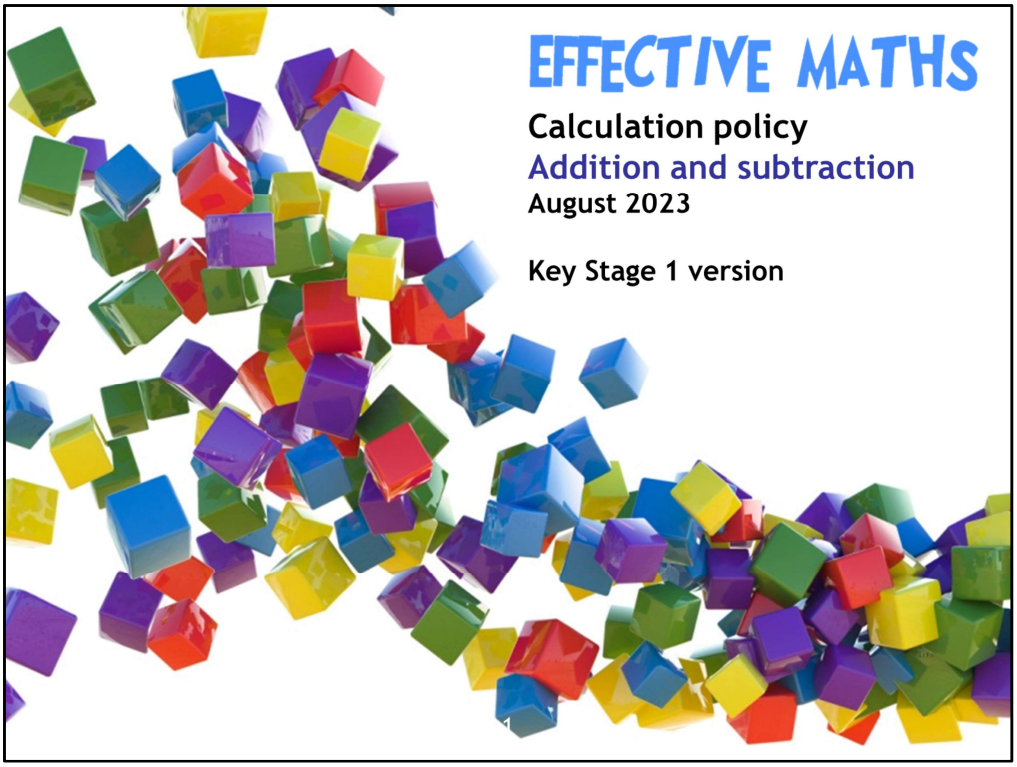

EFFECTIVE MATHS
Calculation policy
Addition and subtraction
August 2023
Key Stage 1 version

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

INTRODUCTION

This document provides an overview of the content and methods encountered in each year group from Year 1 to Year 6. For Years 1-4 it also includes the visual representations of the methods. (In Year 5 and 6 there are no new methods and the representations encountered are the same as in earlier years. What is different is the range of number that children work with.)

For each year group in Years 1-4 the document provides:

i. a content summary section;
ii. details about the approaches used for teaching the above;
iii. the representations used.

(For Year 5 and 6 the document contains (i) and (ii).)

The *content summary sections* (i) and the *details about the approaches used* sections (ii) include content from:

- addition and subtraction units 1 and 2;
- the Block 3 calculation unit;
- money and decimals units;
- fractions unit 2 (Years 3-6).

The *representations* sections do not include the representations used in money/decimals units or fractions units. (These representations are essentially the same as those used in the main addition and subtraction units.)

The document is provided in several versions:

- whole school version;
- year group specific versions;
- a Key Stage 1 only version (for infant schools).

For Years 1-4 there are two versions of each year group specific version:

- a landscape version, like a PowerPoint slide, containing (i), (ii) and (iii);
- a portrait version of the representations section (iii) with notes to support the representations.

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Calculation content	CALCULATION (UNIT 1) • Addition facts for 5-10 CALCULATION (UNIT 2) • Subtraction from 5-10 MONEY (UNIT 1) • Adding amounts to a total of 10p • Subtracting from a total of up to 10p	CALCULATION (UNIT 3) • Number bonds for ten (r) • Adding to numbers to ten and related subtraction facts (11-20) CALCULATION (UNIT 4) • Add and subtract to/from 11-15 CALCULATION (UNIT 5) • Add and subtract to/from 11-15 (r) • Add and subtract to/from 16-18 • Adding single digit numbers to 11-19 • Subtracting single digit numbers from 11 to 19 • Number bonds for 20 MONEY (UNIT 2) • Adding amounts to a total of 20p • Subtracting from a total of up to 20p	Ongoing practice of number bonds for numbers to ten and related facts.

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	<u>Addition facts for 5-10</u> The core representation that supports children's learning of addition facts for 5-10 is the tens frame with two-colour counters. Children use their ability to subitise to articulate addition facts for numbers to 10. Teachers need to have two tens frames with two colour counters on display throughout Year 1 and children need access to their own tens frames and counters. Other representations of facts for 5-10 are also encountered within the lessons to provide more opportunities for children to derive number facts. These include dominoes, bar models and part-whole models. <u>Subtraction from 5-10</u> The first two subtraction lessons focus on subtraction as reduction (taking away) and make use of pictorial representations to support this. From lesson three, as for learning about addition facts, the core representation that supports children's learning of subtraction facts for 5-10 is the tens frame with two-colour counters.	<u>Number bonds for ten (r)</u> Cuisenaire® rods were encountered in some lessons in Block 1, but were not essential for successful learning. In this revision lesson they are integral to the lesson. Knowing additive facts to 10 is a key goal for the end of Year 1 and ongoing practise is essential to achieve this. It is suggested that ongoing number facts practice for 5-10 is supported by additional resources from this point, including Cuisenaire rods. During this practice children need to be taught to derive additive facts within 10 from previously memorised facts. For example, using knowledge of doubles to derive near doubles, eg: 5 + 4 = 4 + 4 + 1 = 9	Ongoing practice of number bonds for numbers to ten and related facts.

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Subtraction from 5-10 (ctd) The relationship triangle is introduced during the lesson on subtracting from 9. Adding amounts to a total of 10p As for earlier work on addition facts for 5-10 the tens frame with two-colour counters supports understanding about adding amounts to a total of 10p. Representations of coins are also used. Subtracting from a total of up to 10p The core representation that supports children's learning of subtraction from amounts to a total of 10p is the tens frame with two-colour counters. Representations of coins are also used.	Adding to numbers to ten and related subtraction facts (11-20) Children need secure recall of facts such as 10 + 1, 10 + 2 and their related subtraction facts (11 - 1, 12 - 2). This will support later work on additive facts that bridge ten using the making the next/previous ten method: 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14 The lessons on adding to numbers to ten and related subtraction facts make extensive use of number tracks, tens frames and place value cards to support understanding. Add and subtract to/from 11-15 Children engage in a series of lessons about making 11, 12, 13 etc with numbers other than 10 and 1, 10 and 2, 10 and 3. The purpose is to lay the foundations of understanding that will support the ability to use the making the next/previous ten strategy in Year 2 and beyond.	

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

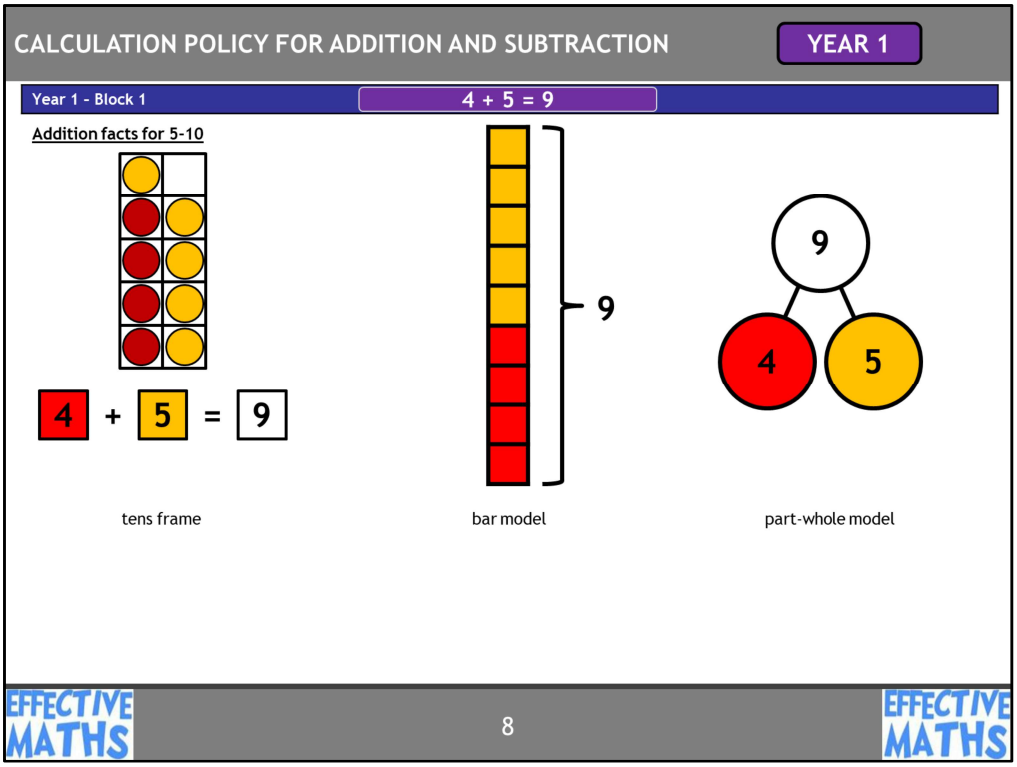
YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods		Whole lessons are spent exploring all the ways to make numbers from 11-15 (and the related subtraction facts). For example 15 = 9 + 6 = 8 + 7 = 7 + 8 = 6 + 9 Tens frames support the understanding that 9 + 6 = 10 + 5. Children also encounter the numeric representation for this. <u>Add and subtract to/from 11-15 (r)</u> Revision of making next/previous ten Relationships - using an anchor fact to find new facts: 10 + 5 = 15 so 9 + 5 is one less than 15 <u>Add and subtract to/from 16-18</u> Same approach as for adding and subtracting to/from 11-15 in Block 2.	

