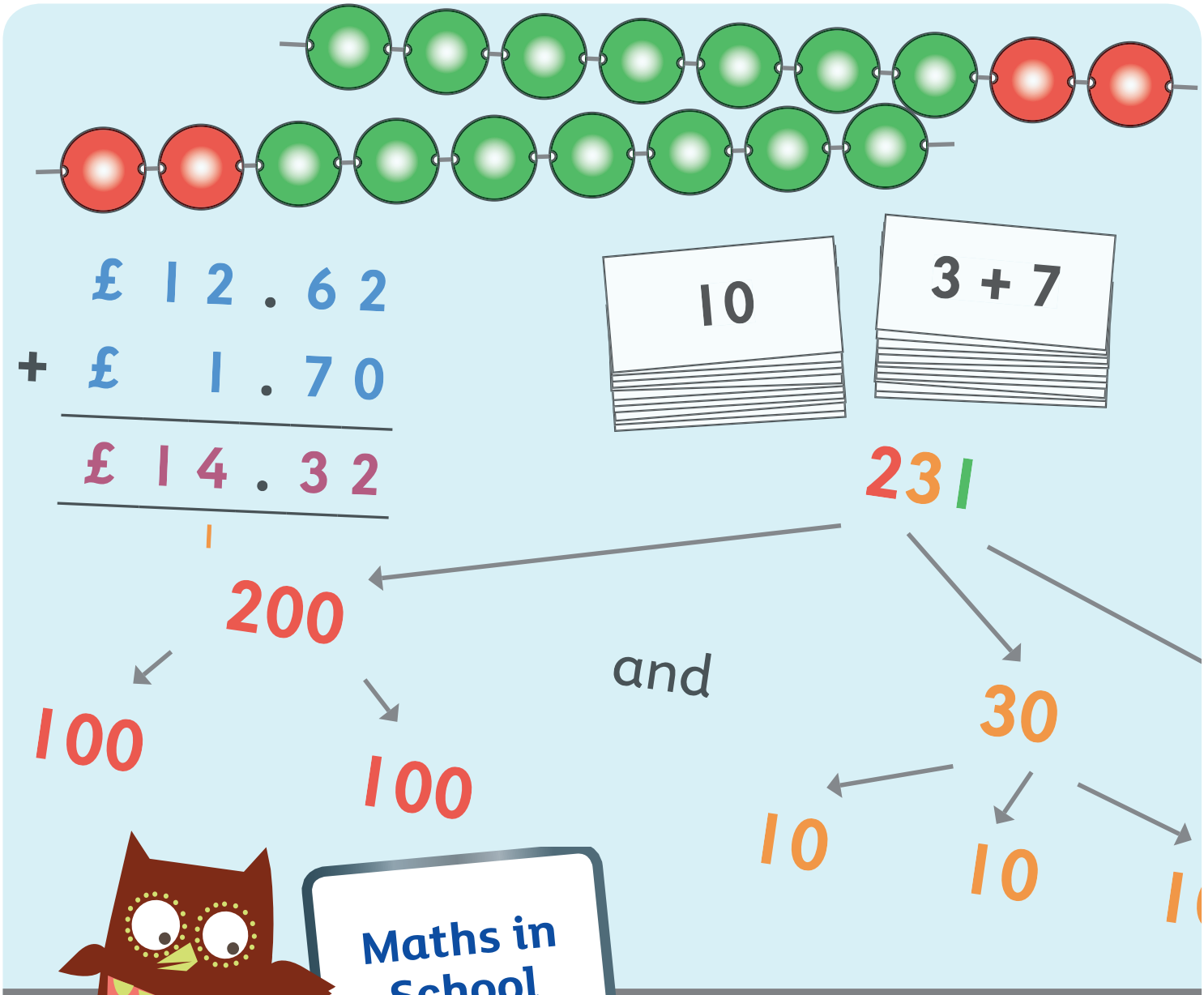

Addition in School

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OXFORD

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Introduction

In this booklet, you'll find out how children are taught to add in school. You'll also find a range of games and activities that you can use at home to build your child's skills and confidence at adding.

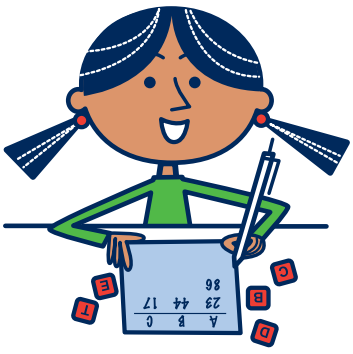
Adding in everyday life

Children first learn to add using real stuff, such as their fingers, toys, food and counters.

Real things that our children can see, touch and feel, maybe even smell or taste, bring maths to life. And when those things are in real situations – everyday activities, games and events – maths makes sense and has a clear purpose.

