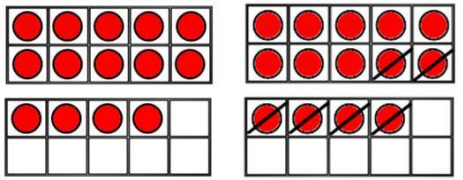


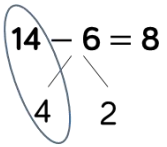


$$14 - 6 = 8$$

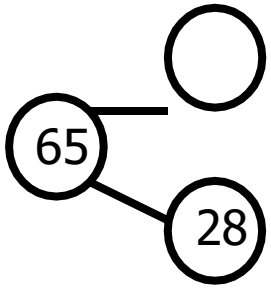
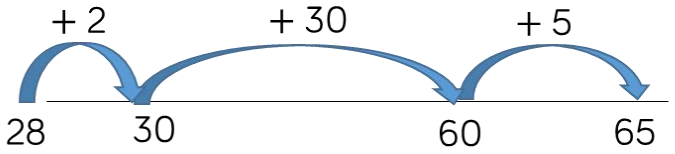
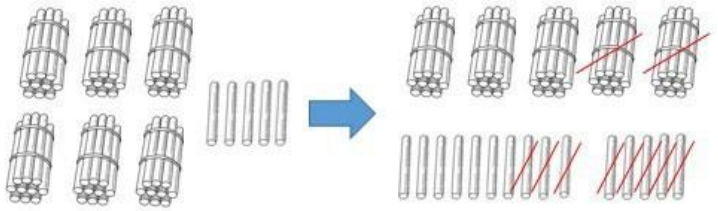
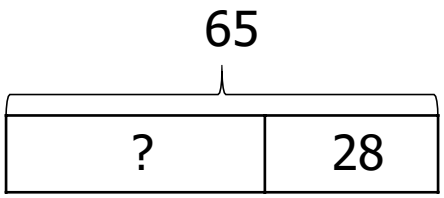
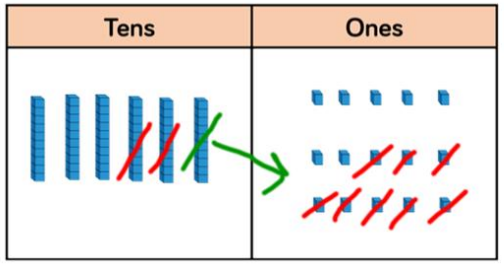
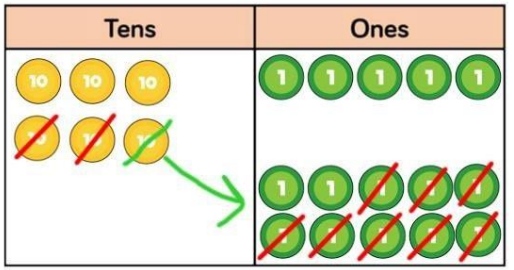


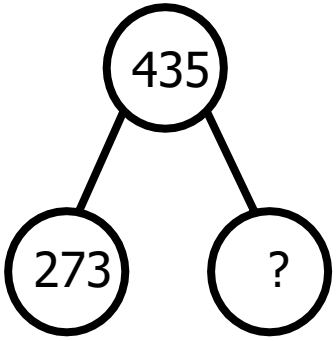
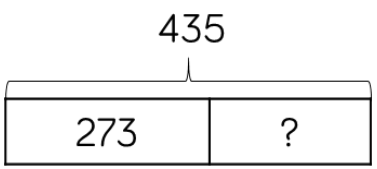
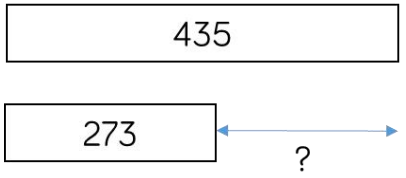
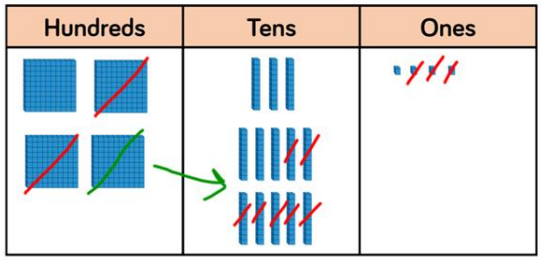
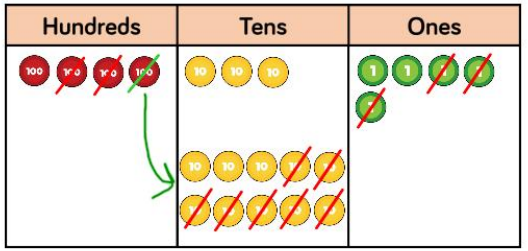






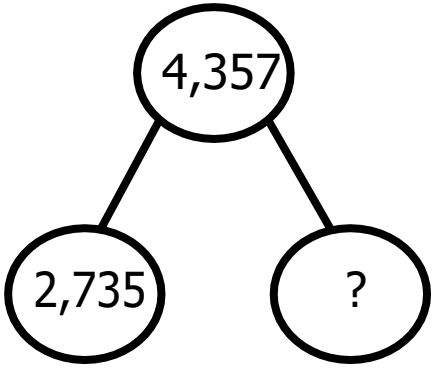
In Year 1, subtracting one-digit numbers that cross 10, is done by counting back, using objects, number tracks and number lines. From Year 2, children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

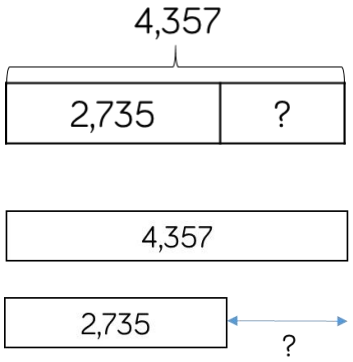
Skill: Subtract 1 and 2-digit numbers to 100	Year: 2/3
    **65 − 28 = 37**  5 1 ~~6~~5 − 28 37 	Children can also use a blank number line to count back to find the difference. Encourage them to jump to multiples of 10 to become more efficient. From Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

Skill: Subtract numbers with up to 3 digits	Year: 3
   $435 - 273 = 162$  $\begin{array}{r} {}^{3}\not{4}{}^{1}\not{3}5 \\ -\ 273 \\ \hline 162 \end{array}$ 	Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method. Plain counters on a place value grid can also be used to support learning.

Skill: Subtract numbers with up to 4 digits

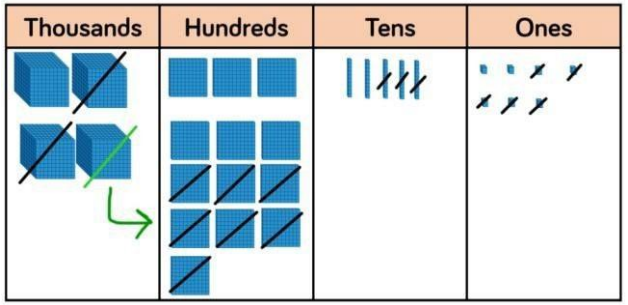
Year: 4

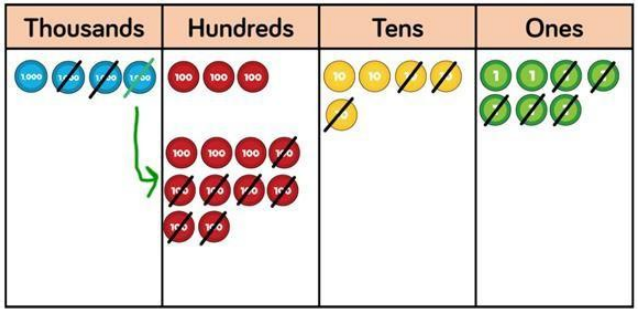




$$\begin{array}{r} {}^{3}\cancel{4}{}^{1}\cancel{3}57 \\ -\ 2735 \\ \hline 1622 \end{array}$$

$$4{,}357 - 2{,}735 = 1{,}622$$





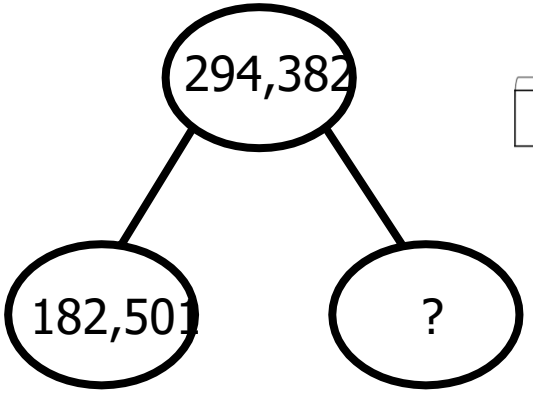
Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

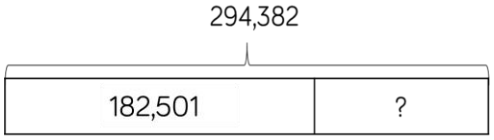
Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

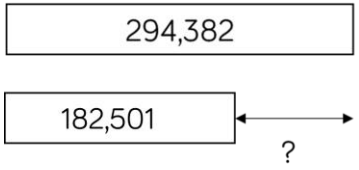
Plain counters on a place value grid can also be used to support learning.

Skill: Subtract numbers with more than 4 digits

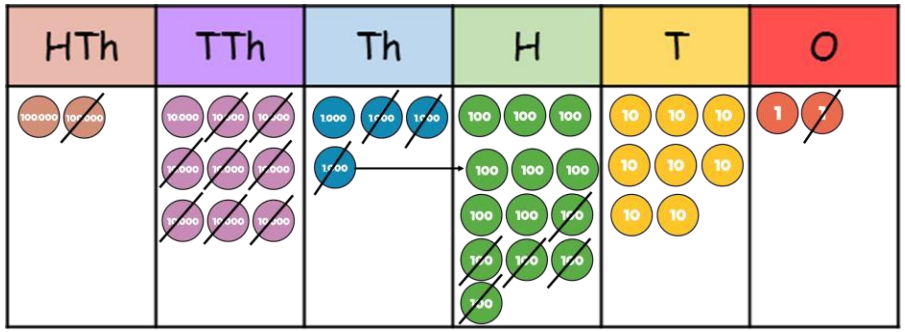
Year: 5/6







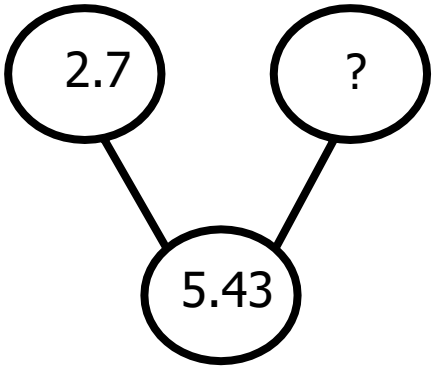
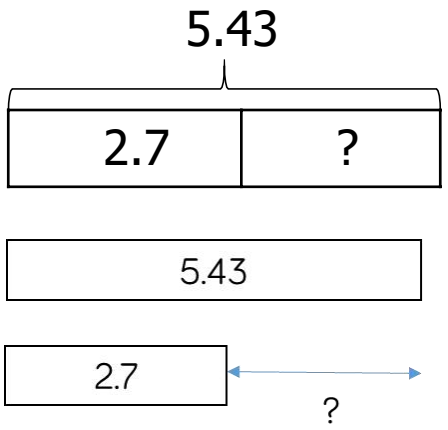
294,382 – 182,501 = 111,881



	2	9	$^{3}\cancel{4}$	$^{1}3$	8	2
–	1	8	2	5	0	1
	1	1	1	8	8	1

Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

Skill: Subtract with up to 3 decimal places	Year: 5/6
  $4\ 1$ 5.43 $-\ 2.7$ 2.73 **$5.43 - 2.7 = 2.73$**	Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places. Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative - numbers can be added in any order.