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 1

Year 1			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods		<u>Adding single digit numbers to 11-19</u> Using known facts to derive new facts, eg: 6 + 2 = 8 so 16 + 2 = 18. Also partitioning first addend into tens and ones then combining ones, eg: 16 + 2 = 10 + 6 + 2. <u>Subtracting single digit numbers from 11 to 19</u> Similar approach to above, eg: 6 - 2 = 4 so 16 - 2 = 14 <u>Number bonds for 20</u> The core representations that support children's learning of facts for 20 (and related facts) is tens frames with two-colour counters and the relationship triangle. <u>Adding amounts to a total of 20p and subtracting from a total of up to 20p</u> Within the lessons coins are the core representation. Teachers may want to support the calculation process for some children by using tens frames with two-colour counters.	

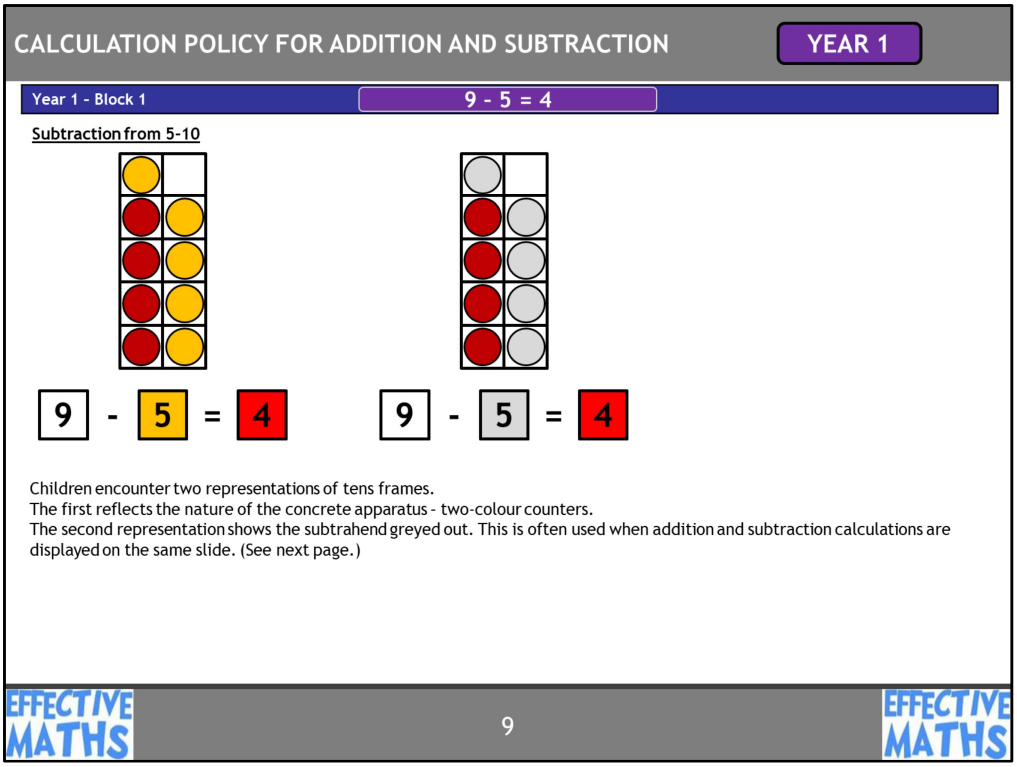


BLOCK 1

Addition facts for 5-10

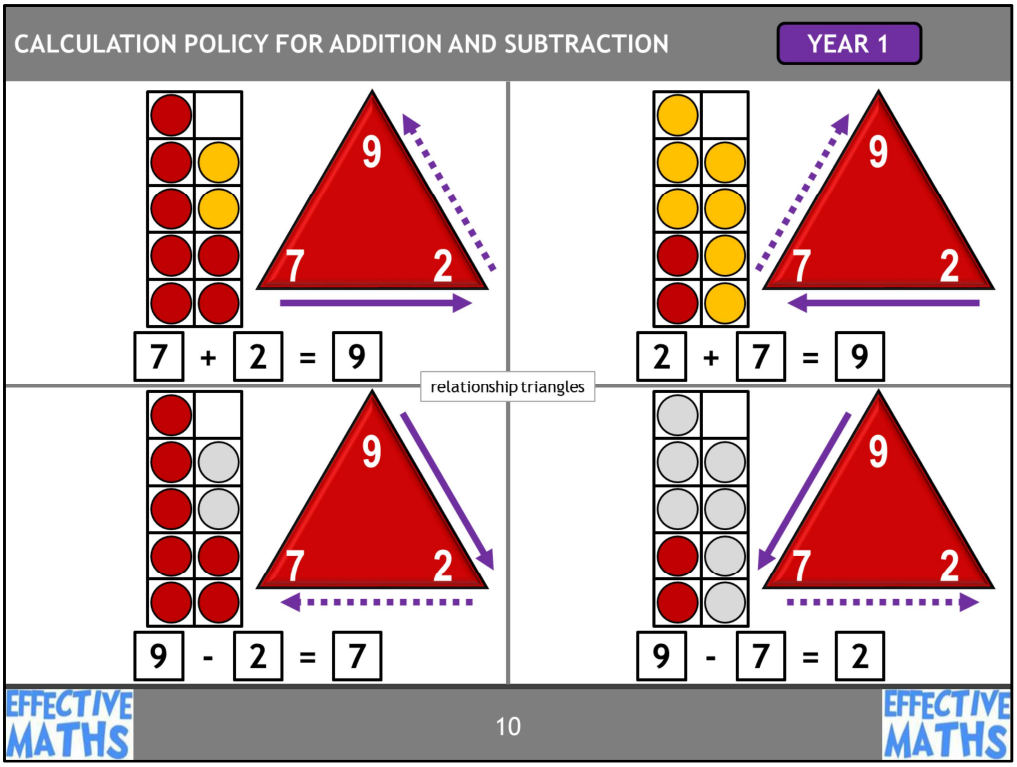
The core representation that supports children's learning of addition facts for 5-10 is the tens frame with two-colour counters. Children use their ability to subitise to articulate addition facts for numbers to 10. Teachers need to have two tens frames with two colour counters on display throughout Year 1 and children need access to their own tens frames and counters.

Other representations of facts for 5-10 are also encountered within the lessons to provide more opportunities for children to derive number facts. These include dominoes, bar models and part-whole models.



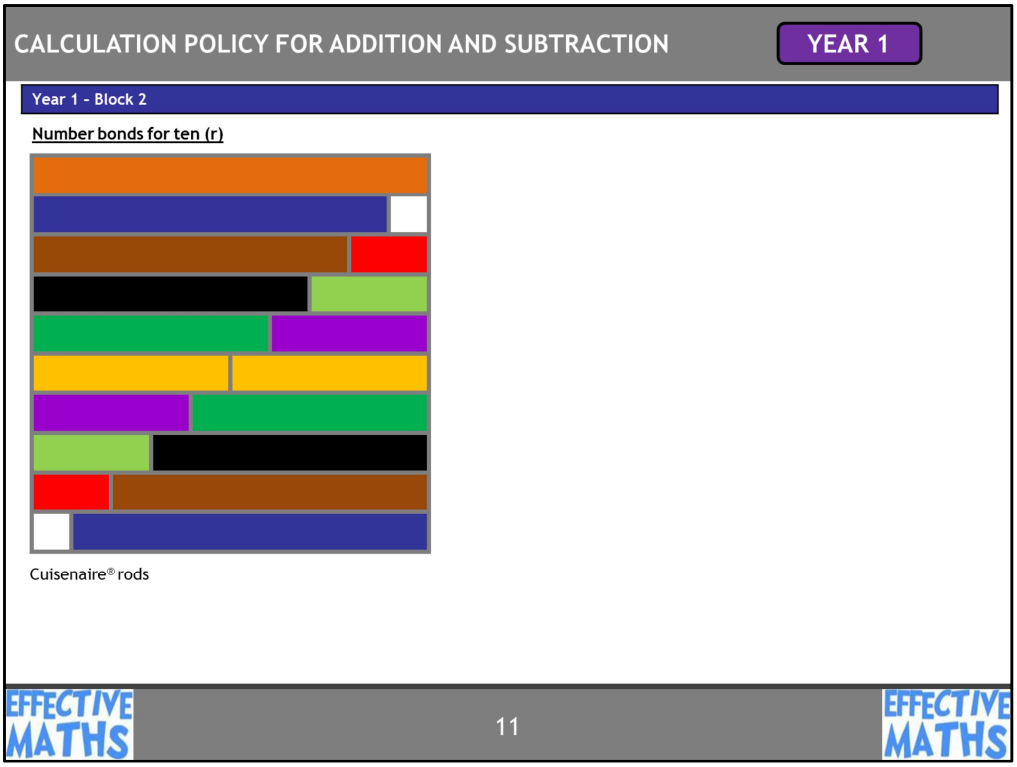
Subtraction from 5-10

The first two subtraction lessons focus on subtraction as reduction (taking away) and make use of pictorial representations to support this. From lesson three, as for learning about addition facts, the core representation that supports children's learning of subtraction facts for 5-10 is the tens frame with two-colour counters.



Subtraction from 5-10 (ctd)

The relationship triangle is introduced during the lesson on subtracting from 9.