You can:

- *Help young children to add numbers of toys or amounts of food.*
- *Make your child their very own Coat hanger abacus (see page 4).*
- *Help them, when they are ready, to add prices in shops, scores in games, etc.*

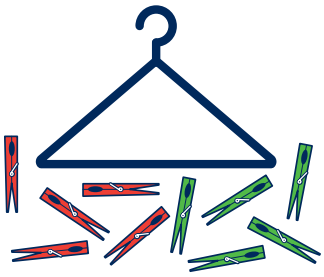


Coat hanger abacus

A great, easy-to-make aid for early adding skills is a coat hanger with clothes pegs attached. Here's how you can make one:

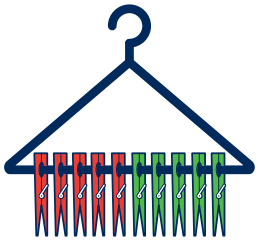
You will need:

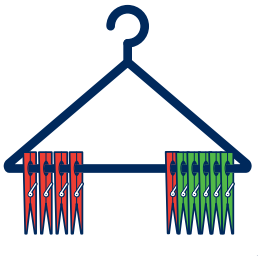
- *A 3-sided plastic (or wooden) coat hanger*
- *10 clothes pegs, ideally 5 in one colour and 5 in another colour*



What to do:

- *Wrap any sharp ends of the coat hanger with sticky tape to make it safe to handle.*
- *Attach the pegs so that they hang down from the bottom bar of the hanger.*
- *Help your child to use the pegs to add amounts that total less than 10, e.g. to add 4 and 3, separate out the first 4 pegs and then the next 3, then push the two amounts together and count how many there are altogether.*
- *After a while your child may start to see that, if the final amount includes all the pegs of one colour and a few of the other, then they can just add onto 5 the number of pegs they have in the second colour.*
- *When your child is ready you can try this with 20 pegs – 10 in one colour and 10 in another.*





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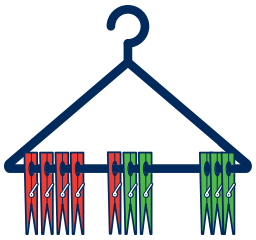
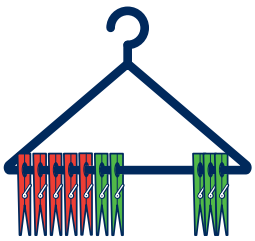


4 + 3



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Different words for addition

In real life, we use all sorts of words and phrases for addition. Here are some examples:

plus

added to

with

and

more than

altogether...

It takes lots of practice for children to understand that when they hear these words they need to add. The more we use these words, during everyday activities at home, the better.

Ask your child addition questions using a range of words and phrases, e.g.

'If Joe has 2 cars and Milly has 3 cars, how many cars are there *altogether*?'

'What is 4 *and* 4?'

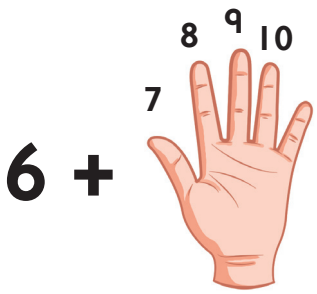
'I have 6 cherries and you have 3 *more than* me, so how many have you got?'

Adding as counting and counting on

When children first start to add, they use their counting skills, putting two amounts together and then counting the final amount.

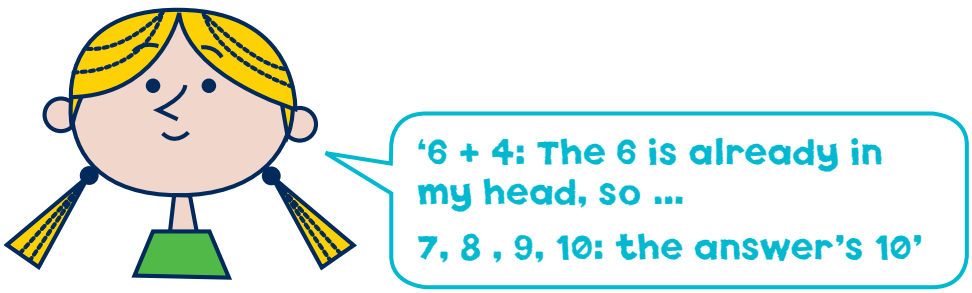
One of the milestones in learning to add is being able to ***count on*** from the first number, using fingers or other props to help if necessary, without having to actually count up to the first number. For example, if a child is adding 6 and 4, a milestone is to be able to start at 6 and then just count on another 4, perhaps using their fingers or another tool to help.

6 + 4



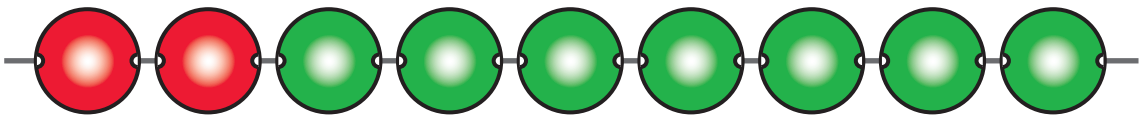
You can:

- *Help your child to imagine that the first number is already inside their head.*
- *Touch the top of their head and say the number and then count on. This can help your child to understand why they don't have to actually count out the first number:*

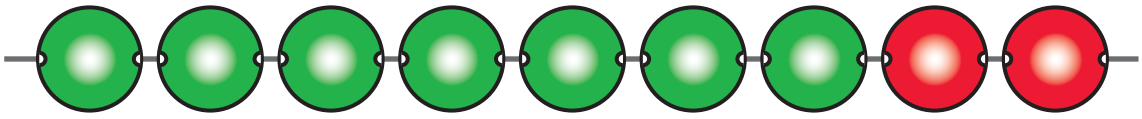


Which number first?