Complement - in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference - the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange - Change a number or expression for another of an equal value.

Minuend - A quantity or number from which another is subtracted.

Partitioning - Splitting a number into its component parts.

Reduction - Subtraction as take away.

Subitise - Instantly recognise the number of objects in a small group without needing to count.

Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

Total - The aggregate or the sum found by addition.

Darley and Summerbridge

Calculation Policy

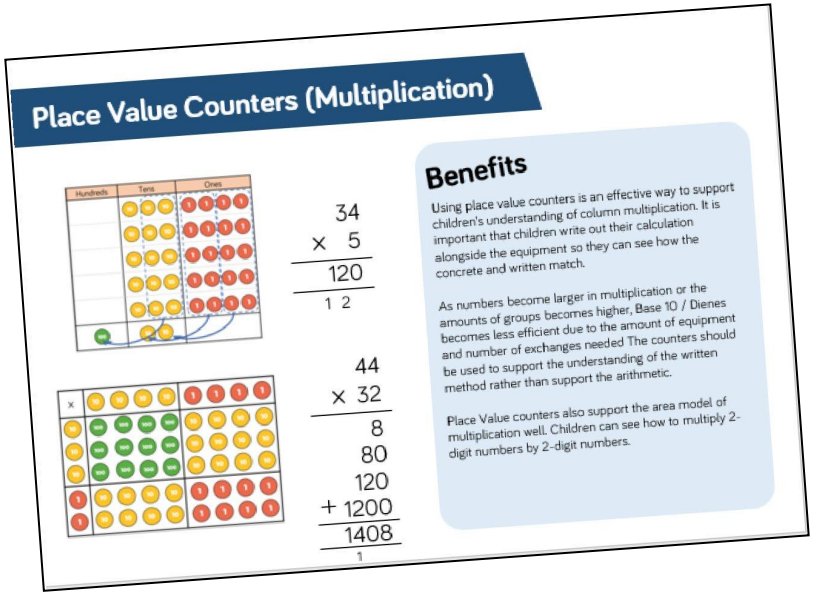
Multiplication and Division

Calculation Policy

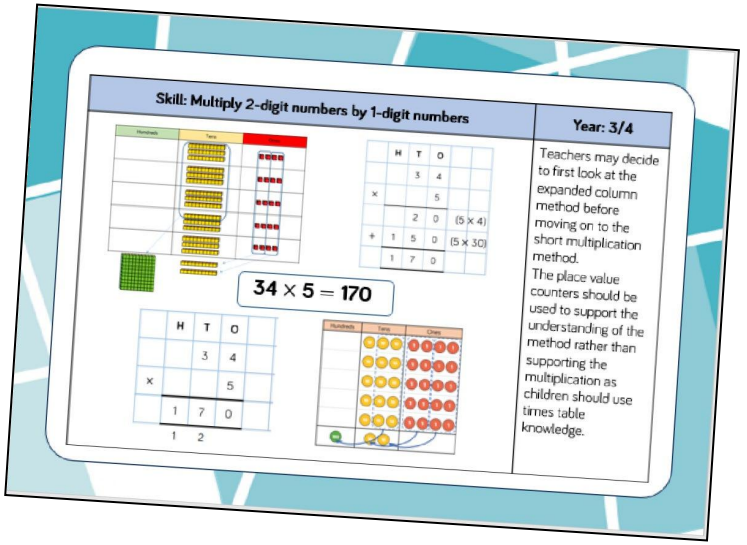
Welcome to the White Rose Maths Calculation Policy.

This document is broken down into addition and subtraction, and multiplication and division.

At the start of each policy, there is an overview of the different models and images that can support the teaching of different concepts. These provide explanations of the benefits of using the models and show the links between differentoperations.

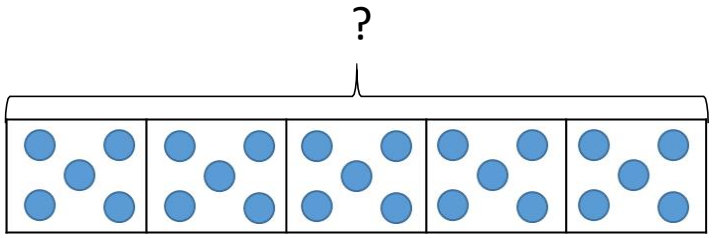


Each operation is then broken down into skills and each skill has a dedicated page showing the different models and images that could be used to effectively teach that concept.

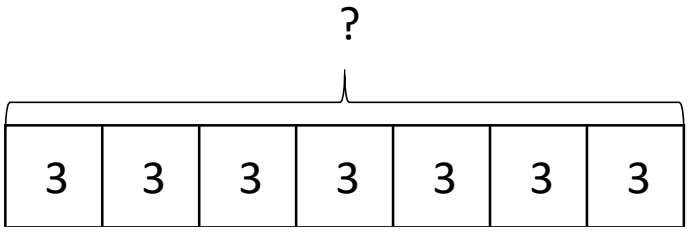


There is an overview of skills linked to year groups to support consistency through out school. A glossary of terms is provided at the end of the calculation policy to support understanding ofthe key language used to teach the four operations.

Bar Model

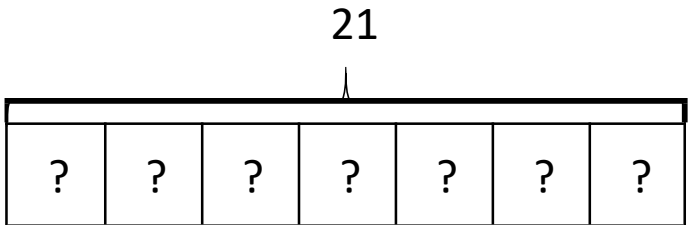


$5 \times 5 = 25$

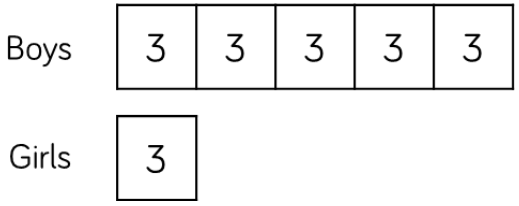


$3 \times 7 = 21$

$7 \times 3 = 21$



$21 \div 7 = 3$



Benefits

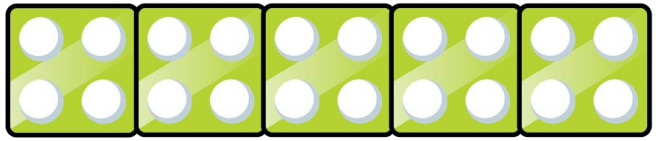
Children can use the single bar model to represent multiplication as repeated addition. They could use counters, cubes or dots within the bar model to support calculation before moving on to placing digits into the bar model to represent the multiplication.

Division can be represented by showing the total of the bar model and then dividing the bar model into equal groups.

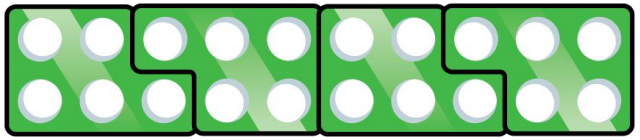
It is important when solving word problems that the bar model represents the problem.

Sometimes, children may look at scaling problems. In this case, more than one bar model is useful to represent this type of problem, e.g. There are 3 girls in a group. There are 5 times more boys than girls. How many boys are there?
The multiple bar model provides an opportunity to compare the groups.

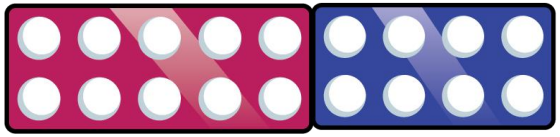
Number Shapes



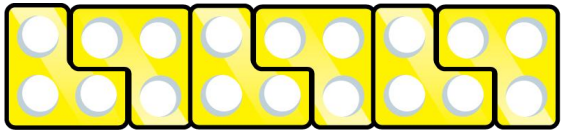
$5 \times 4 = 20$
$4 \times 5 = 20$



$5 \times 4 = 20$
$4 \times 5 = 20$



$18 \div 3 = 6$



Benefits

Number shapes support children's understanding of multiplication as repeated addition.

Children can build multiplications in a row using the number shapes. When using odd numbers, encourage children to interlock the shapes so there are no gaps in the row. They can then use the tens number shapes along with other necessary shapes over the top of the row to check the total. Using the number shapes in multiplication can support children in discovering patterns of multiplication e.g. odd × odd = even, odd × even = odd, even × even = even.

When dividing, number shapes support children's understanding of division as grouping. Children make the number they are dividing and then place the number shape they are dividing by over the top of the number to find how many groups of the number there are altogether e.g. There are 6 groups of 3 in 18.

Bead Strings

$5 \times 3 = 15$

$3 \times 5 = 15$

$15 \div 3 = 5$

$5 \times 3 = 15$

$3 \times 5 = 15$

$15 \div 5 = 3$

$4 \times 5 = 20$

$5 \times 4 = 20$

$20 \div 4 = 5$

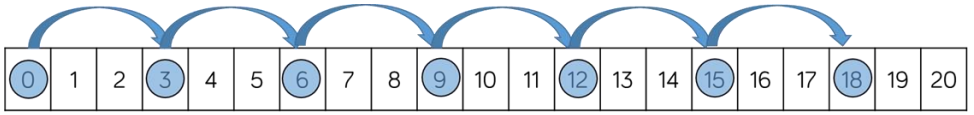
Benefits

Bead strings to 100 can support children in their understanding of multiplication as repeated addition. Children can build the multiplication using the beads. The colour of beads supports children in seeing how many groups of 10 they have, to calculate the total more efficiently.
Encourage children to count in multiples as they build the number e.g. 4, 8, 12, 16, 20.

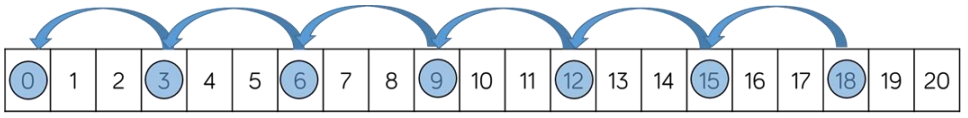
Children can also use the bead string to count forwards and backwards in multiples, moving the beads as they count.

When dividing, children build the number they are dividing and then group the beads into the number they are dividing by e.g. 20 divided by 4 – Make 20 and then group the beads into groups of four. Count how many groups you have made to find the answer.

Number Tracks



$6 \times 3 = 18$
$3 \times 6 = 18$



$18 \div 3 = 6$

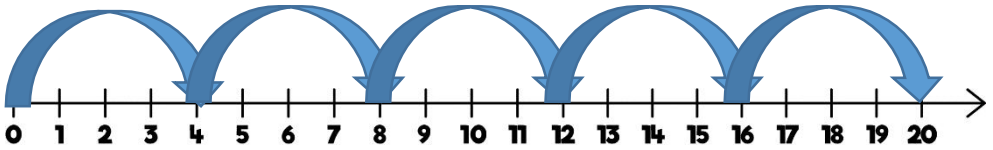
Benefits

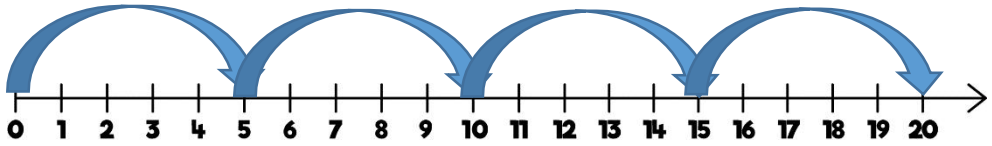
Number tracks are useful to support children to count in multiples, forwards and backwards. Moving counters or cubes along the number track can support children to keep track of their counting. Translucent counters help children to see the number they have landed on whilst counting.