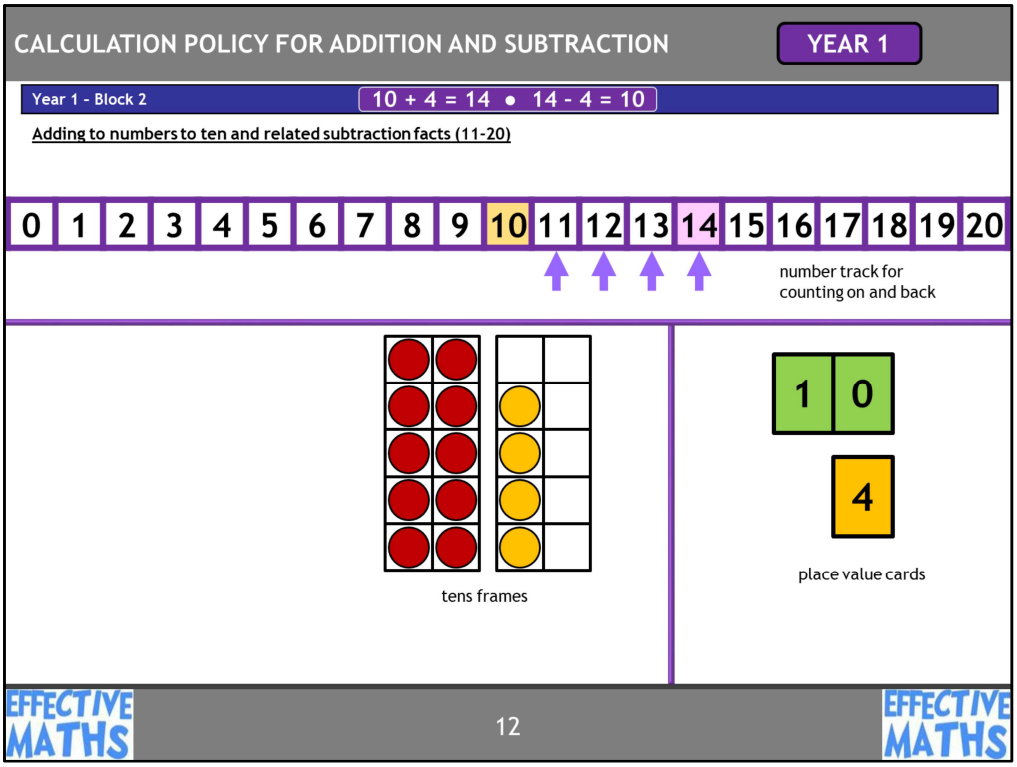


BLOCK 2

Number bonds for ten (r)

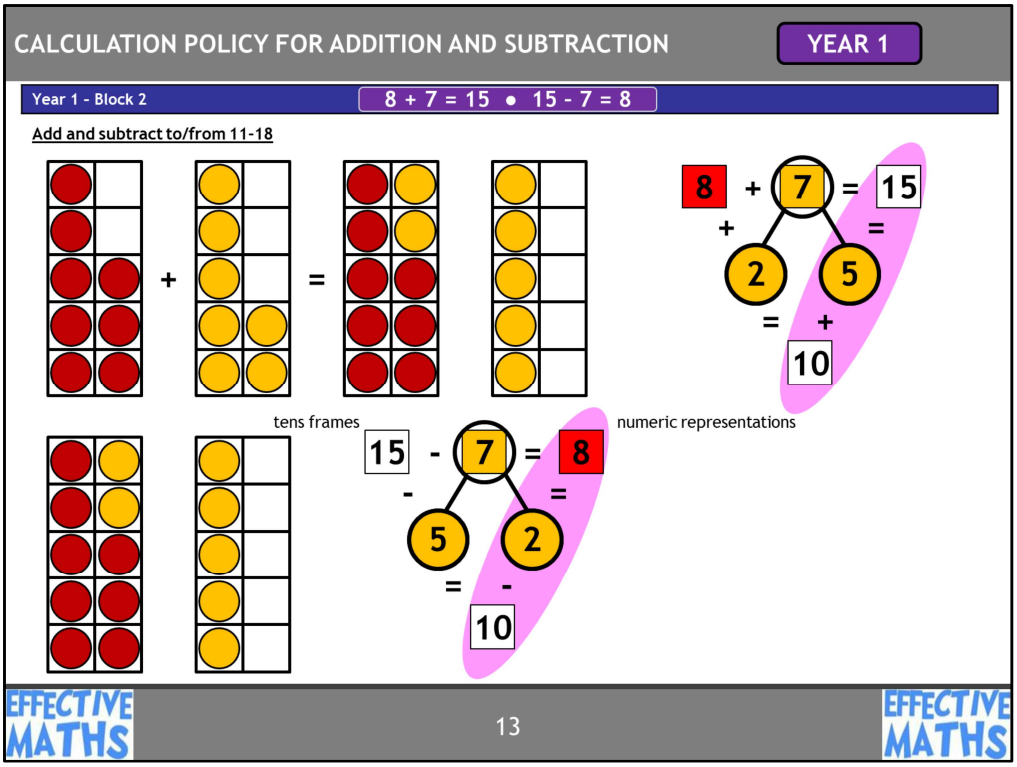
Cuisenaire® rods were encountered in some lessons in Block 1, but were not essential for successful learning. In this revision lesson they are integral to the lesson.

Knowing additive facts to 10 is a key goal for the end of Year 1 and ongoing practise is essential to achieve this.
It is suggested that ongoing number facts practice for 5-10 is supported by additional resources from this point, including Cuisenaire rods. During this practice children need to be taught to derive additive facts within 10 from previously memorised facts. For example, using knowledge of doubles to derive near doubles, eg:
5 + 4 =
4 + 4 + 1 = 9



Adding to numbers to ten and related subtraction facts (11-20)
Children need secure recall of facts such as 10 + 1, 10 + 2 and their related subtraction facts (11 – 1, 12 – 2). This will support later work on additive facts that bridge ten using the making the next/previous ten method:
8 + 6 = 8 + 2 + 4 = 10 + 4 = 14

The lessons on adding to numbers to ten and related subtraction facts make extensive use of number tracks, tens frames and place value cards to support understanding.

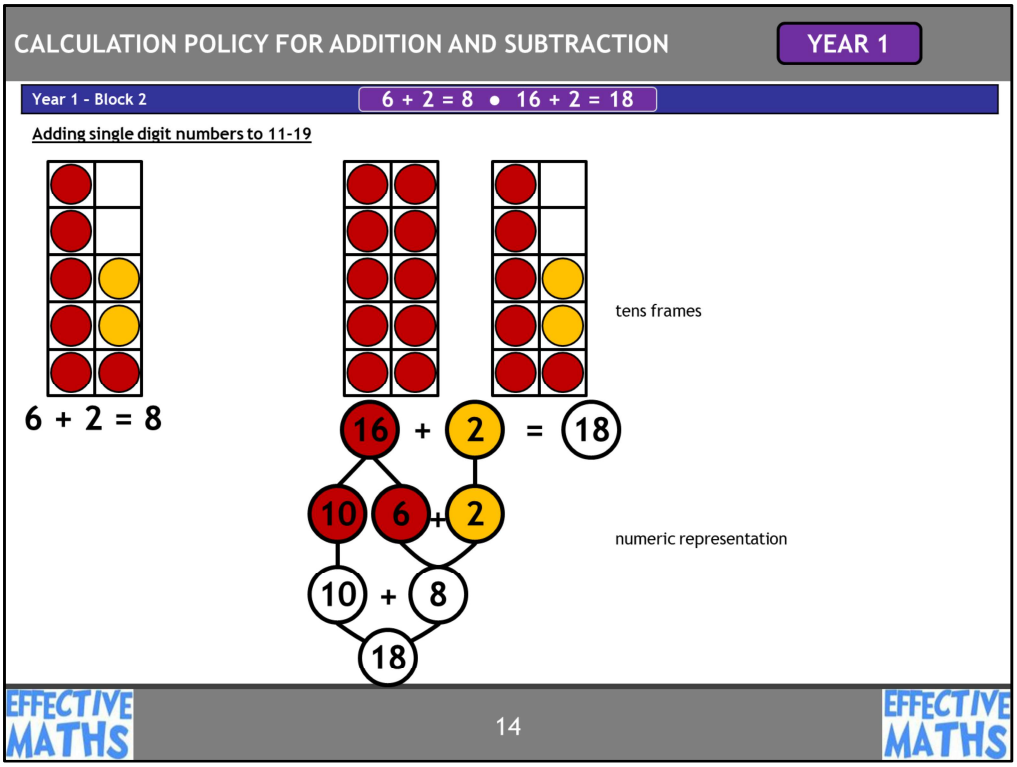


Add and subtract to/from 11-18

Children engage in a series of lessons about making 11, 12, 13 etc with numbers other than 10 and 1, 10 and 2, 10 and 3. The purpose is to lay the foundations of understanding that will support the ability to use the making the next/previous ten strategy in Year 2 and beyond.

Whole lessons are spent exploring all the ways to make numbers from 11-15 (and the related subtraction facts). For example 15 = 9 + 6 = 8 + 7 = 7 + 8 = 6 + 9

Tens frames support the understanding that 9 + 6 = 10 + 5. Children also encounter the numeric representation for this.



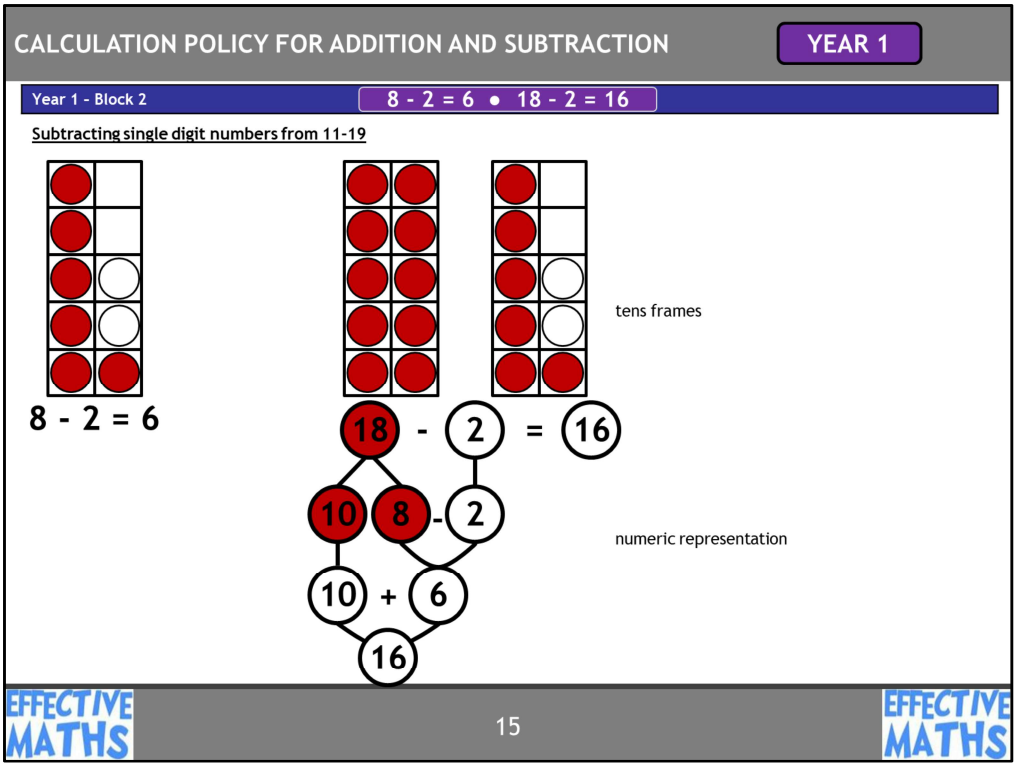
Adding single digit numbers to 11-19

Using known facts to derive new facts, eg:

6 + 2 = 8 so 16 + 2 = 18.