It helps children to learn that addition can be done in any order – it doesn't matter which number comes first. This is known as the commutative property of addition.



2 + 7 = 9



7 + 2 = 9

Bigger number first is easier

Although addition can be done in any order, it is helpful for children to see that it's usually easier to start with the larger number; that way there are fewer numbers to count on:

2 + 7 =

'**2** → 3 → 4 → 5 → 6 → 7… ***Where was I?'***

But …

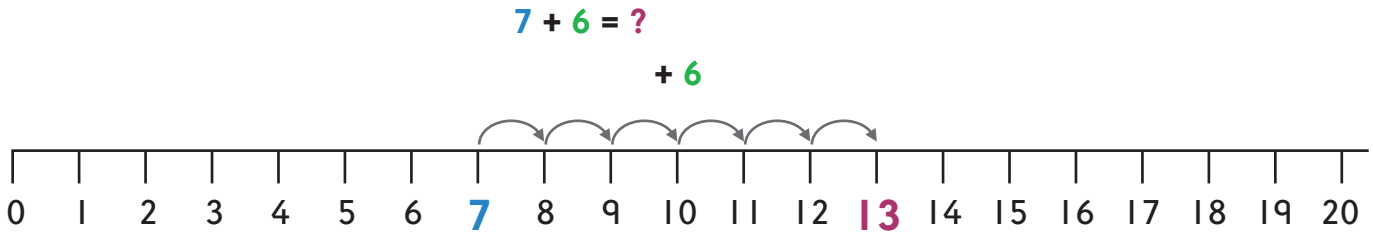
7 + 2 =

'**7** → 8 → **9**'

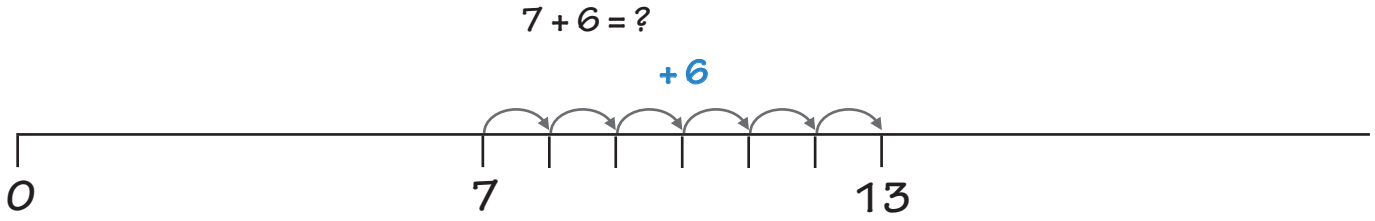
Number lines

Children will move from adding real things, such as counters and pictures of things, to adding written numbers. They'll practise lots of methods to make this easier, including the use of a number line.

A number line is simply a line with numbers on it that can help with calculations. Some number lines already have numbers on them, like this one:



Some number lines are left blank for children to fill in the numbers as they need them in a calculation:



You can:

- *Help your child to use the number lines on page 20 to add. They can use a counter (see page 21), pencil or finger to hop from one number to the next and keep their place.*
- *Draw your own number lines with your child. Here are some tips:*
  - *Always include 0 on your number line. (Forgetting about 0 can get children into a real muddle!)*
  - *Start by drawing them pretty big, with a nice gap between each number.*
  - *Blank number lines, on which you just write in the numbers that you need to remember as you do a calculation, are great to move on to when your child is ready.*

Number bonds

Children will learn to use **number bonds**. These are basic addition questions that we can answer instantly, without having to work out the answers in our heads. Some examples are:

$4 + 1 = 5$ $6 + 3 = 9$

At first, children practise number bonds that add up to 10 or less, like these. Schools give children lots of practice to help them remember the answers instantly. Children then move on to number bonds that add up to 20 or less. Some examples are:

$7 + 5 = 12$ $8 + 9 = 17$

The more number bonds a child knows, the easier they'll find addition and a whole range of other maths skills that use addition. But remembering number bonds takes lots of practice.

You can:

- *Ask your child lots of questions that involve number bonds, e.g. 'If you're having three potatoes and I'm having two, how many do we need altogether?'*
- *Print and play Number Bond Bingo (pages 22–26) and Number Bond Pairs and Snap (pages 27–29).*
- *Make your own number bonds games for your child, e.g. make Number Bond Bingo, Pairs or Snap for numbers up to 20. All you'll need is a few sheets of paper or card to write the numbers on.*
- *Play board games with two dice. These offer a great opportunity to practise number bonds.*

Bridging

When children start to add numbers to totals above 10, there is a method called ***bridging*** that they can find useful.