When multiplying, children place their counter on 0 to start and then count on to find the product of the numbers.
When dividing, children place their counter on the number they are dividing and the count back in jumps of the number they are dividing by until they reach 0. Children record how many jumps they have made to find the answer to the division.

Number tracks can be useful with smaller multiples but when reaching larger numbers they can become less efficient.

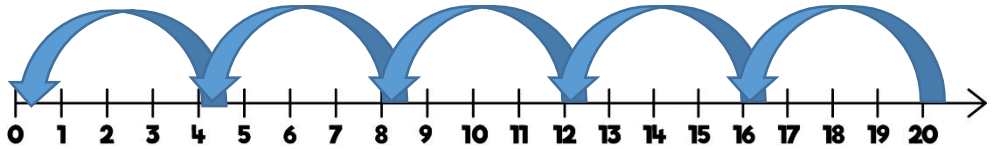
Number Lines (labelled)





$4 \times 5 = 20$

$5 \times 4 = 20$



$20 \div 4 = 5$

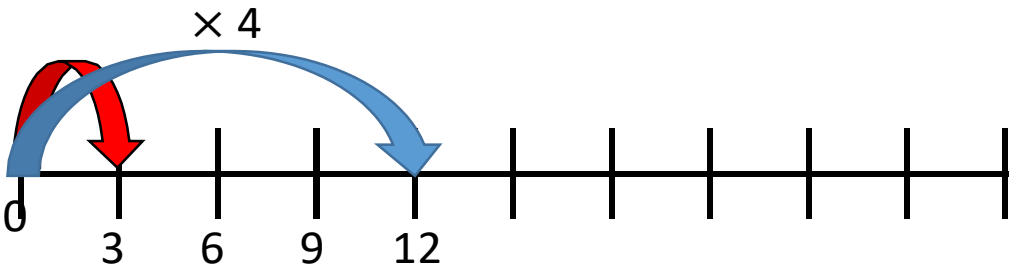
Benefits

Labelled number lines are useful to support children to count in multiples, forwards and backwards as well as calculating single-digit multiplications.

When multiplying, children start at 0 and then count on to find the product of the numbers.
When dividing, start at the number they are dividing and the count back in jumps of the number they are dividing by until they reach 0.
Children record how many jumps they have made to find the answer to the division.

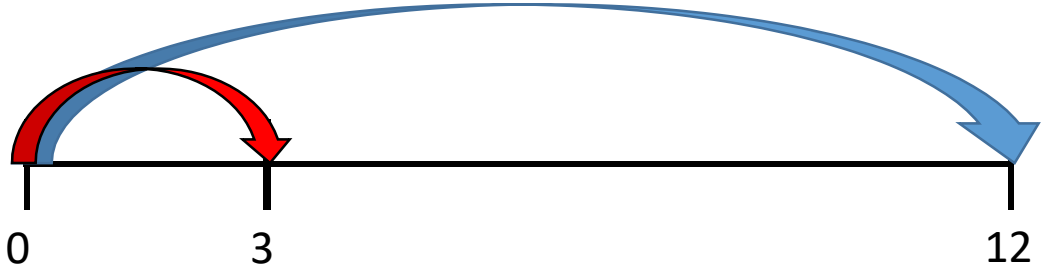
Labelled number lines can be useful with smaller multiples, however they become inefficient as numbers become larger due to the required size of the number line.

Number Lines (blank)



A red car travels 3 miles.
A blue car 4 times further.
How far does the blue car travel?

× 4



A blue car travels 12 miles.
A red car 4 timesless.

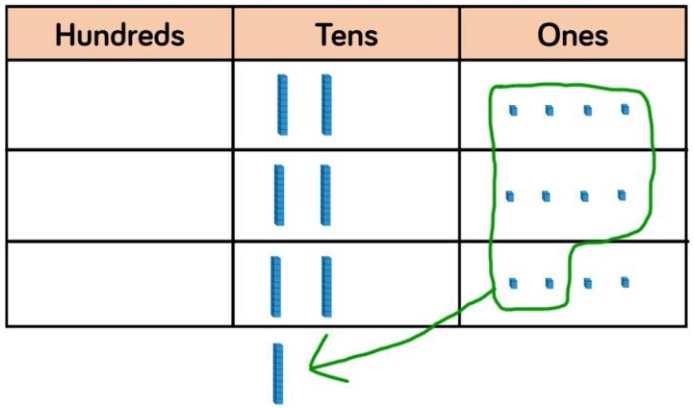
Benefits

Children can use blank number lines to represent scaling as multiplication or division.

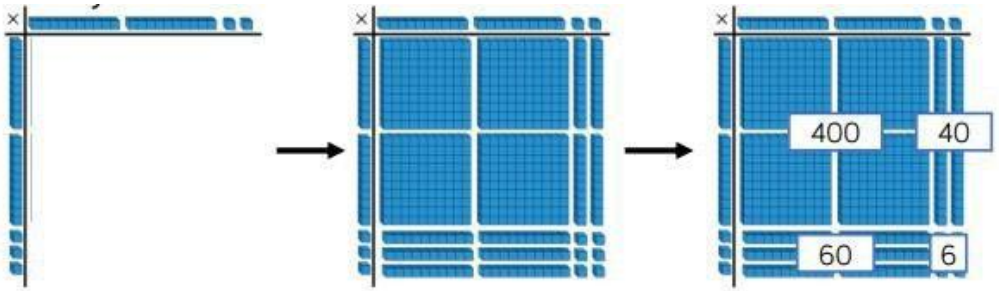
Blank number lines with intervals can support children to represent scaling accurately. Children can label intervals with multiples to calculate scaling problems.

Blank number lines without intervals can also be used for children to represent scaling.

Base 10/Dienes (multiplication)



$$\begin{array}{r} 2 \\ \times \quad 3 \\ \hline 72 \\ 1 \end{array}$$



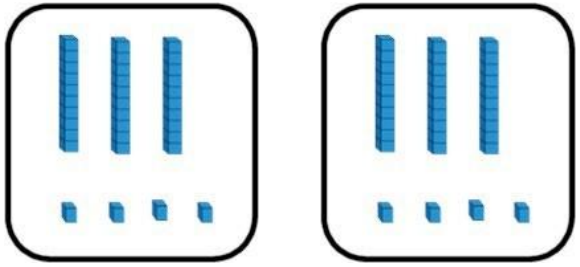
Benefits

Using Base 10 or Dienes is an effective way to support children's understanding of column multiplication. It is important thatchildren write out their calculation alongside the equipment so they can see how the concrete and written representations match.

As numbers become larger in multiplication or the amounts of groups becomes higher, Base 10 / Dienes becomes less efficient due to the amount of equipment and number of exchanges needed.

Base 10 also supports the area model of multiplication well. Children use the equipment to build the number in a rectangular shape which they then find the area of by calculating the total value of the pieces This area model can be linked to the grid method or the formal column method of multiplying 2-digits by 2-digits.

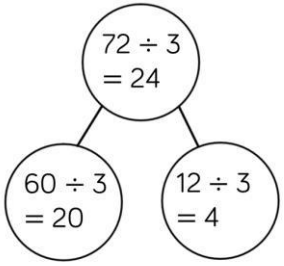
Base 10/Dienes (division)



$68 \div 2 = 34$

Tens	Ones

$72 \div 3 = 24$



Benefits

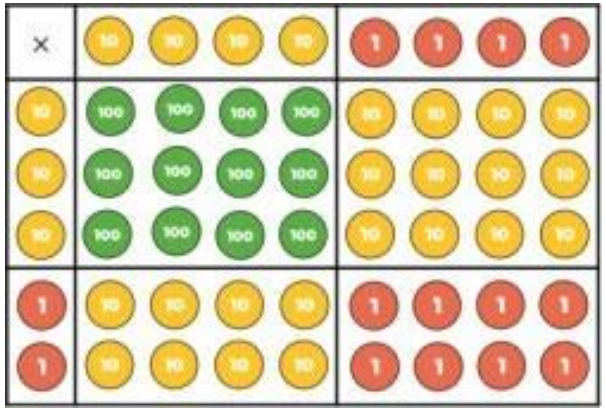
Using Base 10 or Dienes is an effective way to support children's understanding of division.

When numbers become larger, it can be an effective way to move children from representing numbers as ones towards representing them as tens and ones in order to divide. Children can then share the Base 10/ Dienes between different groups e.g. by drawing circles or by rows on a place value grid.

When they are sharing, children start with the larger place value and work from left to right. If there are any left in a column, they exchange e.g. one ten for ten ones. When recording, encourage children to use the part-whole model so they can consider how the number has been partitioned in order to divide. This will support them with mental methods.

Place Value Counters (multiplication)

$$\begin{array}{r} 34 \\ \times \quad 5 \\ \hline 170 \\ \hline 1\ 2 \end{array}$$



$$\begin{array}{r} 44 \\ \times\ 32 \\ \hline 8 \\ 80 \\ 120 \\ +\ 1200 \\ \hline \end{array}$$

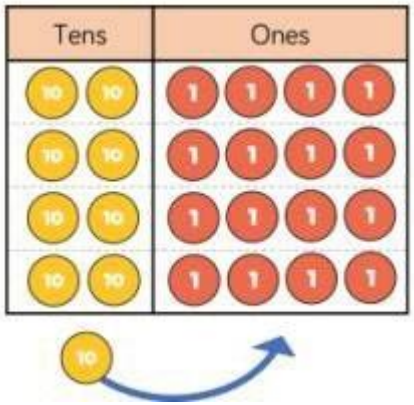
Benefits

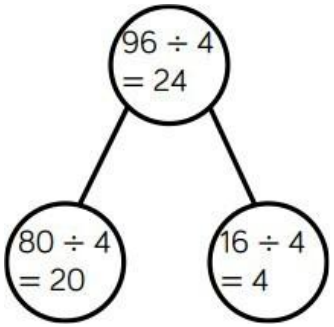
Using place value counters is an effective way to support children's understanding of column multiplication. It is important that children write out their calculation alongside the equipment so they can see how the concrete and written match.

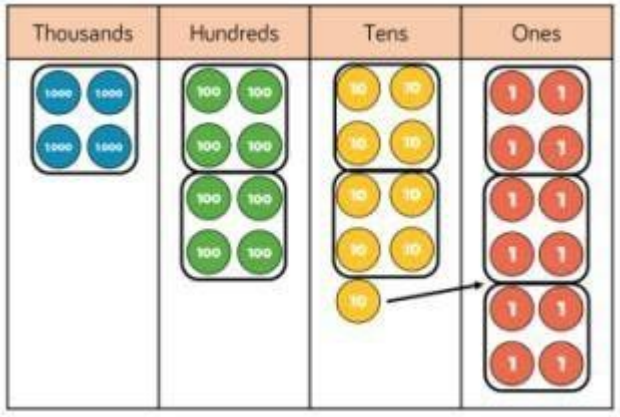
As numbers become larger in multiplication or the amounts of groups becomes higher, Base 10 / Dienes becomes less efficient due to the amount of equipment and number of exchanges needed The counters should be used to support the understanding of the written method rather than support the arithmetic.