Also partitioning first addend into tens and ones then combining ones, eg:

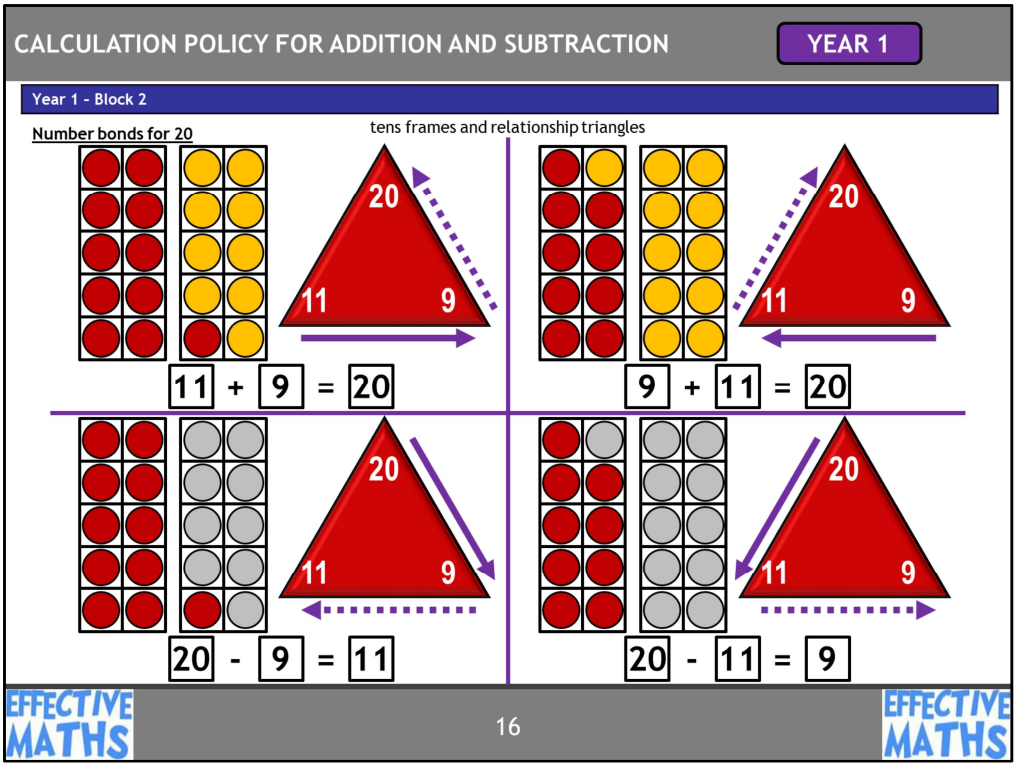
16 + 2 = 10 + 6 + 2.



Subtracting single digit numbers from 11 to 19

Similar approach to adding single digit numbers to 11-19, eg:

6 – 2 = 4 so 16 – 2 = 14



Number bonds for 20

The core representations that support children's learning of facts for 20 (and related facts) is tens frames with two-colour counters and the relationship triangle.

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Calculation content	**ADDITION AND SUBTRACTION (UNIT 1)** • **Number bonds for 20** (r) • **Add a two-digit number and ones** - no exchanging • **Add multiples of ten** • **Friendly number pairs** • **Subtract ones from a two-digit number** - no exchanging • **Subtract multiples of ten** • **Subtract ones from a multiple of ten** • **Add single digit numbers bridging ten** (eg 8 + 6) • **Subtract single digit numbers from 11-18 bridging ten** (eg 15 - 8)	**MONEY (UNIT 1)** • **Finding the total** (two-digit amount + 1 digit amount (no exchanging); add multiples of ten pence; adding single digit pounds bridging ten pounds) • **Change** (change from 20p; change from 50p) **ADDITION AND SUBTRACTION (UNIT 2)** • **Add a two-digit number and ones** - bridging the next ten (eg 28 + 6) • **Add 3 one-digit numbers** • **Subtract ones from a two-digit number** - making the previous ten (eg 25 - 8) • **Adding 2 two-digit numbers** • **Subtracting a two-digit number from a multiple of ten** • **Subtracting a two-digit number from a two-digit number**	**CALCULATION UNIT** • **Adding two 2-digit numbers** (r) • **Subtracting a 2-digit number from a 2-digit number** (r) **MONEY (UNIT 2)** • **Adding coins** (finding different combinations to make totals) • **Adding notes** (adding multiples of ten and five) • **Subtracting amounts of money** (eg £60 - £15 = £60 - £10 - £5)

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Number bonds for 20 Partitioning first addend into tens and ones then combining ones, eg: 18 + 2 = 10 + 8 + 2. *NB Number bonds for 20 are revisited early on in the Block 2 unit on money.* Add a two-digit number and ones - no exchanging Counting on; partitioning first addend into tens and ones, then combining ones; column method. Add multiples of ten Use known facts, eg: 3 + 2 = 5 so 3 tens + 2 tens = 5 tens. Friendly number pairs Friendly numbers fit together to make a number that is easy to work with. Re-ordering is often used to simplify calculations. Eg: 14 + 30 + 6 becomes 14 + 6 + 30 which becomes 20 + 30.	Finding the total Two-digit amount + 1 digit amount (no exchanging) using partitioning, eg: 54p + 5p = 50p + 4p + 5p. Column method used as well. Add multiples of ten pence using representations of coins. Adding single digit pounds bridging ten pounds, eg: £8 + £6 = £8 + £2 + £4 Change Change from 20p using tens frames and recall of number bonds for 20. Change from 50p using base 10 and mental calculation to subtract multiples of five and ten from 50p.	Calculation unit Revisits methods from Block 2. Adding coins Children use their mental calculation skills to find totals supported by representations of coins. Adding notes Children use their mental calculation skills to add multiples of ten and five pounds supported by representations of bank notes. Subtracting amounts of money Children subtract amounts using notes and coins. The core strategy is to partition the subtrahend, eg: £60 - £15 = £60 - £10 - £5

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

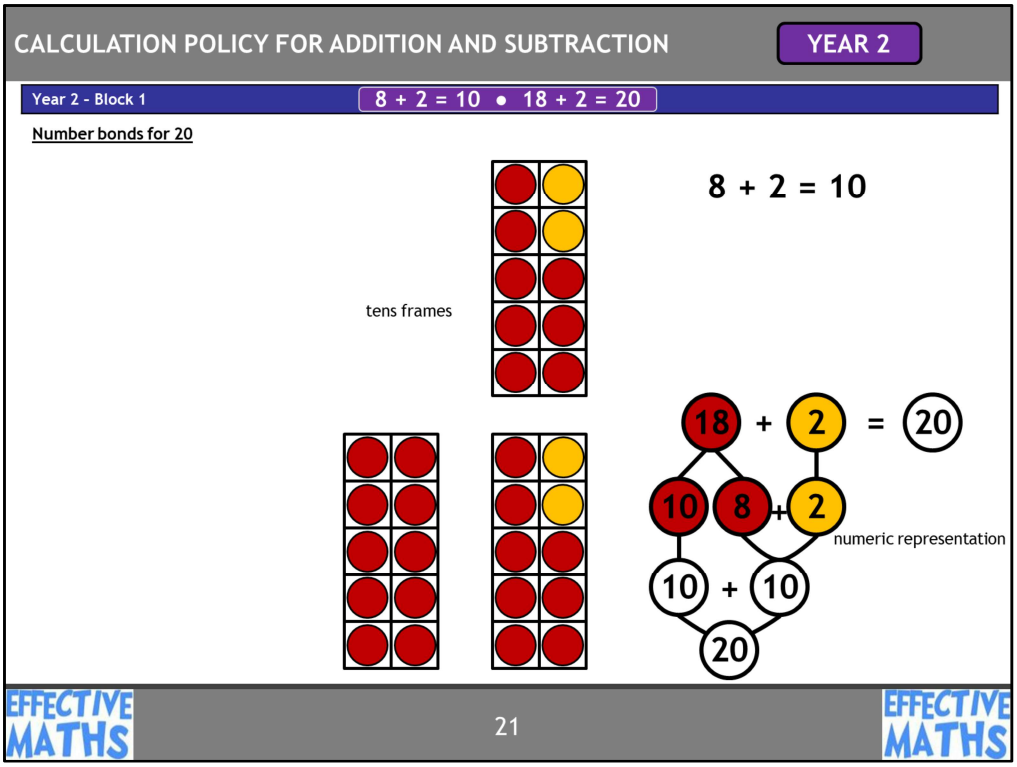
YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods	Subtract ones from a two-digit number - no exchanging Counting back; partitioning minuend; column method. Subtract multiples of ten Use known facts, eg: 5 - 2 = 3 so 5 tens - 2 tens = 3 tens. Subtract ones from a multiple of ten Use known facts, eg: 10 - 2 = 8 so 30 - 2 = 28. Add single digit numbers bridging ten Making the next ten, eg: 8 + 6 = 8 + 2 + 4. Subtract single digit numbers from 11-18 bridging ten Making the previous ten, eg: 15 - 8 = 15 - 5 - 3.	Add a two-digit number and ones Making the next ten, eg: 28 + 6 = 28 + 2 + 4; expanded column method; compact column method. Add 3 one-digit numbers Add 3 one-digit numbers Children use their developing ability to make the next ten to add 3 one-digit numbers. The core representation is the tens frame, eg: 9 + 7 + 5 = 16 + 5 = 16 + 4 + 1 = 21 Subtract ones from a two-digit number Making the previous ten; compact column method. Adding 2 two-digit numbers Partitioning addends into tens and ones and combining; expanded column method; compact column method.	

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 2

Year 2			
	Block 1	**Block 2**	**Block 3**
Strategies/ methods		<u>Subtracting a two-digit number from a multiple of ten</u> Partitioning the subtrahend, eg: 30 - 19 = 30 - 10 - 9. <u>Subtracting a two-digit number from a two-digit number</u> Partitioning the subtrahend; compact column method.	