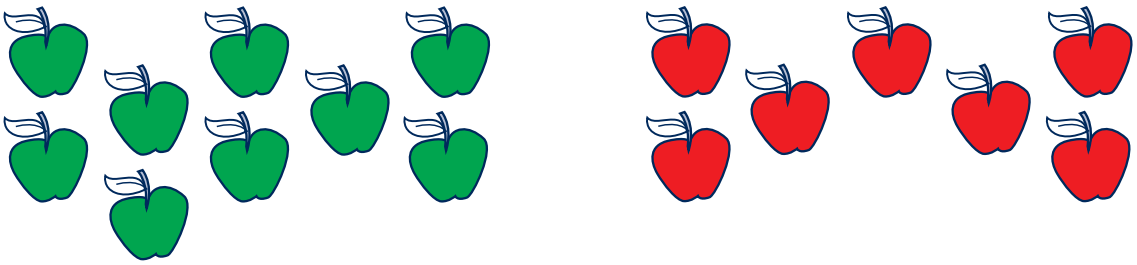
Bridging uses numbers ending in zero (0), like 10, 20, 100, 700, 1000, 5000 etc, as a *'bridge'*, or stepping stone, in a calculation.

When an addition takes us over a number ending in 0, we:

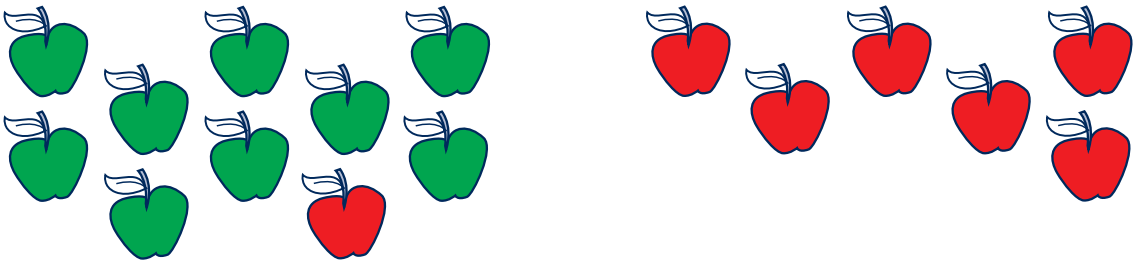
1) add on enough to take us up to that number

2) add on whatever is left over:

9 apples + 7 apples



To get from 9 apples to 10 apples is an easier addition: we just need to add 1 out of our 7 apples



We've got 6 left over from the 7,

so 10 + 6 = 16

(another easier addition)

So, 9 apples + 7 apples = 16 apples

You can:

- *Help your child if they are struggling to add larger numbers. See if you can think of a number ending in **0** that could be a bridge. Ask, 'How much would we need to get to... (the number ending in 0)?' and 'How much do we have left to add on?'*

The compensation method

Children may also be taught the **compensation method** if they are adding a number close to a number ending in **0.** This method can help children to get to an answer more quickly and easily.

This is how the method works:

We want to add **£1.99** to **£4.50**.

- First add or subtract whatever you need to take your number to the nearest number ending in 0. So:

£1.99 + 1p = £2.00

- Next, add the other number as required:

£4.50 + £2.00 = £6.50

- Finally ***compensate*** for the extra bit you added or subtracted at the start. We added one penny, so now we must subtract one penny:

£6.50 – 1p = £6.49

And that's the right answer:

£4.50 + £1.99 = £6.49

In this way, a series of much easier steps get us to the answer more quickly than one hard step.

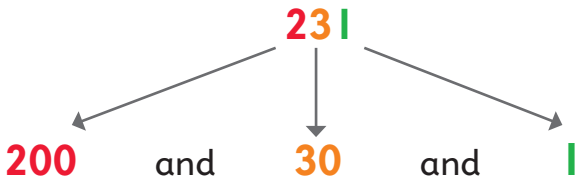
You can:

- *Help your child to use this method when you're shopping. Lots of prices are set just below a number ending in zero.*
- *If your child is struggling with an addition, see if they can spot a nearby number ending in zero and then use the compensation method to make the addition easier.*

Partitioning

Once they are comfortable adding small numbers, children will start adding numbers with two digits. They will then work towards adding numbers with up to four digits and eventually move on to adding numbers with five or more.

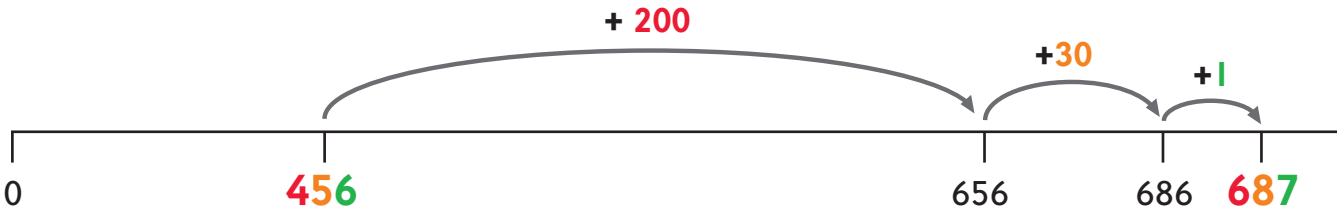
To help, they're often taught a skill called **partitioning**. Partitioning means splitting a number up into smaller bits to make calculations easier. Usually, we split numbers up into hundreds, tens and units.