Place value counters also support the area model of multiplication well. Children can see how to multiply 2-digit numbers by 2-digit numbers.

Place Value Counters (division)







$$\begin{array}{r} 1223 \\ 4\overline{)\,489^{1}2} \end{array}$$

Benefits

Using place value counters is an effective way to support children's understanding of division.

When working with smaller numbers, children can use place value counters to share between groups. They start by sharing the larger place value column and work from left to right. If there are any counters left over once they have been shared, they exchange the counter e.g. exchange one ten for ten ones. This method can be linked to the part-whole model to support children to show their thinking.

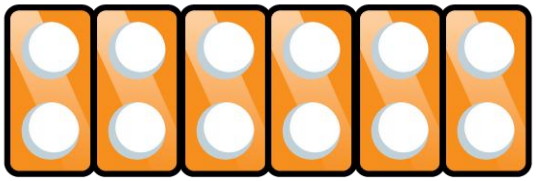
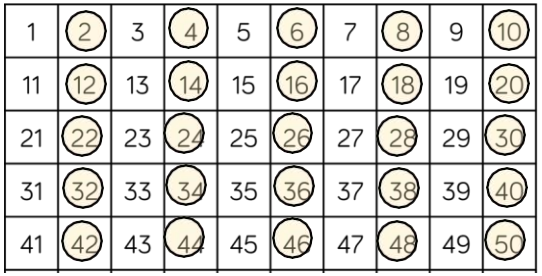
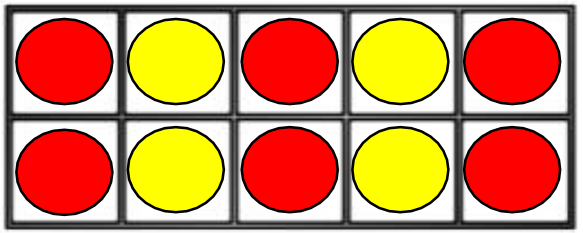
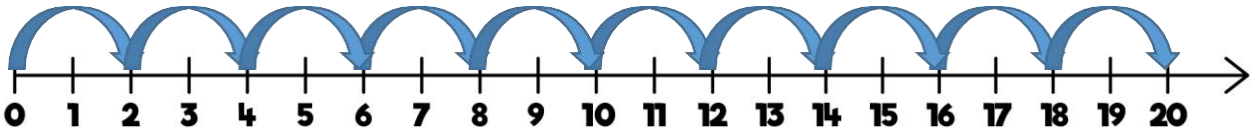
Place value counters also support children's understanding of short division by grouping the counters rather than sharing them. Children work from left to right through the place value columns and group the counters in the number they are dividing by. If there are any counters left over after they have been grouped, they exchange the counter e.g. exchange one hundred for ten tens.

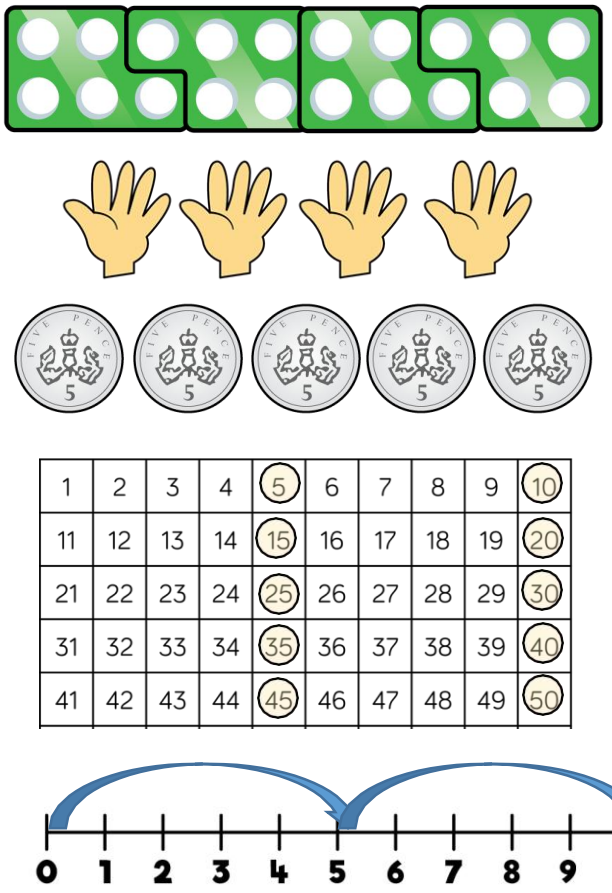
Times Tables

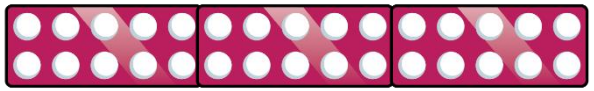
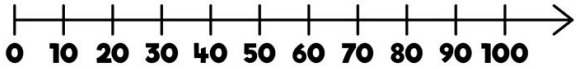
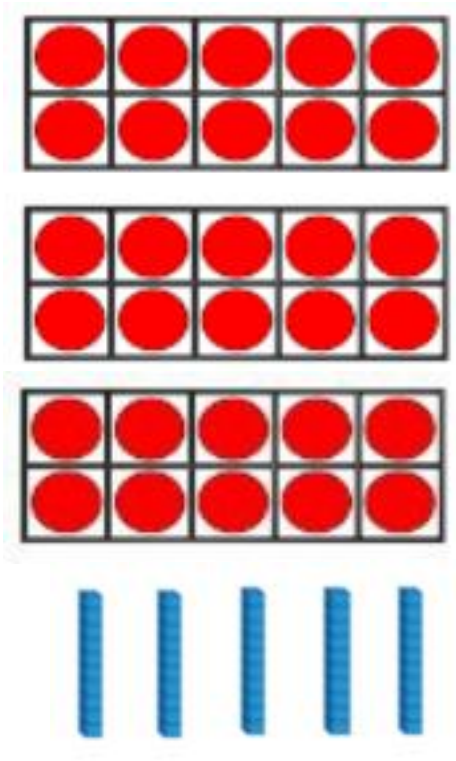
Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 2-times table	2	Bar model Number shapes Counters Money	Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 5-times table	2	Bar model Number shapes Counters Money	Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 10-times table	2	Hundred square Number shapes Counters Money	Ten frames Bead strings Number lines Base 10

Skill	Year	Representations and models
Recall and use multiplication and division facts for the 3-times table	3	Hundred square Number shapes Counters Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 4-times table	3	Hundred square Number shapes Counters Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 8-times table	3	Hundred square Number shapes Bead strings Number tracks Everyday objects
Recall and use multiplication and division facts for the 6-times table	4	Hundred square Number shapes Bead strings Number tracks Everyday objects

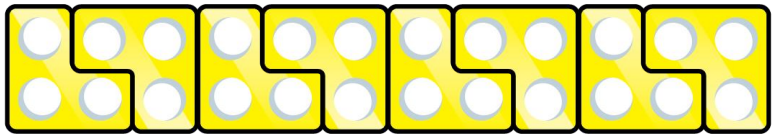
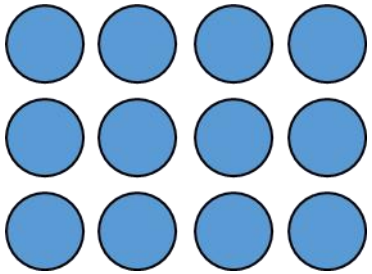
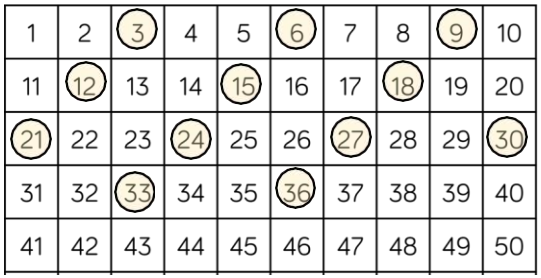
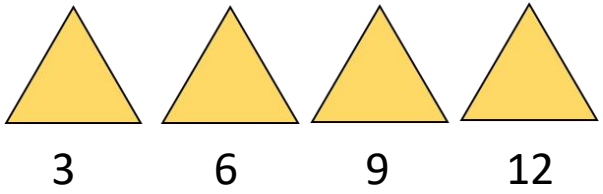
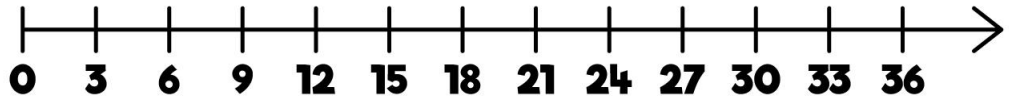
Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 7-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 9-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 11-times table	4	Hundred square Base 10	Place value counters Number lines
Recall and use multiplication and division facts for the 12-times table	4	Hundred square Base 10	Place value counters Number lines

Skill: 2 times table	Year: 2
      	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the two times table, using concrete manipulatives to support. Notice how all the numbers are even and there is a pattern in the ones. Use different models to develop fluency.

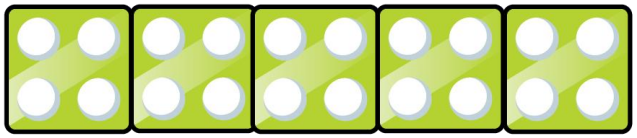
Skill: 5 times table	Year: 2
	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the five times table, using concrete manipulatives to support. Notice the pattern in the ones as well as highlighting the odd, even, odd, even pattern.

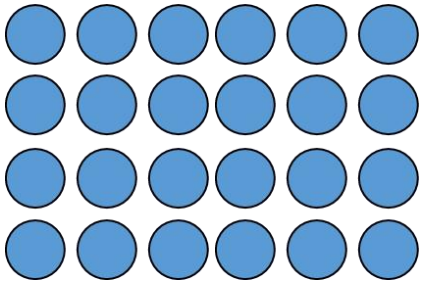
Skill: 10 times table	Year: 2
  	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the ten times table, using concrete manipulatives to support. Notice the pattern in the digits- the ones are always 0, and the tens increase by 1 ten each time.

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

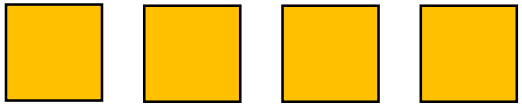
Skill: 3 times table	Year: 3
     	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the three times table, using concrete manipulatives to support. Notice the odd, even, odd, even pattern using number shapes to support. Highlight the pattern in the ones using a hundred square.

Skill: 4 times table	Year: 3



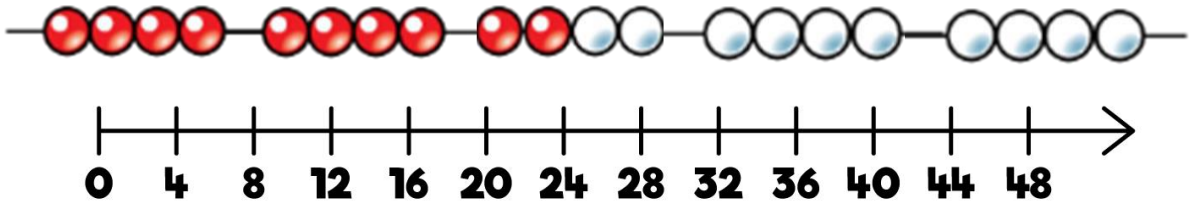


1	2	3	(4)	5	6	7	(8)	9	10
11	(12)	13	14	15	(16)	17	18	19	(20)
21	22	23	(24)	25	26	27	(28)	29	30
31	(32)	33	34	35	(36)	37	38	39	(40)
41	42	43	(44)	45	46	47	(48)	49	50



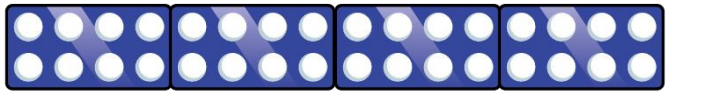
4 8 12 16

4	8	12	16	20
24	28	32	36	40
44	48	52	56	60



Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the four times table, using manipulatives to support. Make links to the 2 times table, seeing how each multiple is double the twos. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.