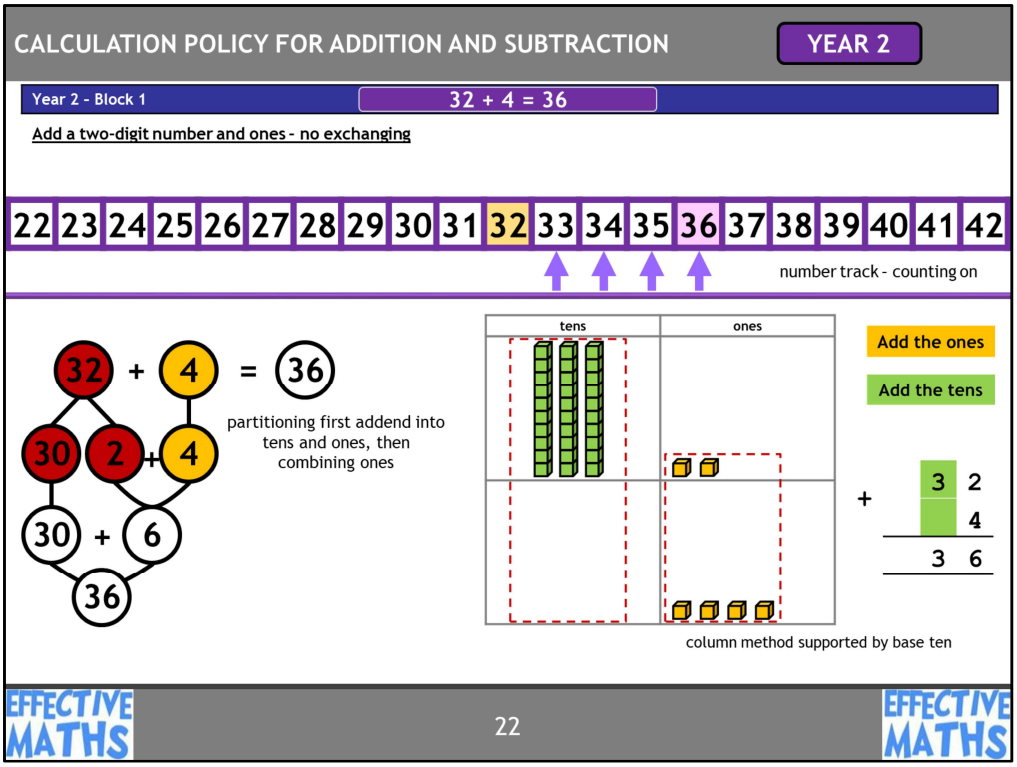


BLOCK 1

Number bonds for 20

Partitioning first addend into tens and ones then combining ones, eg:
18 + 2 = 10 + 8 + 2.

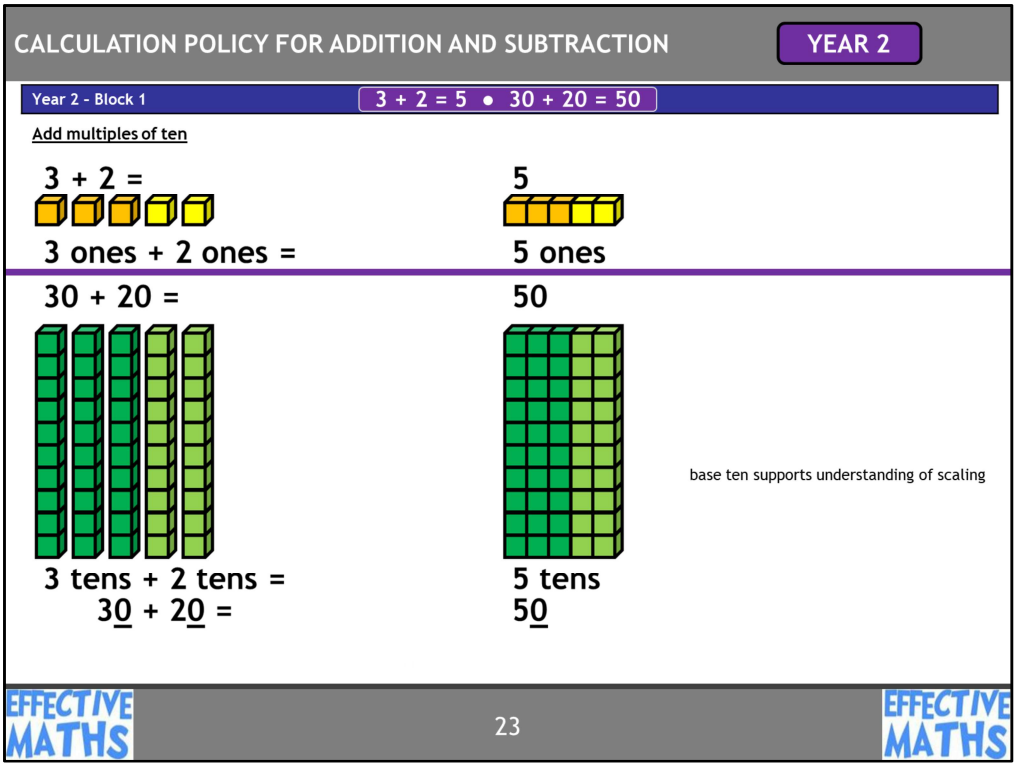
NB Number bonds for 20 are revisited early on in the Block 2 unit on money.



<u>Add a two-digit number and ones – no exchanging</u>

Three methods:

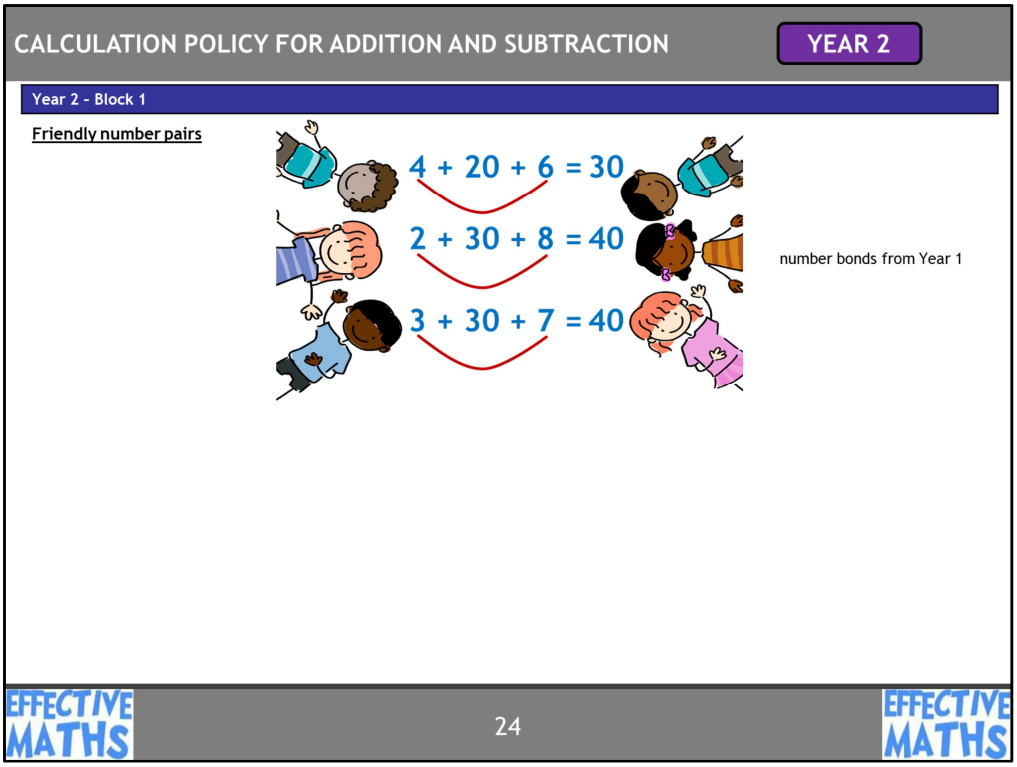
- counting on;
- partitioning first addend into tens and ones, then combining ones;
- column method.



Add multiples of ten

Use known facts, eg:

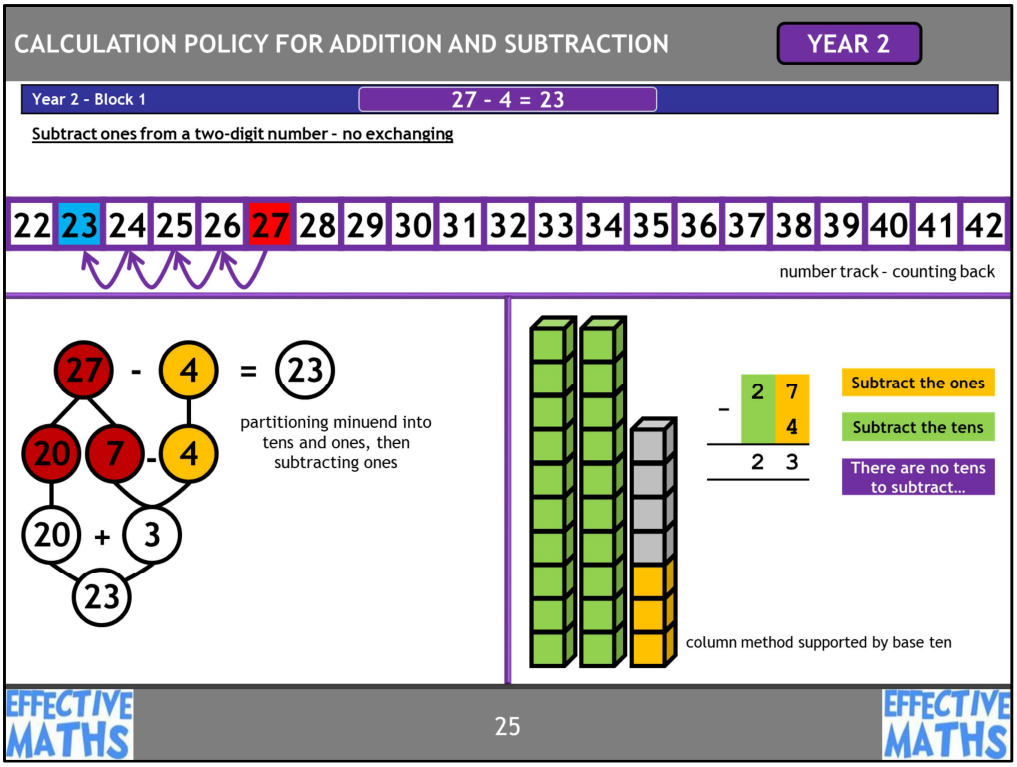
3 + 2 = 5 so 3 tens + 2 tens = 5 tens.