You can:

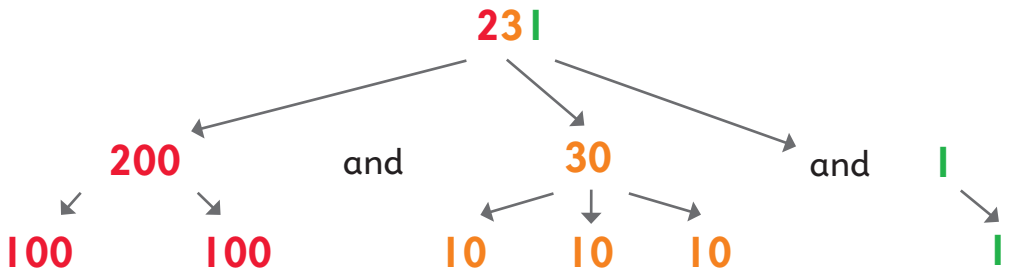
- *Encourage your child to partition numbers over 10 that you see around you – in shops, adverts, game scores, etc.*

If we want to add 231 to another number, say 456, we do it in these bits rather than trying to do it in one go. Here it is on a number line:



456 + 231 = 687

If children want to, they can split the numbers again to make the calculation even easier, like this:



Then they can add on 231 in these smaller, easier bits.

Partitioning into columns

You may see your children partitioning both numbers and placing them in columns, like this:

231 + 456 =

Hundreds		Tens		Units	
200	+	30	+	1	
400		50		6	
600	+	80	+	7	= 687

Reduced partitioning

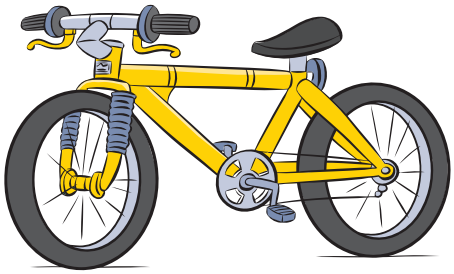
Children may also use partitioning, but in one column, like this:

	H	T	U	
	2	3	1	
+	4	5	6	
			7	*(all the units added together)*
		8	0	*(all the tens added together)*
	6	0	0	*(all the hundreds added together)*
	6	8	7	*(all the answers added together)*

Column addition with carrying

Children are shown how to add larger numbers in a column using a method called **column addition**. Some adults may be familiar with this method from their own school days.

In many additions, we have to do something called **carrying** (sometimes called regrouping). The column addition example below includes carrying.



If a bike costs **£265** and a bike helmet costs **£19**, we can add the two prices together to find the total cost like this:

1) Write the two numbers out, making sure that they are lined up with the units in one column, the tens in the next and so on. Put a pair of lines underneath:

	£	2	6	5
+	£		1	9
	£			

2) Add together the digits on the far right – the units: **5 + 9 = 14**. But **14** is not just units. It's **1** lot of ten and **4** single units. So we put the units part of the answer (our **4** single units) under the units, and we ***carry*** the tens part of the answer, our **1** lot of ten, to add on when we come to the tens part of the addition:

	£	2	6	5
+	£		1	9
	£			4
			1	

3) Next add together the tens. We have **6** lots of ten + **1** lot of ten. That's **7** lots of ten. But we also have to remember to add on the **1** lot of ten that we carried over from the last step. So that comes to **8** lots of ten altogether. We write that answer under the tens:

	£	2	6	5
+	£		1	9
	£		8	4
			1	

4) Finally we, add together the hundreds. We've got **2** lots of a hundred in our top number and none in our bottom number. **2 + nothing = 2**. We write that answer underneath our hundreds:

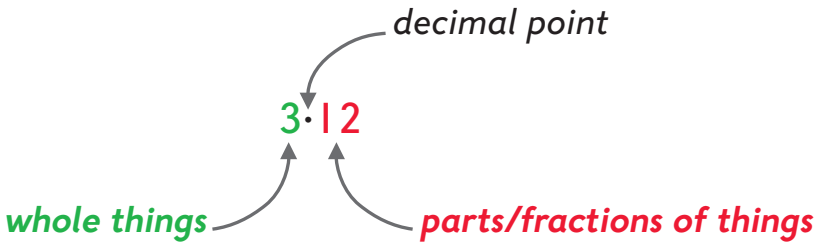
	£	2	6	5
+	£		1	9
	£	2	8	4
			1	

We've added together all our digits, so that's our final answer:

£265 + £19 = £284

Decimal numbers

Once their knowledge of whole numbers is secure, children will be introduced to decimal numbers.



3·12 is a decimal number: it has a decimal point.