Skill: 8 times table	Year: 3



8 16 24 32

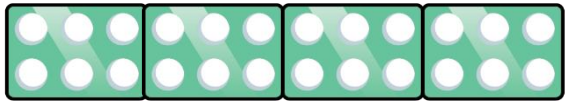
8	16	24	32	40
48	56	64	72	80

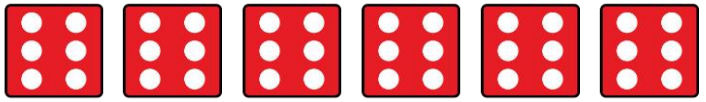
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the eight times table, using manipulatives to support. Make links to the 4 times table, seeing how each multiple is double the fours. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.

Skill: 6 times table

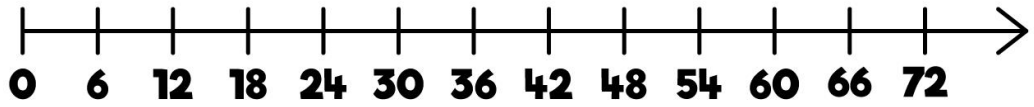
Year: 4





6	12	18	24	30
36	42	48	54	60
66	72	78	84	90

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

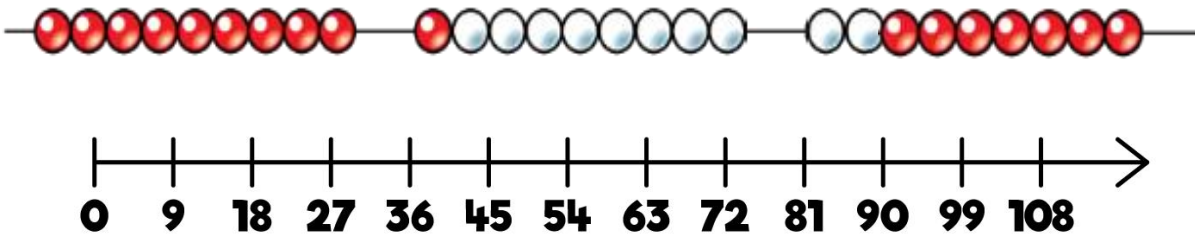


Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the six times table, using manipulatives to support. Make links to the 3 times table, seeing how each multiple is double the threes. Notice the pattern in the ones within each group of five multiples. Highlight that all the multiples are even using number shapes to support.

Skill: 9 times table	Year: 4

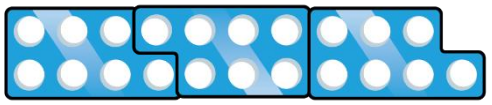
9	18	27	36	45
54	63	72	81	90

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



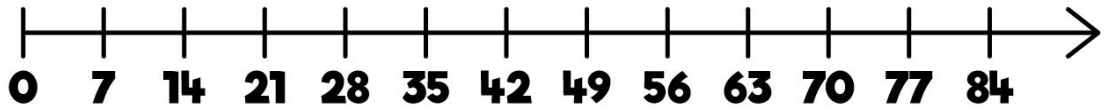
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the nine times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support as well as noting the odd, even pattern within the multiples.

Skill: 7 timestable	Year: 4



7	14	21	28	35
42	49	56	63	70

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
51	52	53	54	55	(56)	57	58	59	60
61	62	(63)	64	65	66	67	68	69	(70)
71	72	73	74	75	76	(77)	78	79	80
81	82	83	(84)	85	86	87	88	89	90
(91)	92	93	94	95	96	97	(98)	99	100



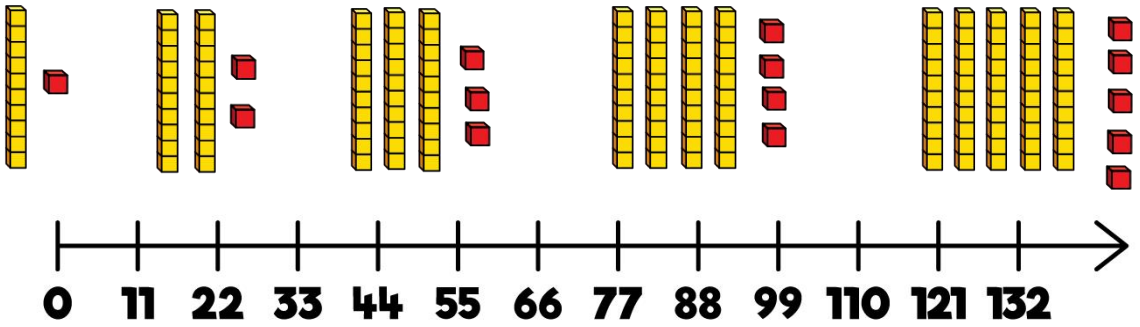
Encourage daily counting in multiples both forwards and backwards, supported by a number line or a hundred square.
The seven times table can be trickier to learn due to the lack of obvious pattern in the numbers, however they already know several facts due to commutativity.
Children can still see the odd, even pattern in the multiples using number shapes to support.

Skill: 11 times table

Year: 4

11	22	33	44	55	66
77	88	99	110	121	132

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

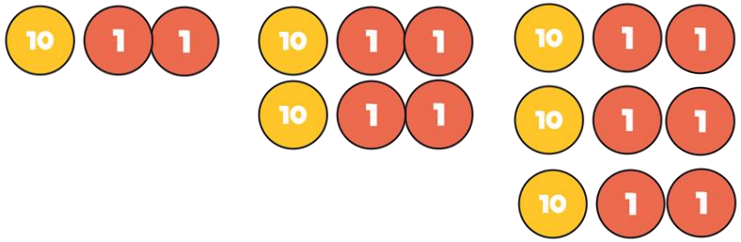
Look for patterns in the eleven times table, using concrete manipulatives to support. Notice the pattern in the tens and ones using the hundred square to support. Also consider the pattern after crossing 100

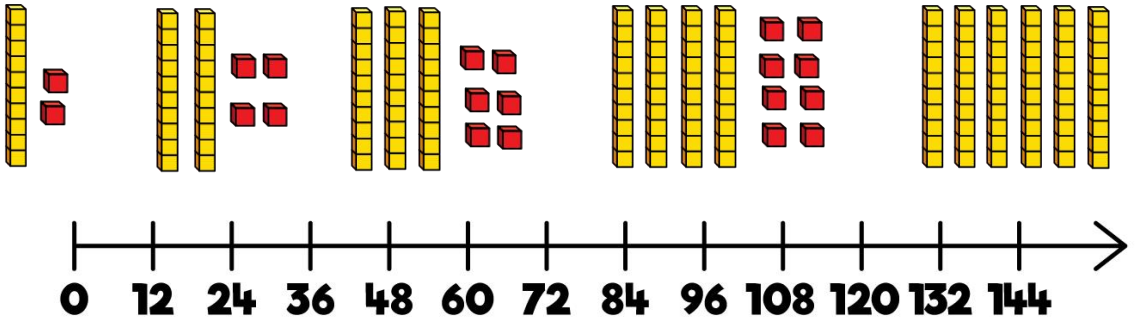
Skill: 12 times table

Year: 4

12	24	36	48	60
72	84	96	108	120
132	144			

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



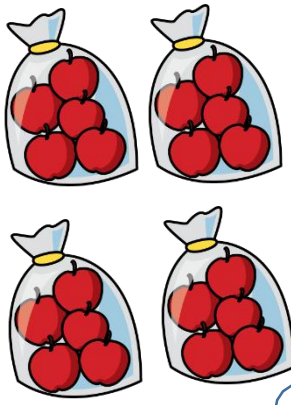
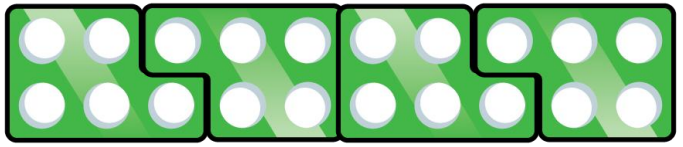
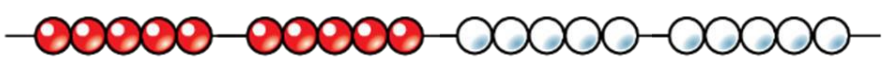
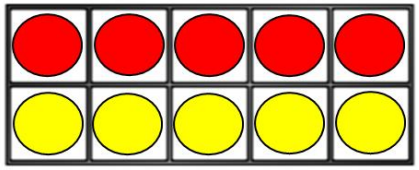
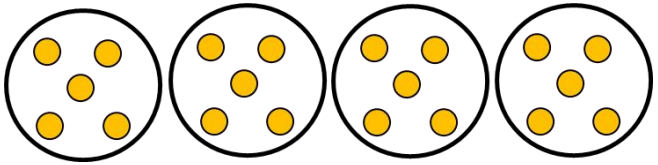
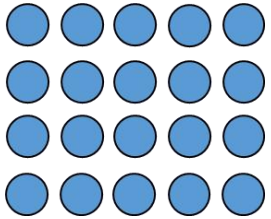


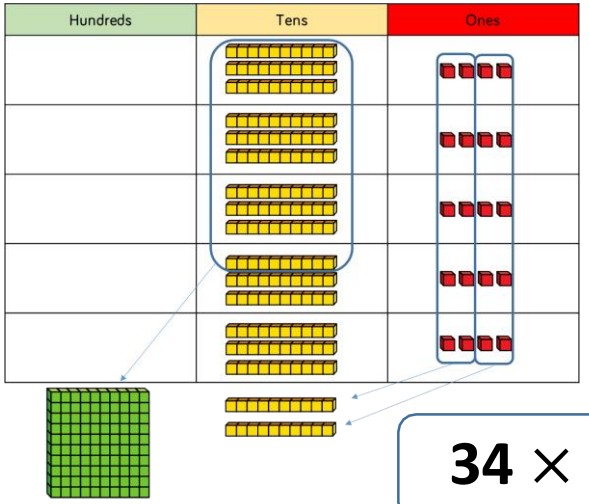
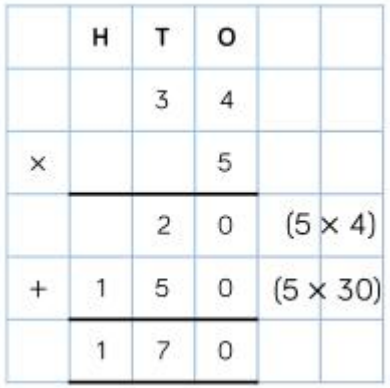
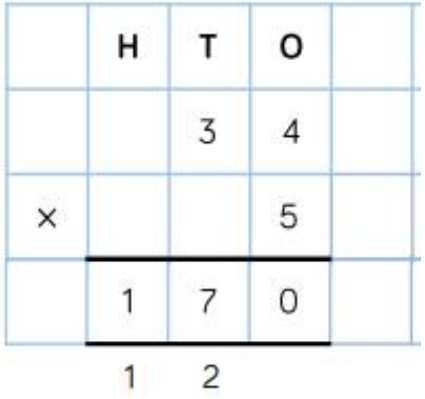
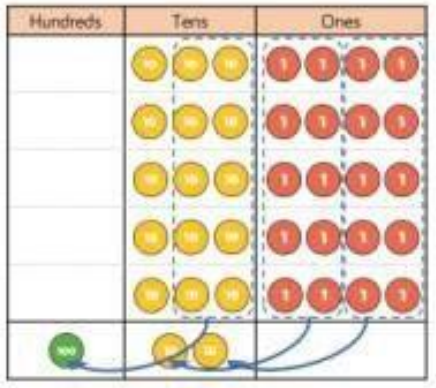
Encourage daily counting in multiples, supported by a number line or a hundred square. Look for patterns in the 12 times table, using manipulatives to support. Make links to the 6 times table, seeing how each multiple is double the sixes. Notice the pattern in the ones within each group of five multiples. The hundred square can support in highlighting this pattern.