Friendly number pairs

Friendly numbers fit together to make a number that is easy to work with. Re-ordering is often used to simplify calculations. Eg:

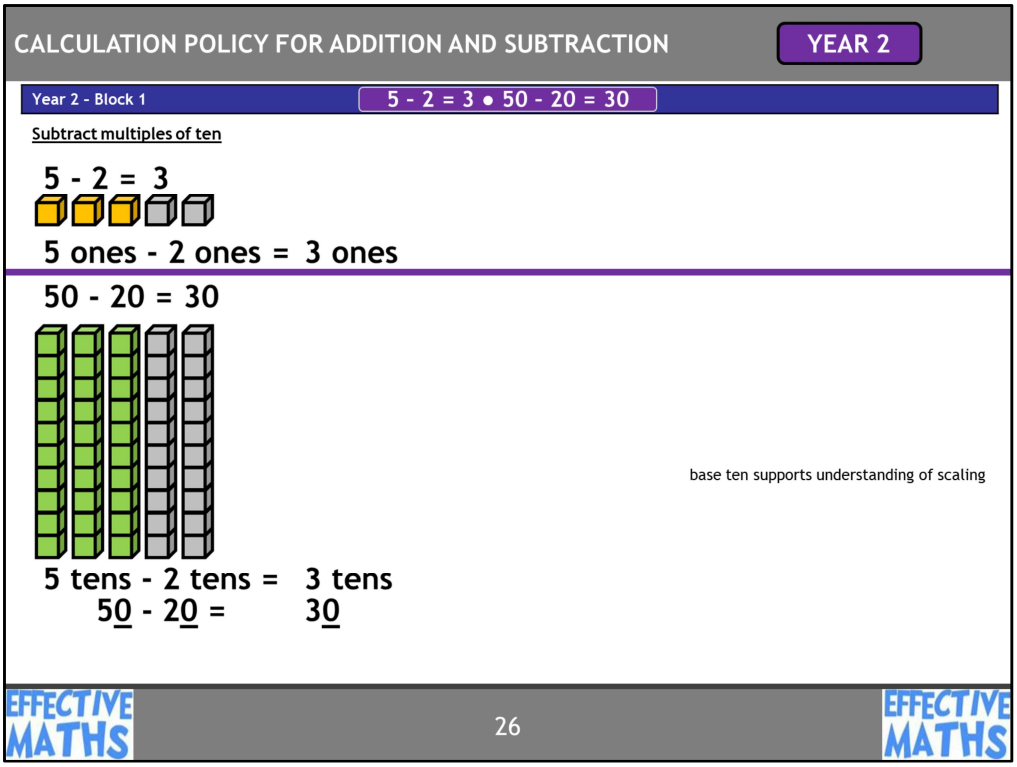
14 + 30 + 6 becomes 14 + 6 + 30 which becomes 20 + 30.



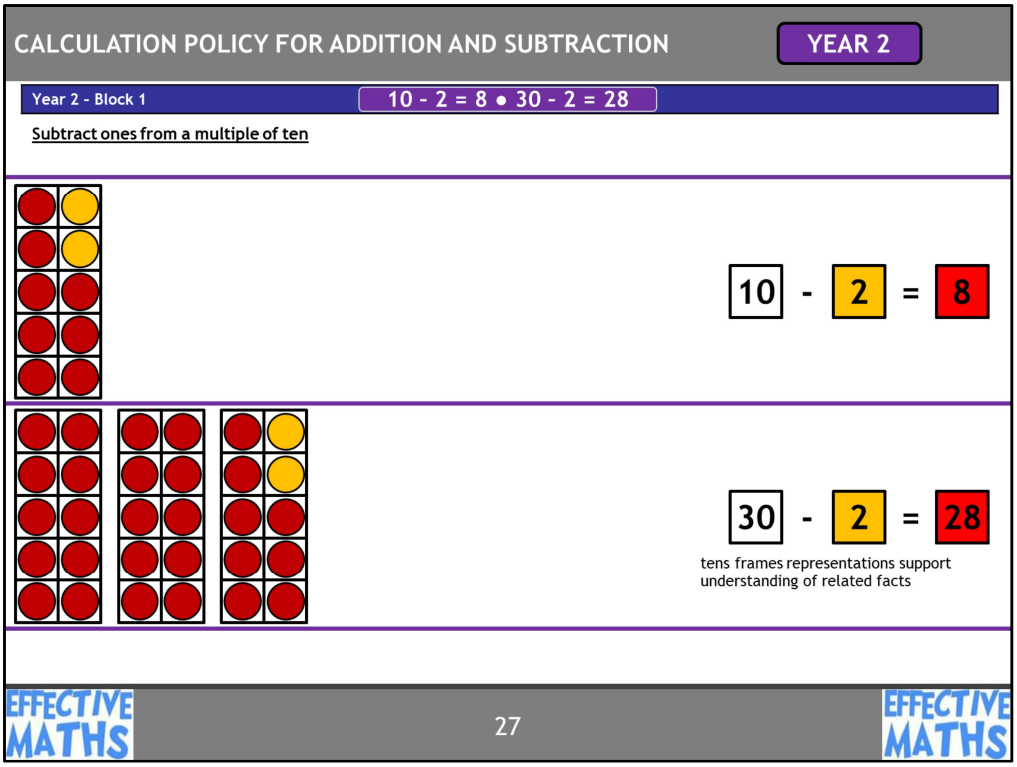
Subtract ones from a two-digit number – no exchanging

Three methods:

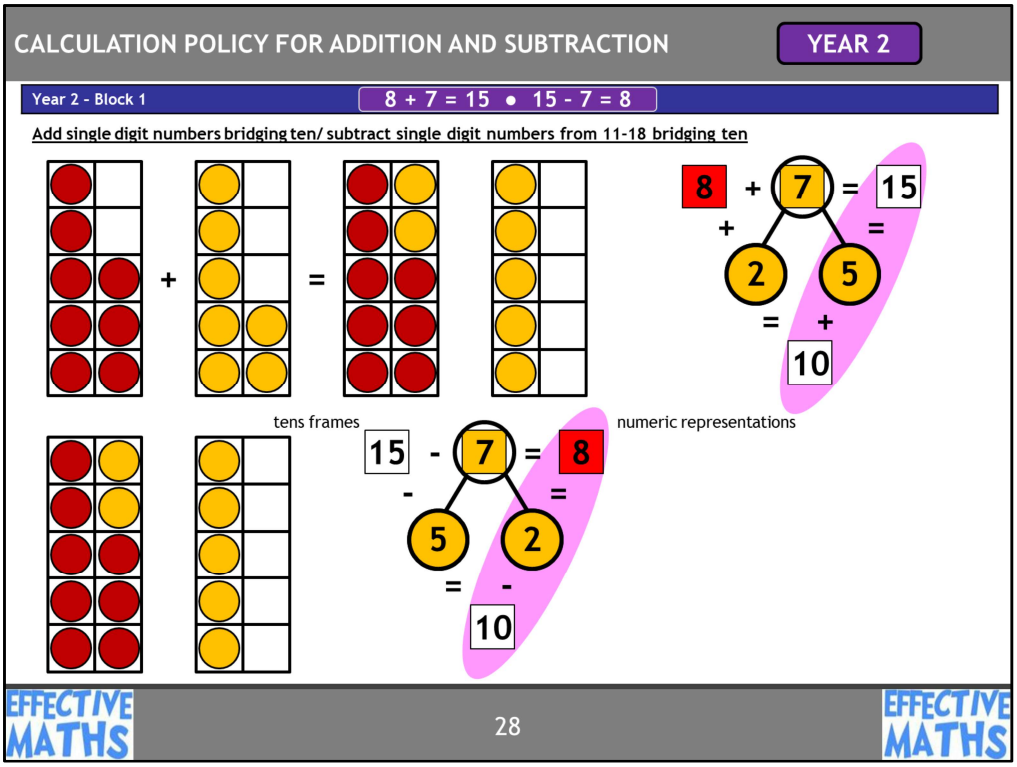
- counting back;
- partitioning minuend;
- column method.



Subtract multiples of ten
Use known facts, eg:
5 – 2 = 3 so 5 tens - 2 tens = 3 tens.

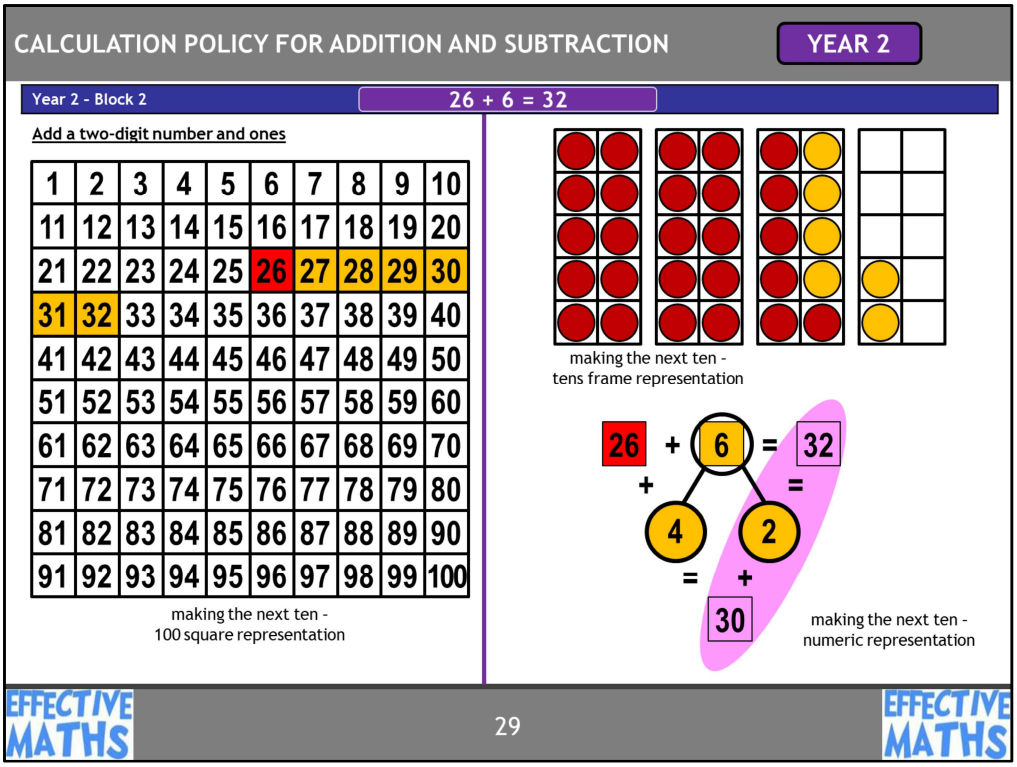


Subtract ones from a multiple of ten
Use known facts, eg:
10 – 2 = 8 so 30 – 2 = 28.



Add single digit numbers bridging ten
Making the next ten, eg:
8 + 6 = 8 + 2 + 4.

Subtract single digit numbers from 11-18 bridging ten
Making the previous ten, eg:
15 – 8 = 15 – 5 – 3.