Digits before the decimal point (the 3) are whole numbers that represent whole things.

Digits after the decimal point (the 1 and 2) represent parts, or fractions, of whole things.

Adding decimal numbers

Children are shown how to add decimal numbers:

$$\begin{array}{r} 12 \cdot 62 \\ +\ \ 1 \cdot 7 \\ \hline 14 \cdot 32 \\ \hline \ \ 1 \end{array}$$

When adding decimals using column addition, ***keep the decimal points lined up.*** Keep all the digits on either side of the decimal point lined up in columns too. Then complete the calculation just like a normal column addition, carrying as needed.

Adding money amounts with decimal numbers

Money amounts that have pounds and pence, like **£12.62**, are decimal numbers. The pence are after the decimal point because they represent a part, or fraction, of a whole pound. We can add money amounts in exactly the same way as any other numbers with decimals:

$$\begin{array}{rr} & £12.62 \\ + & £\ 1.70 \\ \hline & £14.32 \\ & \ \ 1 \end{array}$$

You can:

- *Encourage your child to try and add money amounts that include pounds and pence when they are shopping or budgeting.*

Negative Numbers

Eventually children will start to explore negative numbers. Negative numbers are *not* parts of things, or fractions of things. They are ***numbers less than zero*** – missing things or things that we owe. (Numbers above zero are called ***positive*** numbers.)

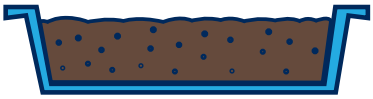
Children can find negative numbers easier to understand if they think of real-life examples:

> If I have no money *and* I owe you a pound, I have minus £1.00: £1.00 less than zero or nothing.

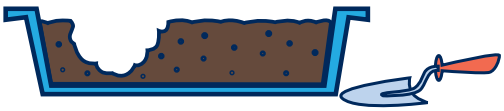
Adding negative numbers

Children will be shown how to add negative numbers. Concrete examples can help:

This blue seed tray has a smooth flat surface with no big mounds of soil and no big holes in the soil. We'll call that flat surface **zero**, or **0**. So, at the moment our soil is at **0**.

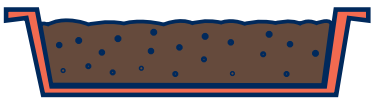


But if we want to plant a flower, we need to take out some soil to make room for it. We'll take out one scoop:

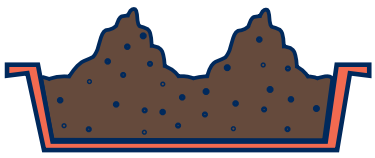


The soil in the blue seed tray isn't at **0** anymore. It's at one scoop less than **0**, it's **minus** one scoop, or just **$^{-}$1**.

Here's a red seed tray with the soil level at **0**.

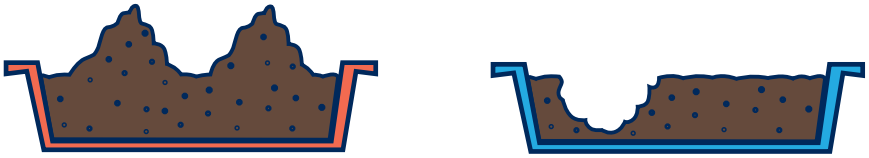


This time, we're not going to take away any soil, we're going to add some soil. We'll add two scoops:



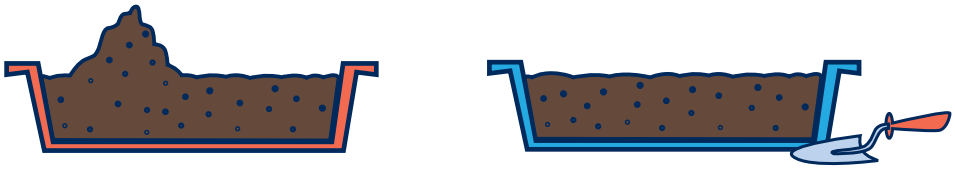
So now the soil level in the red tray is at more than **0**. It's at two scoops more than **0**, or **$^{+}$2**. (When we're only dealing with numbers above zero, we just call this **2**.)

But what happens if we decide to combine the soil in these two seed trays, to see how much soil there now is altogether, between them? In other words, what happens if we take $^{+}2$ and add $^{-}1$?



$^{+}2 \quad + \quad ^{-}1$

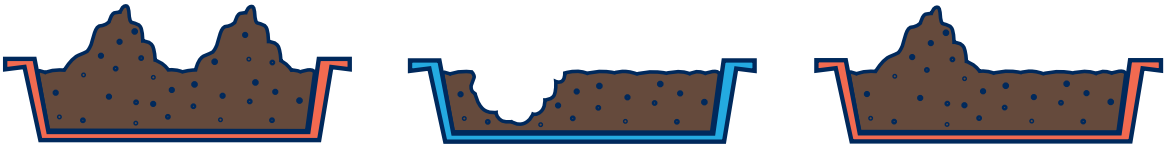
We can take one of the extra scoops from the red $^{+}2$ seed tray and use it to fill up the hole in the blue $^{-}1$ seed tray, like this:



The blue tray doesn't have any holes anymore. It's no longer $^{-}1$ scoop, it's back at **zero** or **0**.