Multiplication

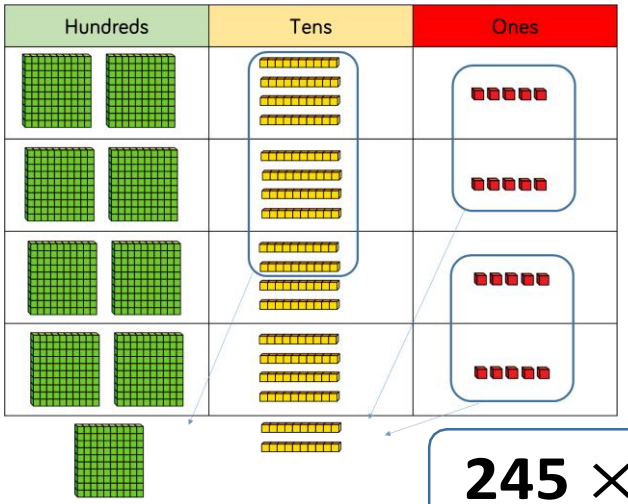
Skill	Year	Representations and models	
Solve one-step problems with multiplication	1/2	Bar model Number shapes Counters	Ten frames Bead strings Number lines
Multiply 2-digit by 1-digit numbers	3/4	Place value counters Base 10	Expanded written method Short written method
Multiply 3-digit by 1-digit numbers	4	Place value counters Base 10	Short written method
Multiply 4-digit by 1-digit numbers	5	Place value counters	Short written method

Skill	Year	Representations and models	
Multiply 2-digit by 2-digit numbers	5	Place value counters Base 10	Short written method Grid method
Multiply 2-digit by 3-digit numbers	5	Place value counters	Short written method Grid method
Multiply 2-digit by 4-digit numbers	5/6	Formal written method	

Skill: Solve 1-step problems using multiplication	Year: 1/2
    One bag holds 5 apples. How many apples do 4 bags hold?    $5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$	Children represent multiplication as repeated addition in many different ways. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally. In Year 2, children are introduced to the multiplication symbol.

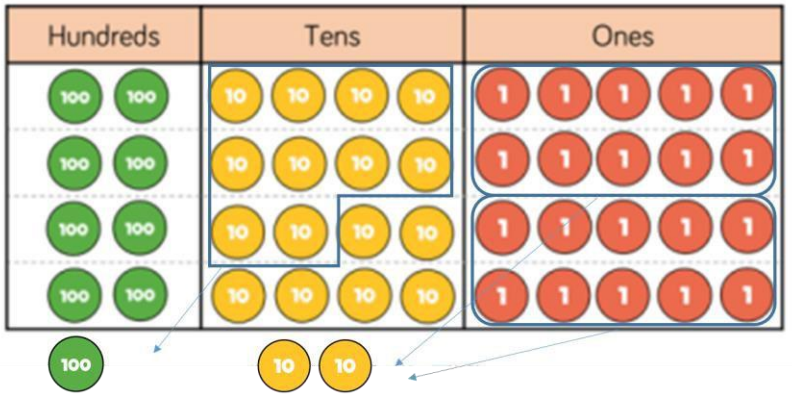
Skill: Multiply 2-digit numbers by 1-digit numbers	Year: 3/4
  $34 \times 5 = 170$  	Informal methods and the expanded method are used in Year 3 before moving on to the short multiplication method in Year 4. Place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

Skill: Multiply 3-digit numbers by 1-digit numbers



	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

$$245 \times 4 = 980$$



Year: 4

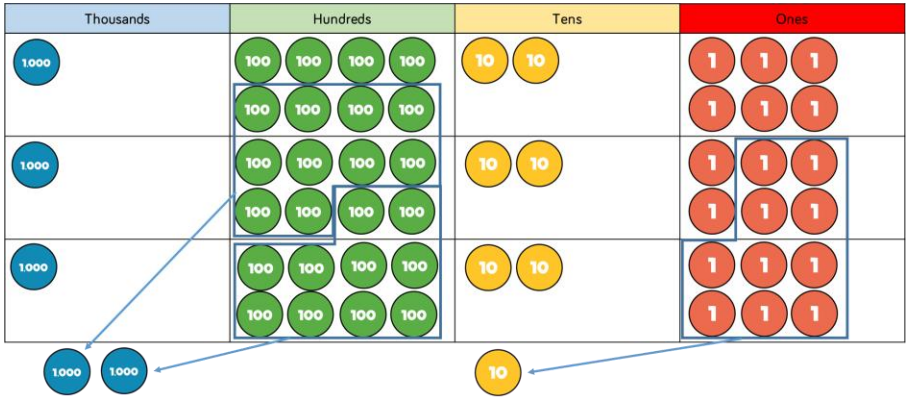
When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

Base 10 and place value counters continue to support the understanding of the written method.

Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Skill: Multiply 4-digit numbers by 1-digit numbers

Year: 5



$$1{,}826 \times 3 = 5{,}478$$

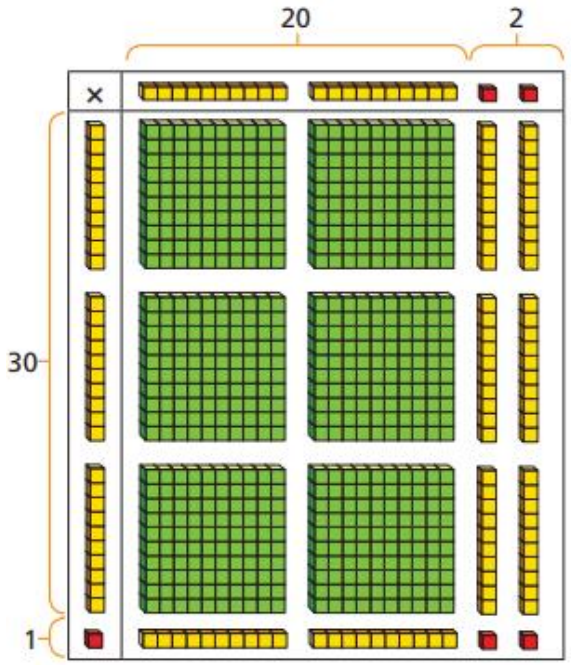
	Th	H	T	O
	1	8	2	6
×				3
	5	4	7	8
	2		1	

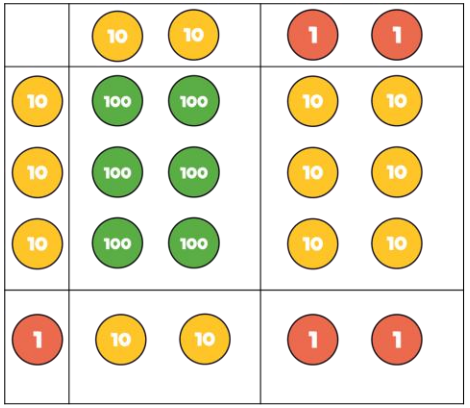
When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers

Year: 5





×	20	2
30	600	60
1	20	2

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

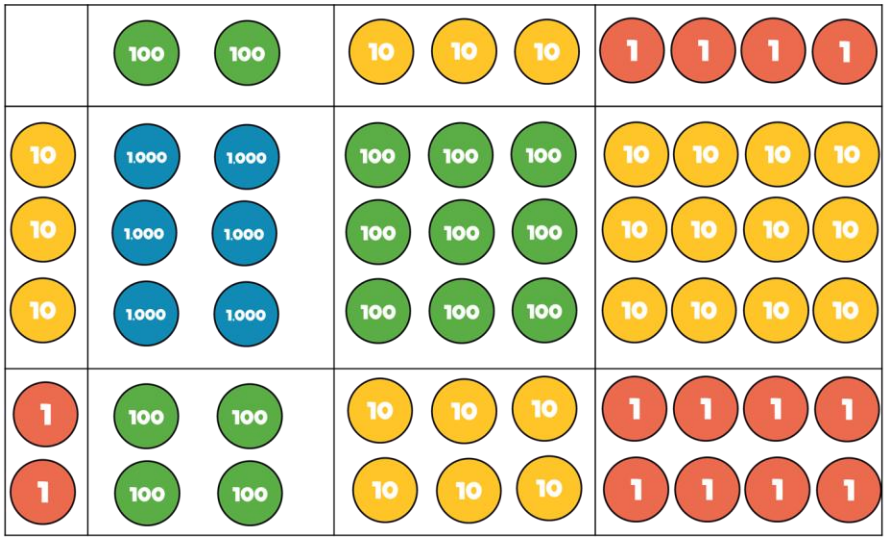
$$22 \times 31 = 682$$

When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. This links to finding the area of a rectangle by finding the space covered by the Base 10.

The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

Skill: Multiply 3-digit numbers by 2-digit numbers

Year: 5



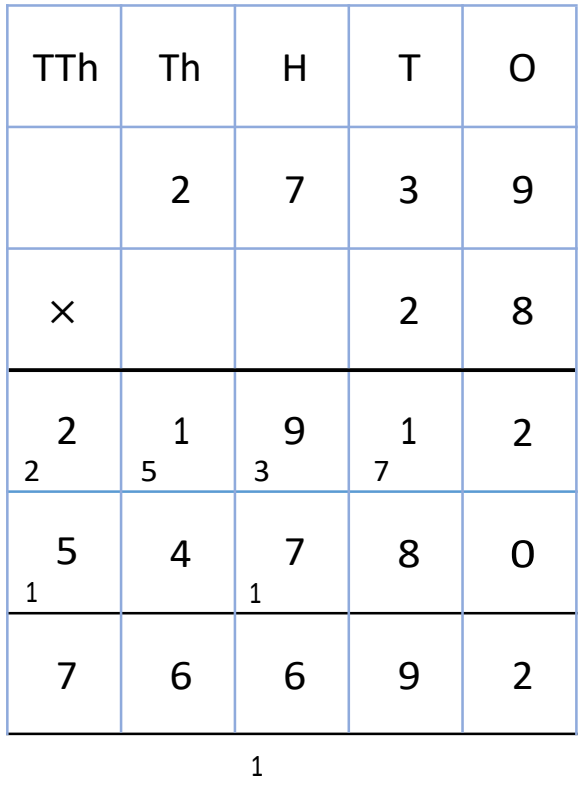
Th	H	T	O
	2	3	4
×		3	2
	4	6	8
1^{7}	1^{0}	2	0
7	4	8	8

×	200	30	4
30	6,000	900	120
2	400	60	8

234 × 32 = 7,488

Children can continue to use the areamodel when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used tohighlight the size of numbers.

Children should now move towards the formal written method, seeing the links with the grid method.