BLOCK 2

<u>Add a two-digit number and ones</u>
Three methods:

- making the next ten, eg:

28 + 6 = 28 + 2 + 4;

- expanded column method (next page);
- compact column method (next page).

CALCULATION POLICY FOR ADDITION AND SUBTRACTION

YEAR 2

Year 2 - Block 2

26 + 6 = 32

Add a two-digit number and ones

	T	O
	2	6
+		6
	1	2
	2	0
	3	2

expanded column method

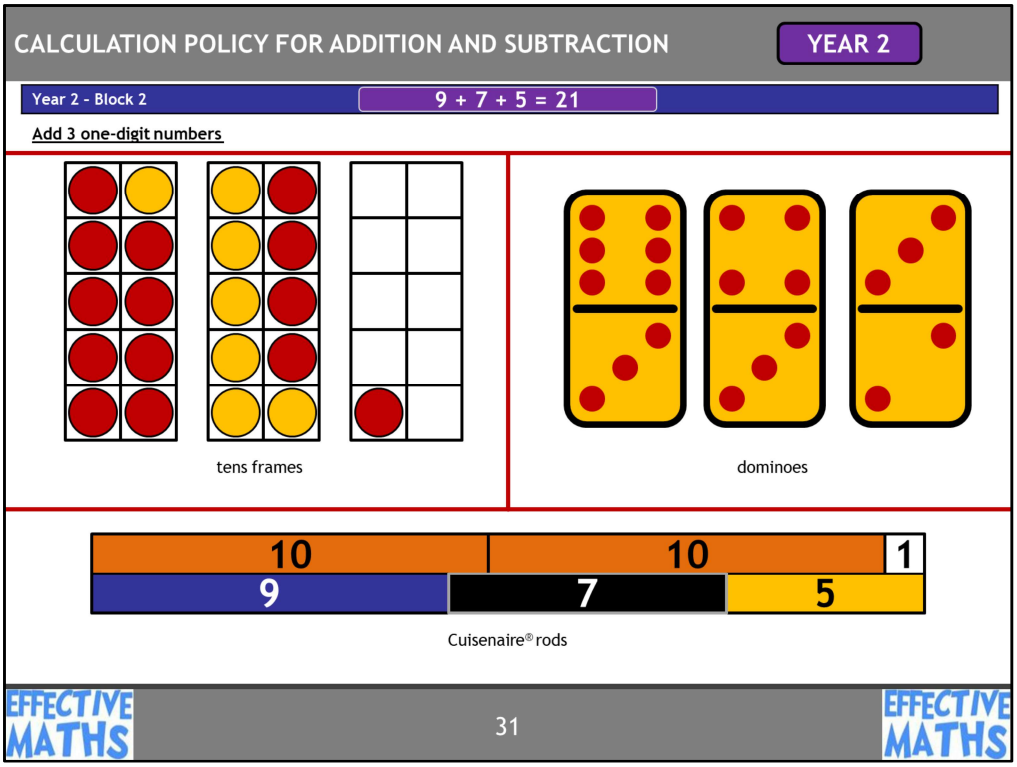
	T	O
	2	6
+		6
	3	2
	1	

compact column method

EFFECTIVE MATHS

30

EFFECTIVE MATHS



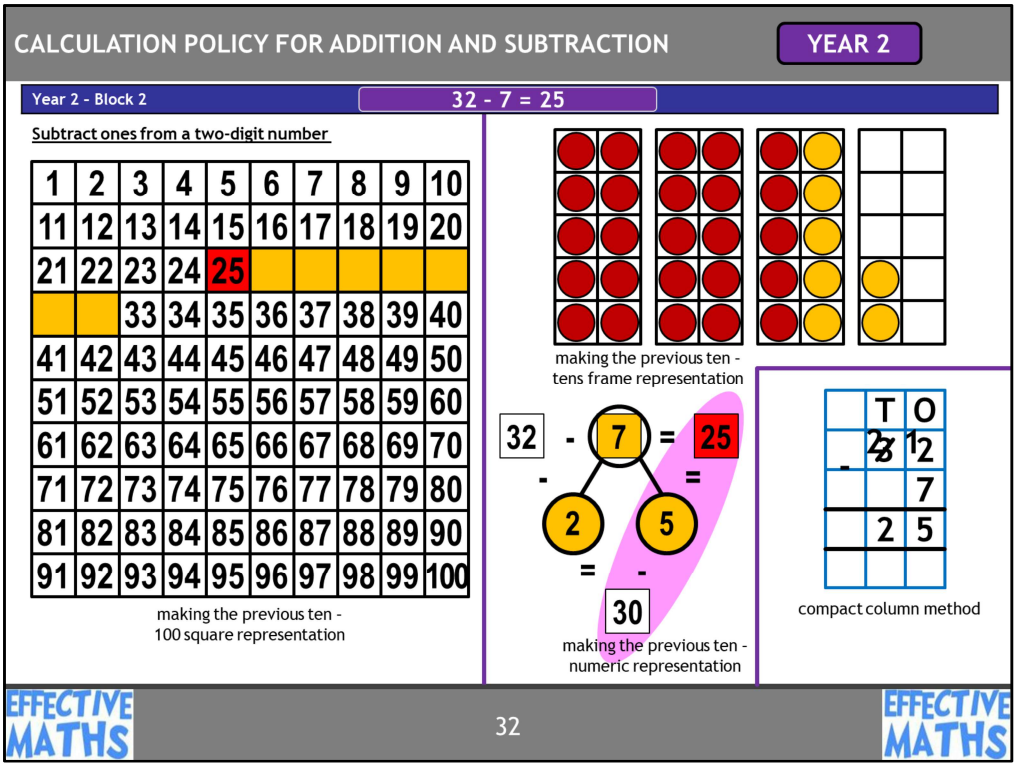
Add 3 one-digit numbers

Children use their developing ability to make the next ten to add 3 one-digit numbers. The core representation is the tens frame, eg:

9 + 7 + 5 =

16 + 5 =

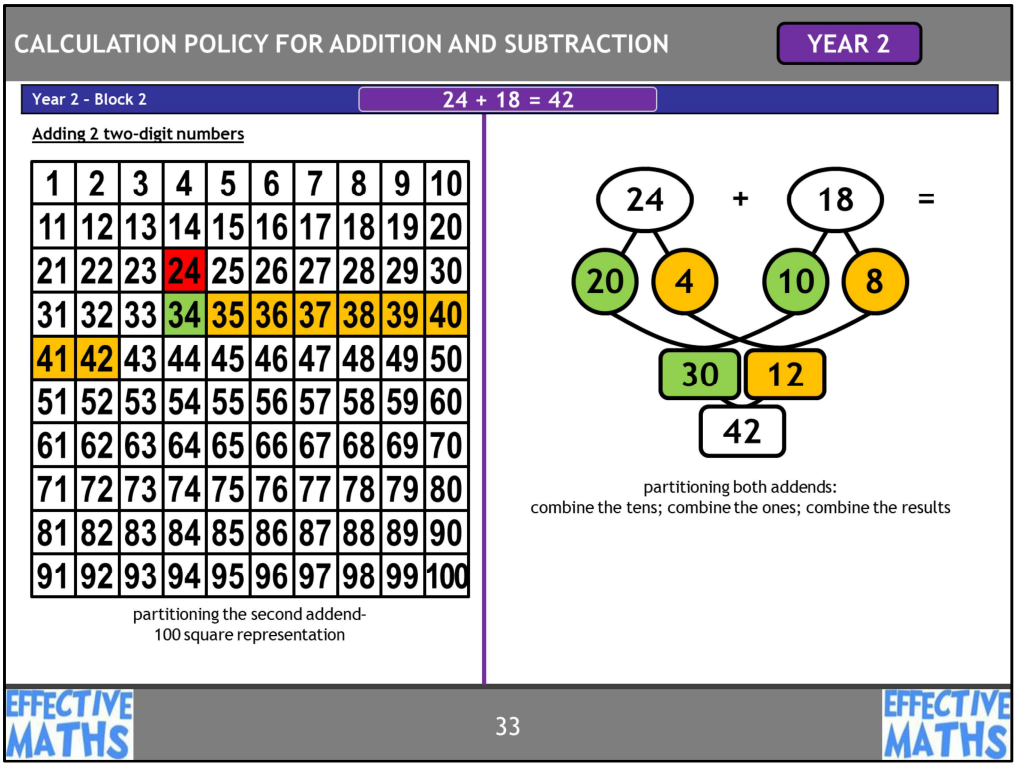
16 + 4 + 1 = 21



Subtract ones from a two-digit number

Two methods:

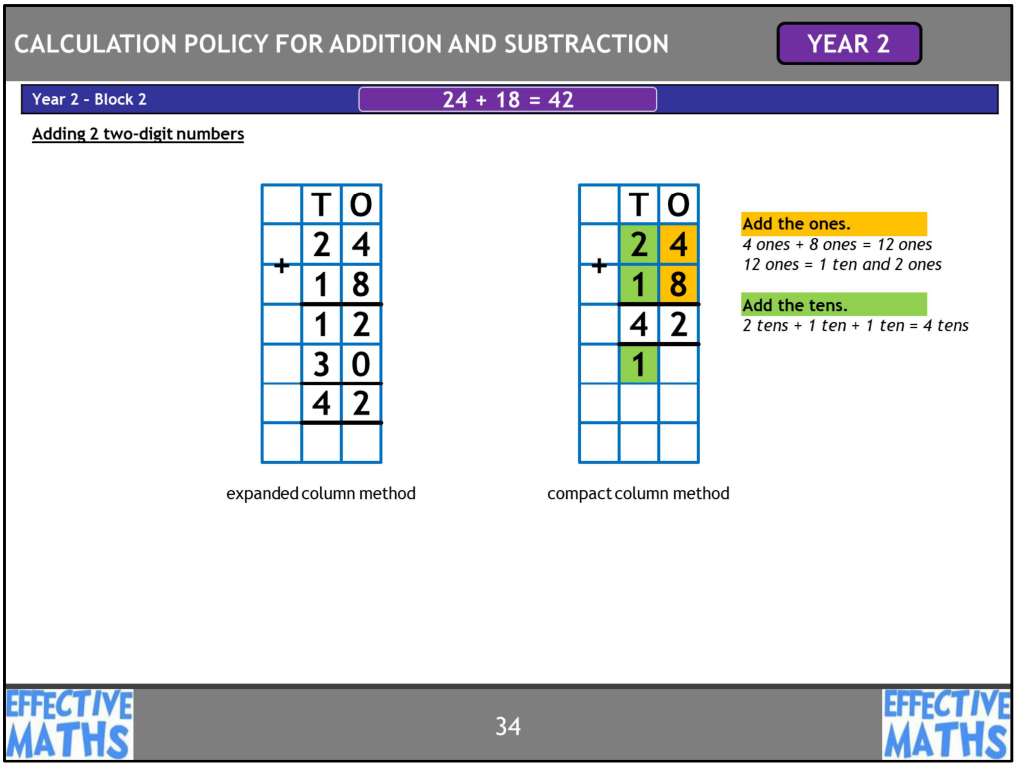
- making the previous ten;
- compact column method.