The red tray doesn't have **2** extra scoops anymore, it's only got **1** extra scoop: it's not at $^{+}2$ anymore, it's at $^{+}1$.

So, altogether the two trays have just got one extra scoop, only one scoop more than zero. They're just $^{+}1$ scoop:



$^{+}2 \quad + \quad ^{-}1 \quad = \quad ^{+}1$

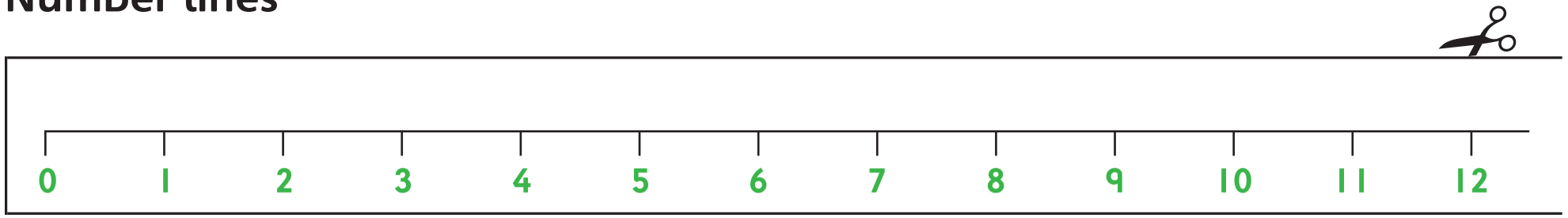
Usually when we add, the answer goes ***up,*** but when we add a negative number to a positive number, the answer goes ***down.***

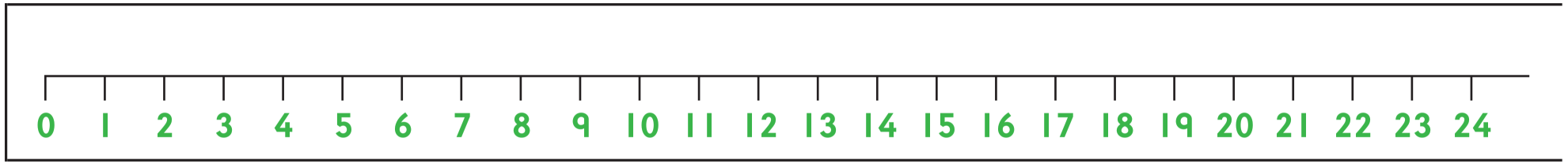
It can take time and practice for children to really understand how, and why, when you add a negative number, the answer goes down, not up.

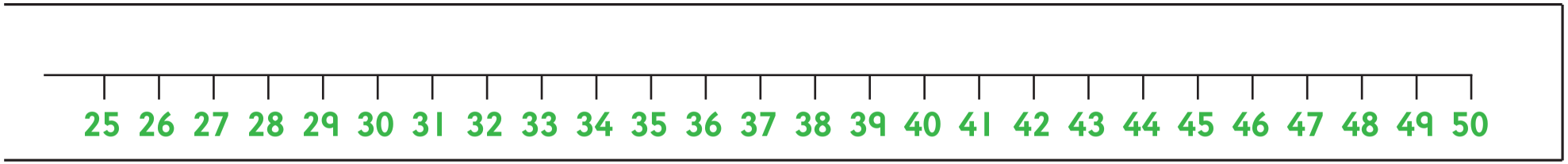
You can:

- *Use real things, e.g. soil in a seed tray or flower bed, thermometers, money boxes or bank accounts to explore negative and positive numbers with your child.*

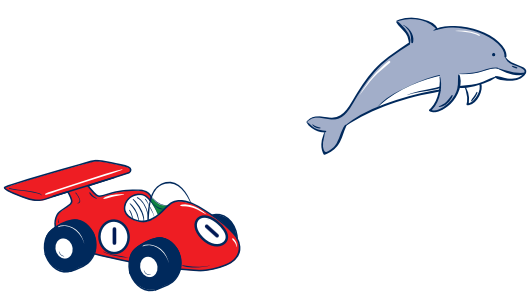
Number lines





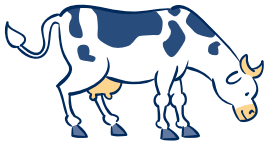
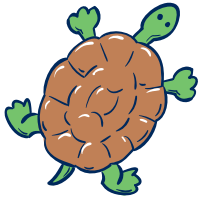


Number line counters



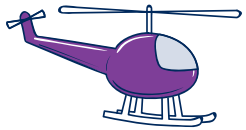









Number Bond Bingo! (2–4 players)

You will need:

Number Bond question cards (page 27)

Number Bond Bingo cards (one per player) (pages 23–26)

What to do:

Choose a bingo caller (can be one of the players). Give him or her the question cards face down in a pile.

Give all players a Bingo card.