Skill: Multiply 4-digit numbers by 2-digit numbers	Year: 5/6
	When multiplying 4-digits by 2-digits, children should be confident in using the formal written method. If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method. Consider where exchanged digits are placed and make sure this is consistent.

TTh	Th	H	T	O
	2	7	3	9
×			2	8
2 (2)	1 (5)	9 (3)	1 (7)	2
5 (1)	4	7 (1)	8	0
7	6	6	9	2

1

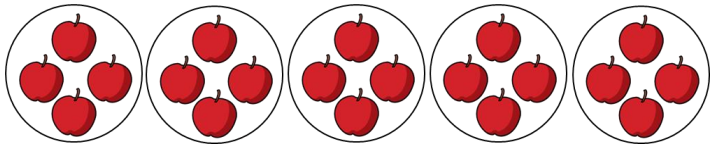
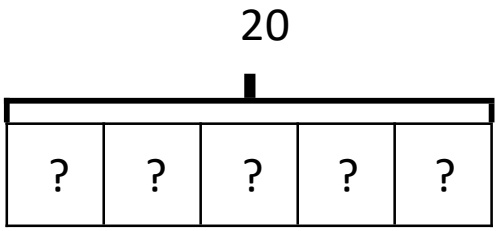
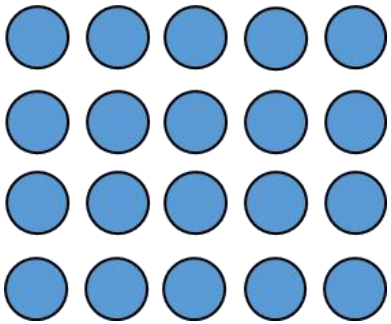
2,739 × 28 = 76,692

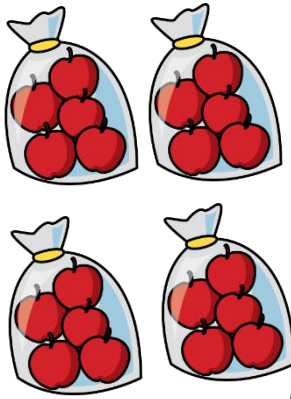
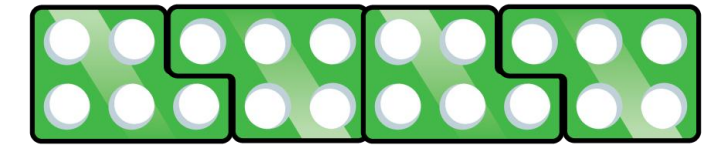
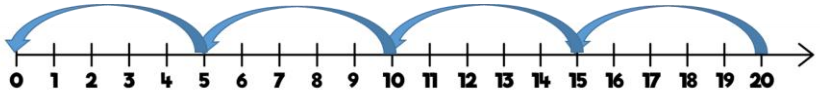
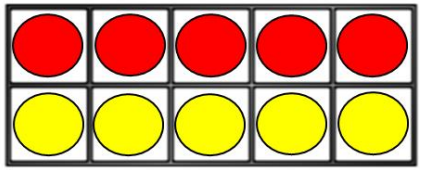
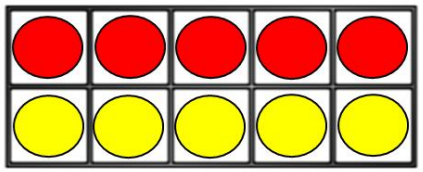
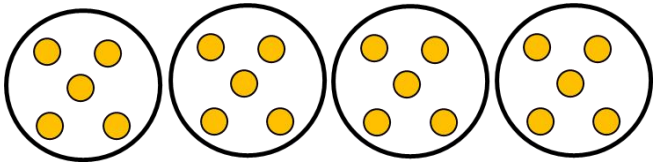
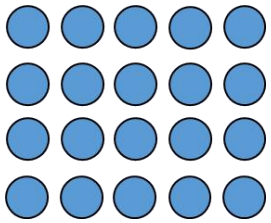
Division

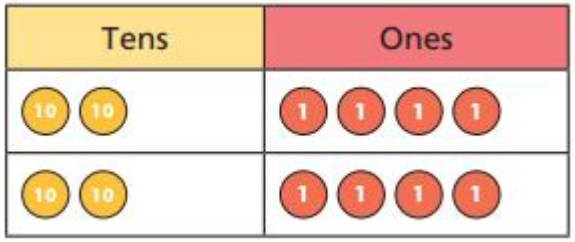
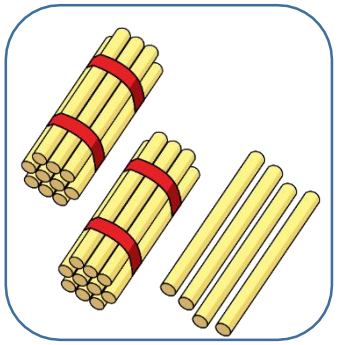
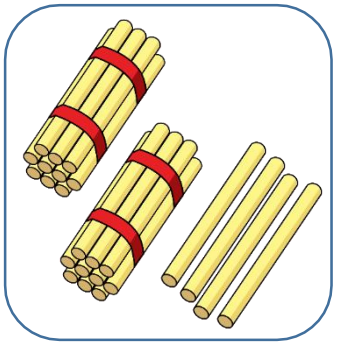
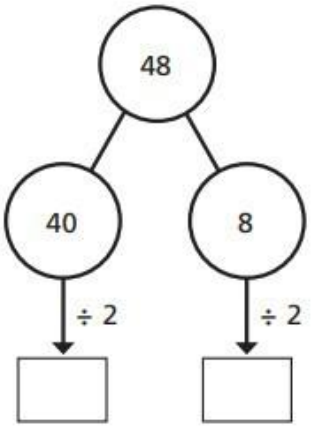
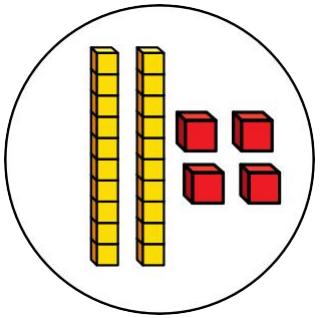
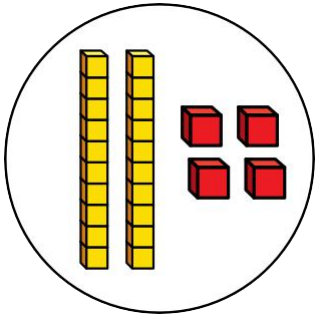
Skill	Year	Representations and models	
Solve one-step problems with division (sharing)	1/2	Bar model Real life objects	Arrays Counters
Solve one-step problems with division (grouping)	1/2	Real life objects Number shapes Bead strings Ten frames	Number lines Arrays Counters
Divide 2-digits by 1-digit (no exchange sharing)	3	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (sharing with exchange)	3	Straws Base 10 Bar model	Place value counters Part-whole model

Skill	Year	Representations and models	
Divide 2-digits by 1-digit (sharing with remainders)	3/4	Straws Base 10 Bar model	Place value counters Part-whole model
Divide 2-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division
Divide 3-digits by 1-digit (sharing with exchange)	4	Base 10 Bar model	Place value counters Part-whole model
Divide 3-digits by 1-digit (grouping)	4/5	Place value counters Counters	Place value grid Written short division

Skill	Year	Representations and models	
Divide 4-digits by 1-digit (grouping)	5	Place value counters Counters	Place value grid Written short division
Divide multi-digits by 2-digits (short division)	6	Written short division	List of multiples
Divide multi-digits by 2-digits (long division)	6	Written long division	List of multiples

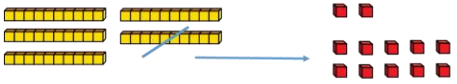
Skill: Solve 1-step problems using multiplication (sharing)	Year: 1/2
  There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag?  $20 \div 5 = 4$	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.

Skill: Solve 1-step problems using division (grouping)	Year: 1/2
    There are 20 apples altogether. They are put in bags of 5. How many bags are there?     $20 \div 5 = 4$	Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

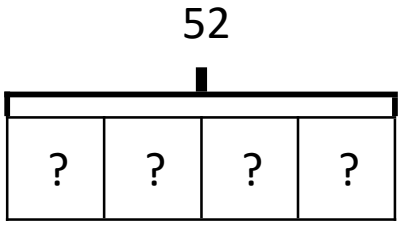
Skill: Divide 2-digits by 1-digit (sharing with no exchange)	Year: 3
    **48 ÷ 2 = 24**  	When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base 10 and place value counters can all be used to share numbers into equal groups. Part-whole models can provide children with a clear written method that matches the concrete representation.

Skill: Divide 2-digits by 1-digit (sharing with exchange)

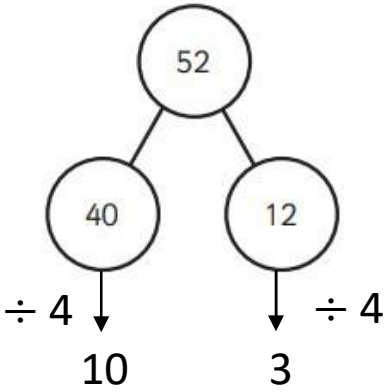
Year: 3/4



Tens	Ones



52 ÷ 4 = 13



10 + 3 = 13

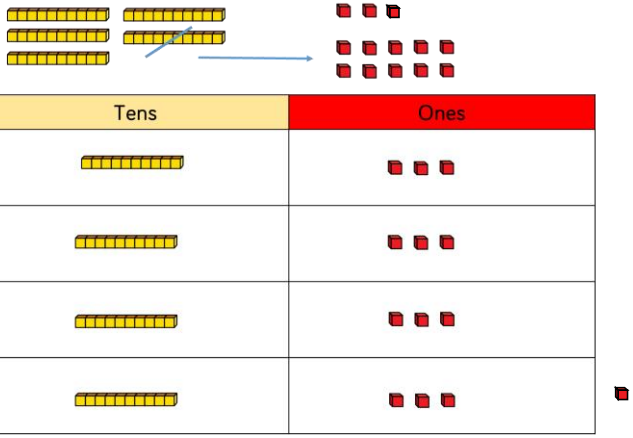
Tens	Ones
10	1 1 1
10	1 1 1
10	1 1 1
10	1 1 1

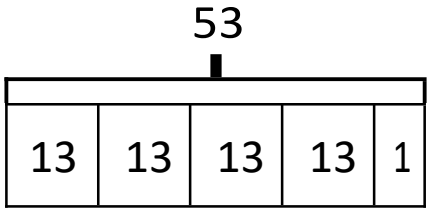
When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones.
Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

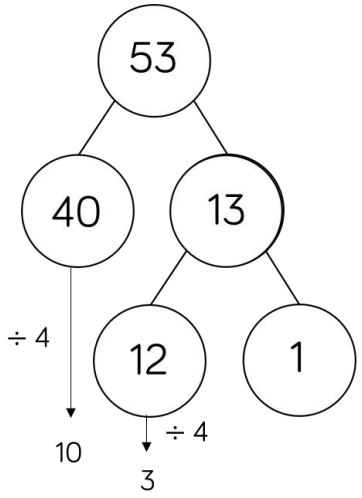
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (sharing with remainders)