Adding 2 two-digit numbers

Three methods:

- partitioning addends into tens and ones and combining;
- expanded column method (next page);
- compact column method (next page).



Language for the compact column method

The use of accurate language is essential to ensure conceptual understanding of the column method.

Avoid terms like 'units' and 'carry'.

Link to children's understanding of how base 10 works (the trading games played in place value unit 1).

Say:

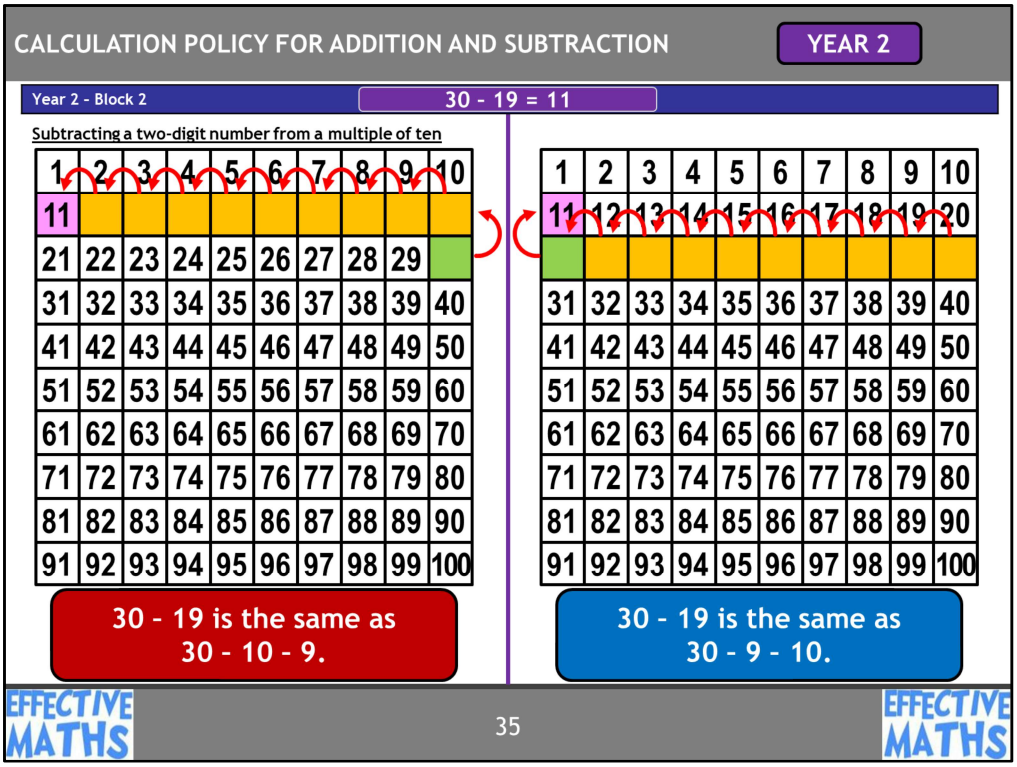
Add the ones.

4 ones and 8 ones makes 12 ones.

12 ones is the same as 1 ten and 2 ones.

Add the tens.

2 tens and 1 ten and 1 ten makes 4 tens.



Subtracting a two-digit number from a multiple of ten
Partitioning the subtrahend, eg:
30 – 19 = 30 – 10 – 9.

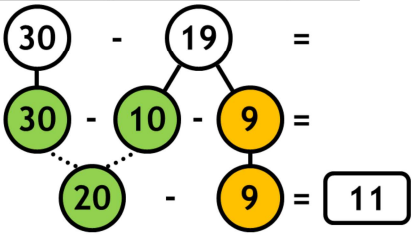
CALCULATION POLICY FOR ADDITION AND SUBTRACTION

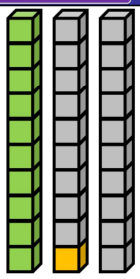
YEAR 2

Year 2 - Block 2

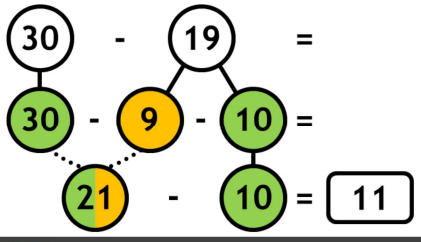
30 - 19 = 11

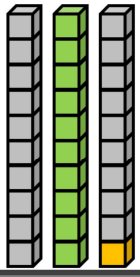
Subtracting a two-digit number from a multiple of ten





partitioning the subtrahend





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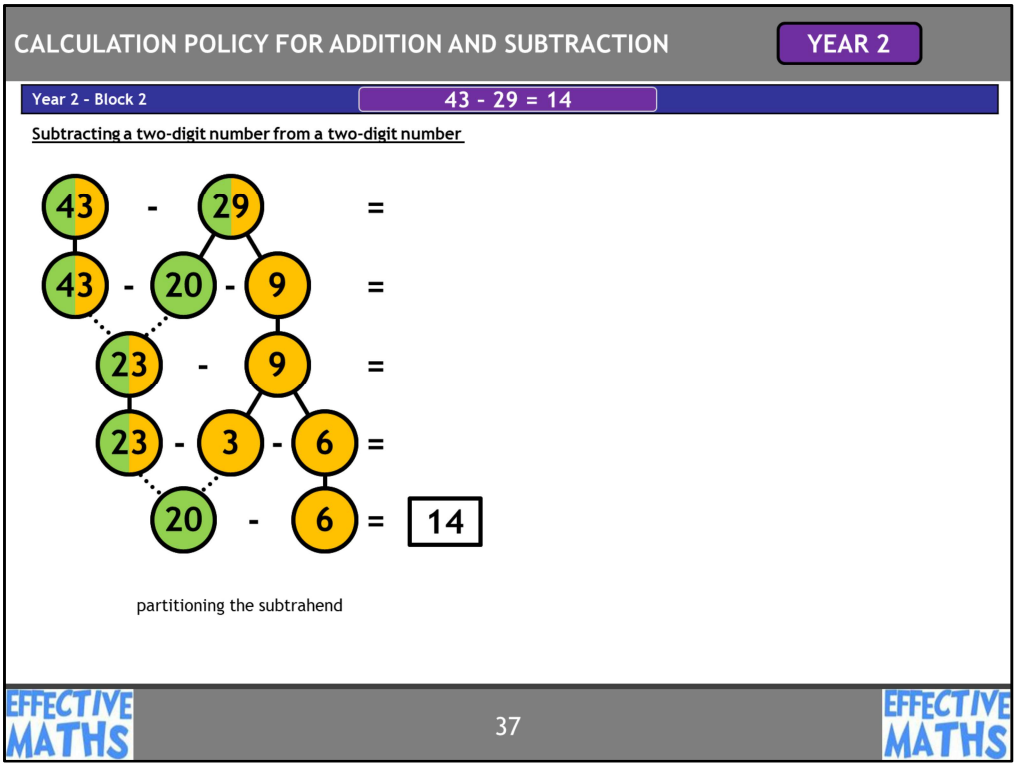
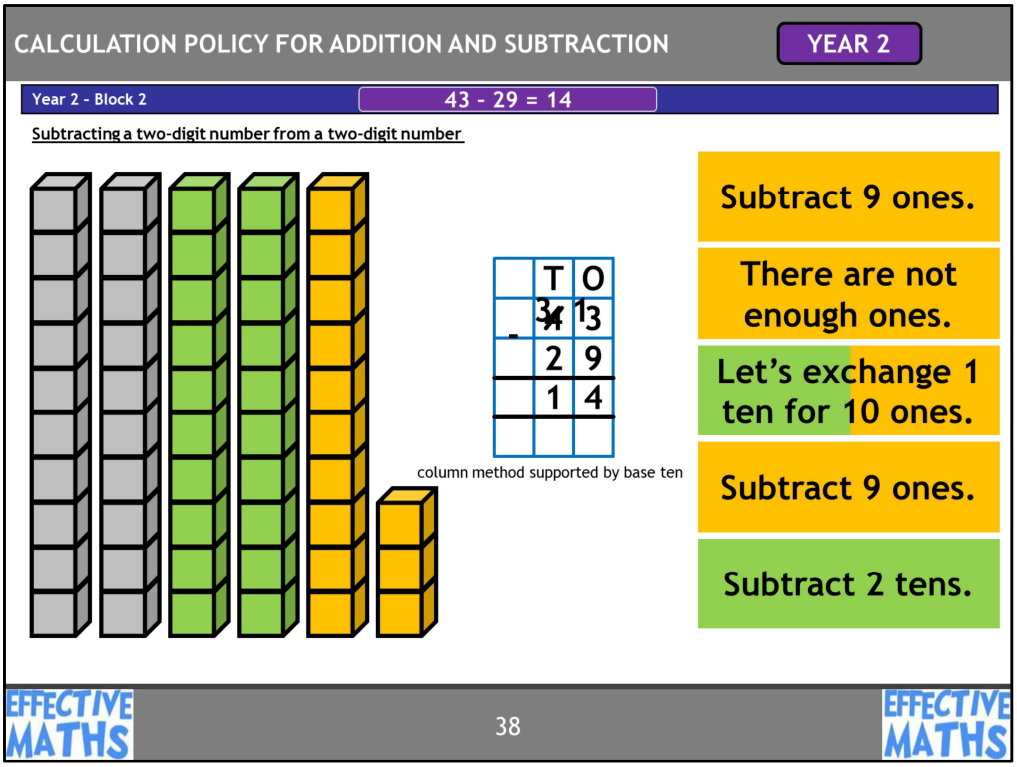


Subtracting a two-digit number from a two-digit number

Two methods:

- partitioning the subtrahend;
- compact column method (next page).



Language for the compact column method

As for addition, accurate use of language is essential to ensure conceptual understanding of the column method.
Do not use the term 'borrow'.
There are not enough ones in the situation *3 ones take away 9 ones*. So we need some more ones. Let's exchange/swap 1 ten for 10 ones. Now we have 13 ones.
13 ones take away 9 ones equals 4 ones.