The bingo caller turns over a Number Bond question, holds it up and reads it out.

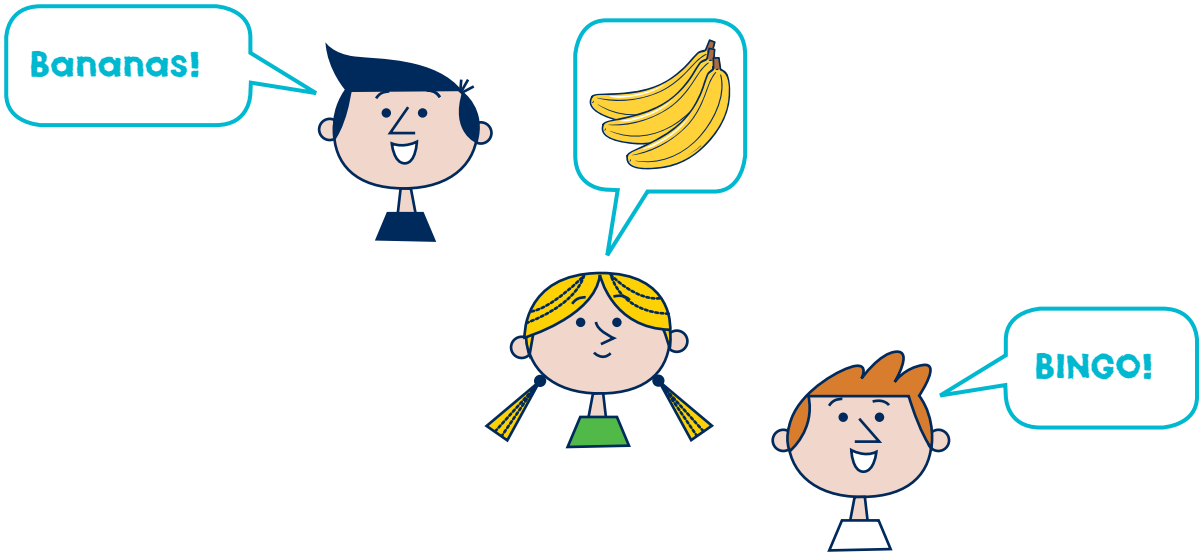
If a player has the answer to the question on their Bingo card, they must shout out 'Bananas!' or another agreed silly word before anyone else.

The player who shouts out 'Bananas!' first places the question card over the answer on their Bingo card.

If someone shouts 'Bananas!', but doesn't have the answer on their Bingo card, they must miss a turn.

If nobody has the answer on their card, discard it and pick another question card.

When all the spaces on a player's Bingo card are covered, they shout '**BINGO**!' The first person to shout '**BINGO!**' is the winner.



Number Bond Bingo card 1

2	7
5	3
10	8

Number Bond Bingo card 2

4	7
9	5
2	6

Number Bond Bingo card 3

4	10
9	8
6	3

Number Bond Bingo card 4

2	8
6	10
5	7

Number Bond question cards

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

Number Bond answer cards

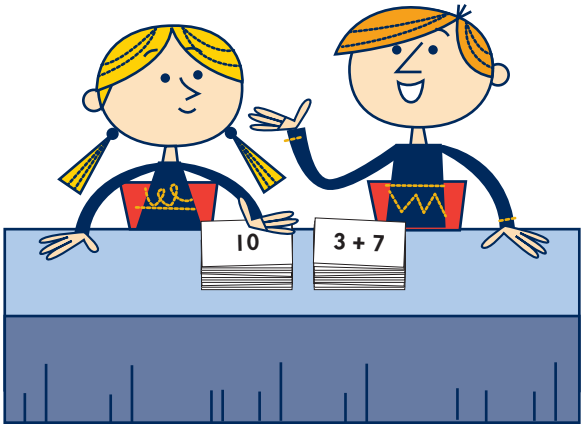
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10

Number Bond Pairs and Snap

You will need:

Number Bond question cards (page 27); use 1, 2 or 3 columns of the cards depending on how many players you have and how challenging you would like the game to be.

Number Bond answer cards (page 28); use the same number of columns as you have chosen for the question cards.



What to do:

Cut out the required number of question and answer cards and shuffle them.

Pairs

Place all cards face down on the table.

In turns, turn over two cards and see if they match, e.g. a number bond (**1 + 4**) and its answer (**5**).

If they match, keep the pair. If they don't, turn them back over.

Try to remember where different cards are, so that you can match up pairs when it's your turn.

The winner is the person with the most pairs once all of the cards have been matched.

This can also be played as a one player game; in this case the player tries to match all cards as quickly as possible.

Snap

Shuffle the question and answer cards and deal them into two piles, face down.

Both players turn their top card over at the same time.

If the cards match, shout 'Snap!' The first person to shout 'Snap!' takes all of the upturned cards.

If they don't match, keep turning over cards, placing them on top of the upturned ones. If you run out of cards without getting a match, shuffle them and deal again.

The winner is the first person to get all of the cards, or the player with the most cards at the end of an agreed length of time.