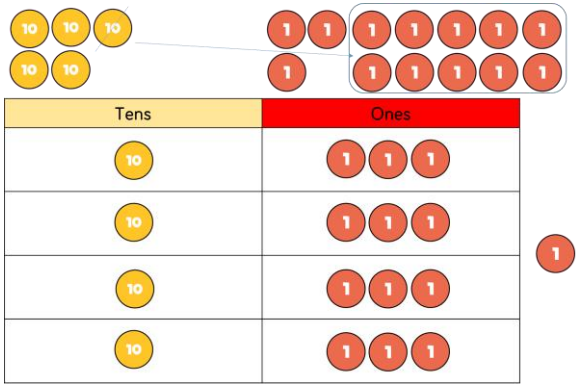
Year: 3/4







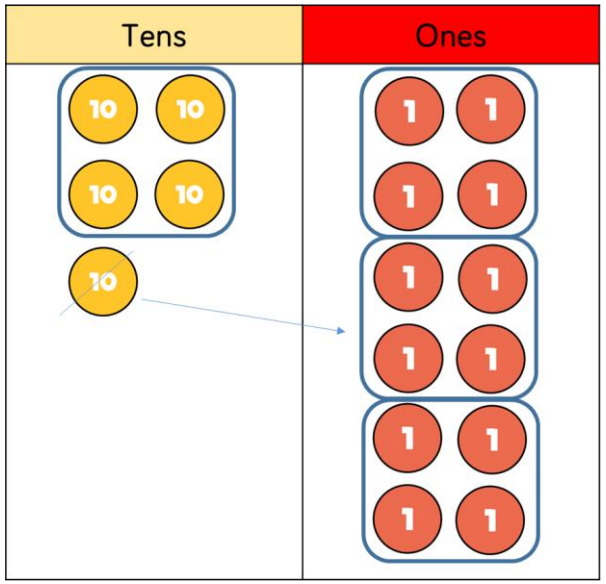
53 ÷ 4 = 13 r1



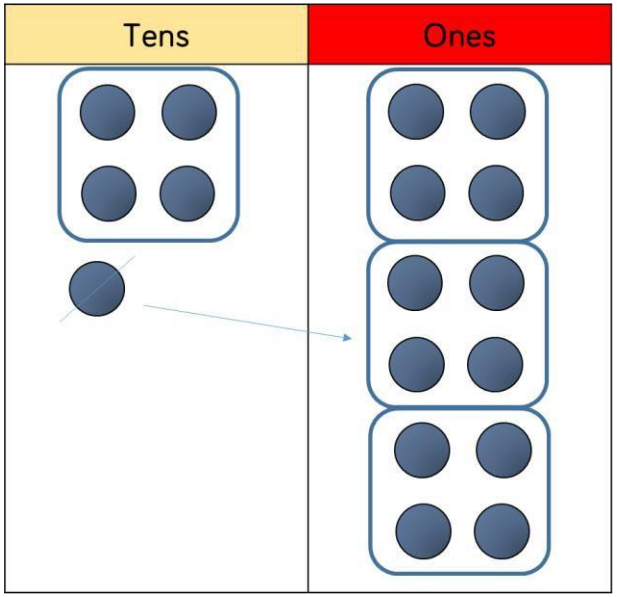
When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones.
Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made.
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (grouping)

Year: 5



		1	3	
	4	5	1 2	

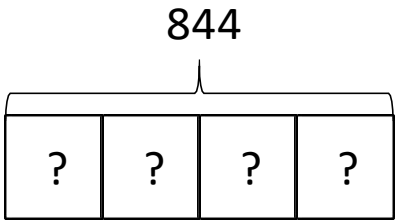
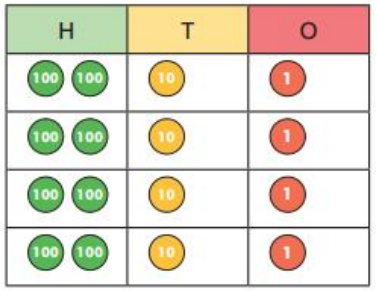
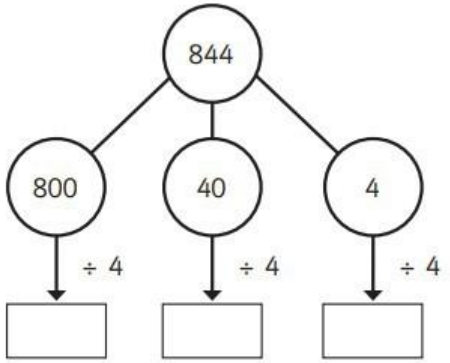
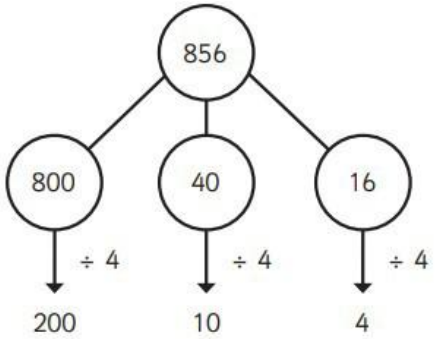
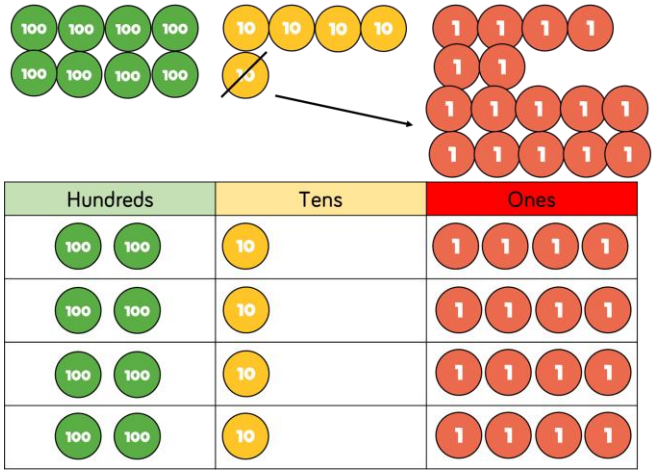


$$52 \div 4 = 13$$

When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

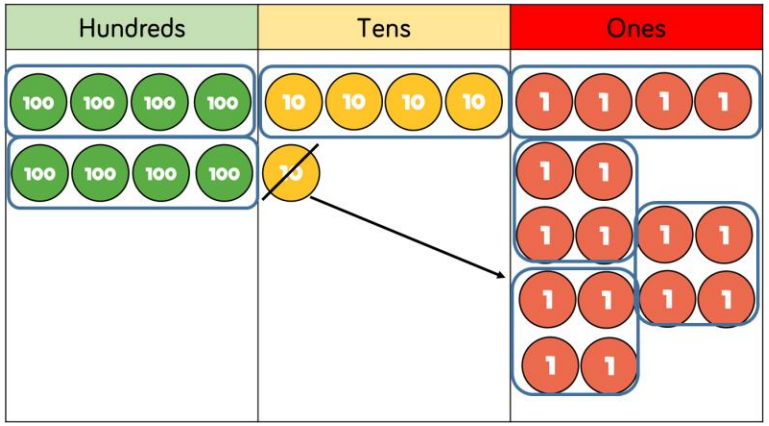
Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.

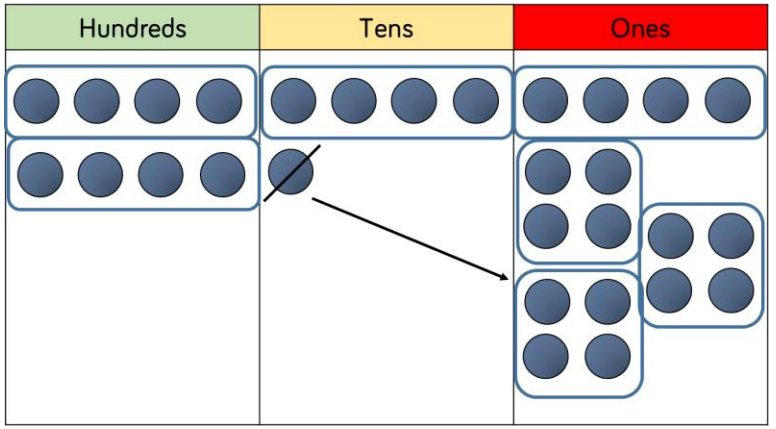
Skill: Divide 3-digits by 1-digit (sharing)	Year: 4
844 ÷ 4 = 211    **856 ÷ 4 = 214**  	Children can continue to use place value counters to share 3-digit numbers into equal groups. Children should start with the equipment outside the place value grid before sharing the hundreds, tens and ones equally between the rows. This method can also help to highlight remainders. Flexible partitioning in a part-whole model supports this method.

Skill: Divide 3-digits by 1-digit (grouping)

Year: 5



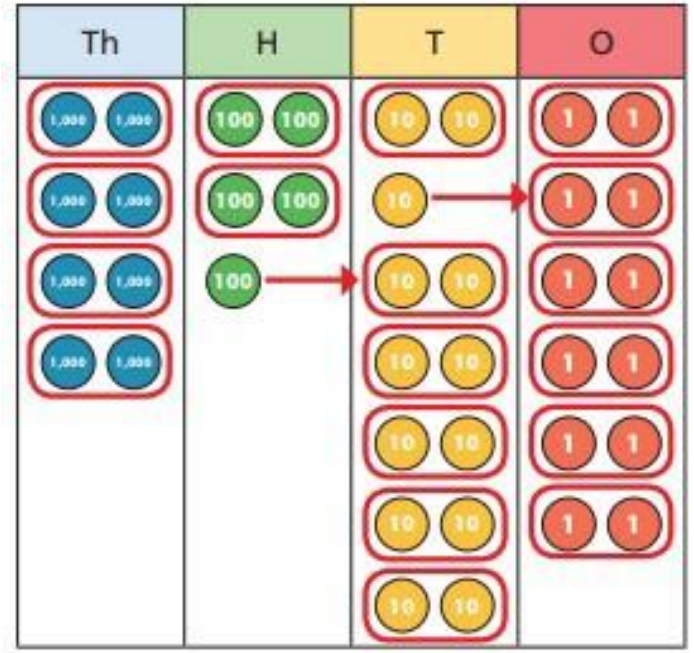
		2	1	4
	4	8	5	$^{1}6$



$$856 \div 4 = 214$$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4-digits by 1-digit (grouping)	Year: 5
 **8,532 ÷ 2 = 4,266**	Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method. Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

	4	2	6	6
2	8	5	$^{1}3$	$^{1}2$

Skill: Divide multi-digits by 2-digits (longdivision)	Year: 6

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

(×30)

(×6)

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

$432 \div 12 = 36$

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

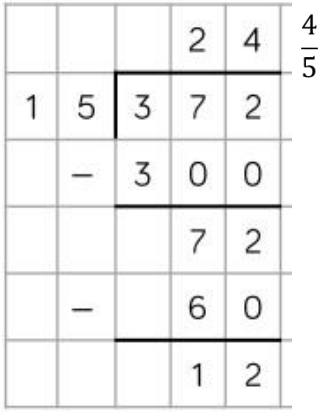
	0	4	8	9	
15	7	3	3	5	
–	6	0	0	0	(×400
	1	3	3	5	
–	1	2	0	0	(×80)
		1	3	5	
–		1	3	5	(×9)
				0	

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

Children can also divide by 2-digit numbers using long division.

Children can write out multiples to support their calculations with larger remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi digits by 2-digits (long division)	Year: 6
372 ÷ 15 = 24 r12  $1 \times 15 = 15$ $2 \times 15 = 30$ $3 \times 15 = 45$ $4 \times 15 = 60$ $5 \times 15 = 75$ $10 \times 15 = 150$  $372 \div 15 = 24\frac{4}{5}$	When a remainder is left at the end of a calculation, children can either leave it as a remainder or convert it to a fraction. This will depend on the context of the question. Children can also answer questions where the quotient needs to be rounded according to the context.

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor