Autumn
Scheme of learning
Year 2

#MathsEveryoneCan

White Rose Maths

The **White Rose Maths** schemes of learning

Teaching for mastery

Our research-based schemes of learning are designed to support a mastery approach to teaching and learning and are consistent with the aims and objectives of the National Curriculum.

Putting number first

Our schemes have number at their heart.
A significant amount of time is spent reinforcing number in order to build competency and ensure children can confidently access the rest of the curriculum.

Depth before breadth

Our easy-to-follow schemes support teachers to stay within the required key stage so that children acquire depth of knowledge in each topic. Opportunities to revisit previously learned skills are built into later blocks.

Working together

Children can progress through the schemes as a whole group, encouraging students of all abilities to support each other in their learning.

Fluency, reasoning and problem solving

Our schemes develop all three key areas of the National Curriculum, giving children the knowledge and skills they need to become confident mathematicians.

Concrete – Pictorial – Abstract (CPA)

Research shows that all children, when introduced to a new concept, should have the opportunity to build competency by following the CPA approach. This features throughout our schemes of learning.

Concrete

Children should have the opportunity to work with physical objects/concrete resources, in order to bring the maths to life and to build understanding of what they are doing.

Pictorial

Alongside concrete resources, children should work with pictorial representations, making links to the concrete.
Visualising a problem in this way can help children to reason and to solve problems.

Abstract

With the support of both the concrete and pictorial representations, children can develop their understanding of abstract methods.

$$5 + 7$$

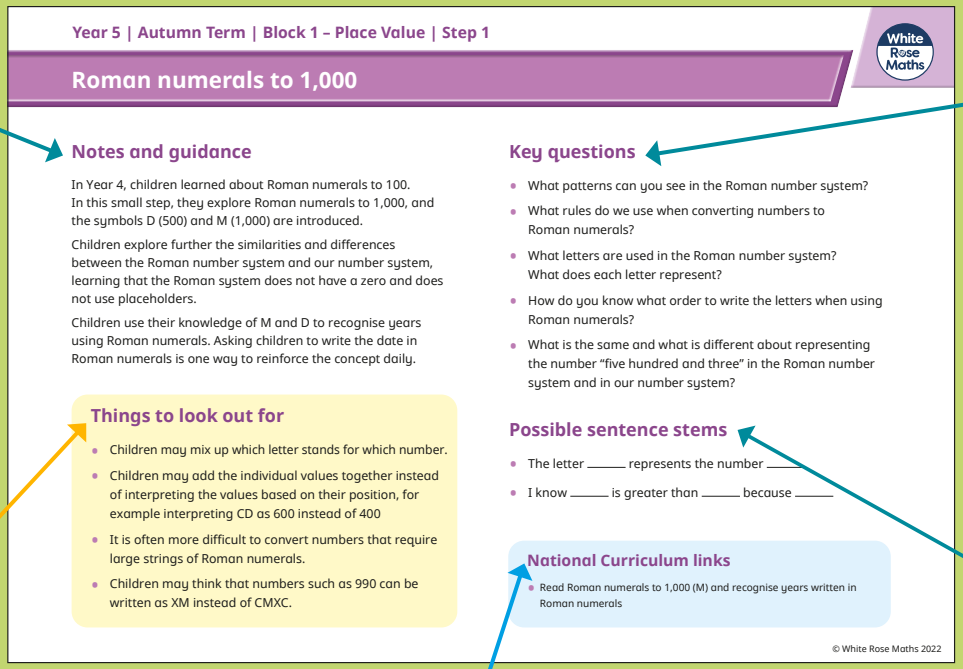
If you have questions about this approach and would like to consider appropriate CPD, please visit www.whiterosemaths.com to find a course that's right for you.

Teacher guidance

Every block in our schemes of learning is broken down into manageable small steps, and we provide comprehensive teacher guidance for each one. Here are the features included in each step.

Notes and guidance that provide an overview of the content of the step and ideas for teaching, along with advice on progression and where a topic fits within the curriculum.

Things to look out for, which highlights common mistakes, misconceptions and areas that may require additional support.



Year 5 | Autumn Term | Block 1 – Place Value | Step 1

Roman numerals to 1,000

Notes and guidance

In Year 4, children learned about Roman numerals to 100. In this small step, they explore Roman numerals to 1,000, and the symbols D (500) and M (1,000) are introduced.

Children explore further the similarities and differences between the Roman number system and our number system, learning that the Roman system does not have a zero and does not use placeholders.

Children use their knowledge of M and D to recognise years using Roman numerals. Asking children to write the date in Roman numerals is one way to reinforce the concept daily.

Things to look out for

- Children may mix up which letter stands for which number.
- Children may add the individual values together instead of interpreting the values based on their position, for example interpreting CD as 600 instead of 400
- It is often more difficult to convert numbers that require large strings of Roman numerals.
- Children may think that numbers such as 990 can be written as XM instead of CMXC.

Key questions

- What patterns can you see in the Roman number system?
- What rules do we use when converting numbers to Roman numerals?
- What letters are used in the Roman number system? What does each letter represent?
- How do you know what order to write the letters when using Roman numerals?
- What is the same and what is different about representing the number "five hundred and three" in the Roman number system and in our number system?

Possible sentence stems

- The letter _____ represents the number _____
- I know _____ is greater than _____ because _____

National Curriculum links

- Read Roman numerals to 1,000 (M) and recognise years written in Roman numerals

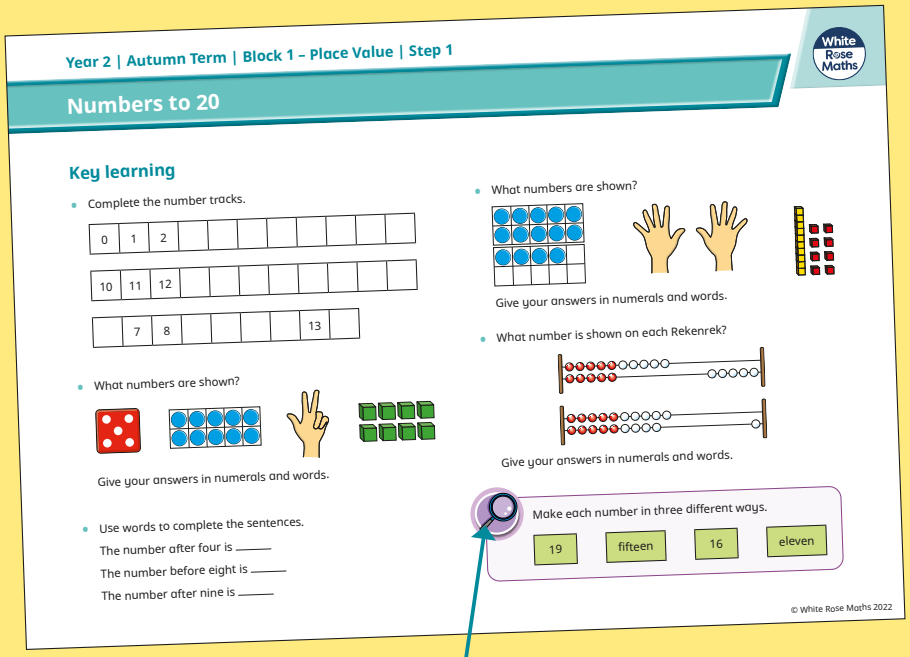
National Curriculum links to indicate the objective(s) being addressed by the step.

Key questions that can be posed to children to develop their mathematical vocabulary and reasoning skills, digging deeper into the content.

Possible sentence stems to further support children's mathematical language and to develop their reasoning skills.

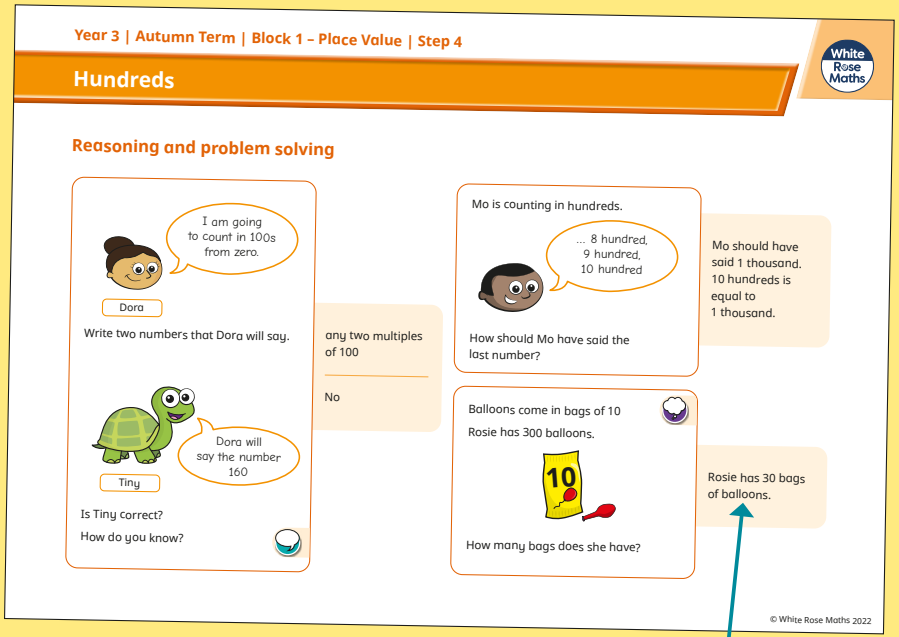
Teacher guidance

A **Key learning** section, which provides plenty of exemplar questions that can be used when teaching the topic.



Activity symbols that indicate an idea can be explored practically

Reasoning and problem-solving activities and questions that can be used in class to provide further challenge and to encourage deeper understanding of each topic.



Answers provided where appropriate

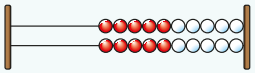
Activities and symbols

Key Stage 1 activities

Key Stage 1 includes more hands-on activities alongside questions.

An activity to be led by the teacher

Use a Rekenrek in the ready position.



Ask children to show a number on their Rekenrek.

An outside activity or one that uses resources from nature

Find some seeds and leaves to represent Autumn.

Ask children to sort the objects in three different ways and then compare their answers with a partner.

An activity introduced by a reading from an appropriate fiction or non-fiction book

Read *The Button Box* by M Reid.

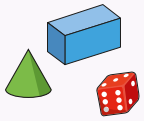
Give children a selection of buttons and ask them to sort the buttons in as many different ways as they can.

Encourage them to think about size, shape, colour and number of holes.

An investigation

Give children a selection of 3D shapes.

Ask children to sort the objects into two groups and then challenge a partner to say how the objects have been sorted.



Key Stage 1 and 2 symbols

The following symbols are used to indicate:

concrete resources might be useful to help answer the question

a bar model might be useful to help answer the question

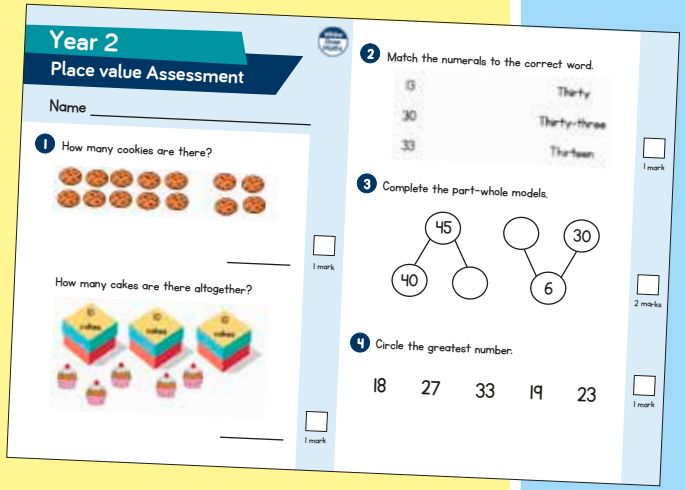
drawing a picture might help children to answer the question

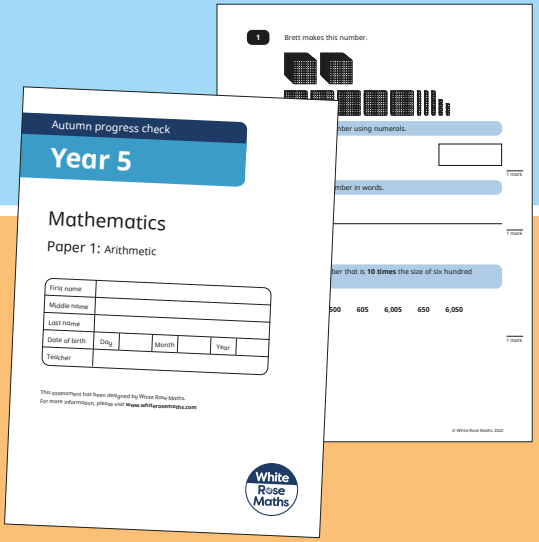
children talk about and compare their answers and reasoning

a question that should really make children think. The question may be structured differently or require a different approach from others and/or tease out common misconceptions.

Free supporting materials

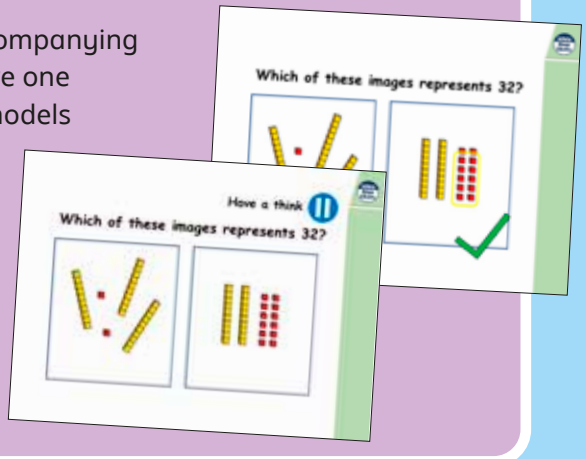
End-of-block assessments to check progress and identify gaps in knowledge and understanding.



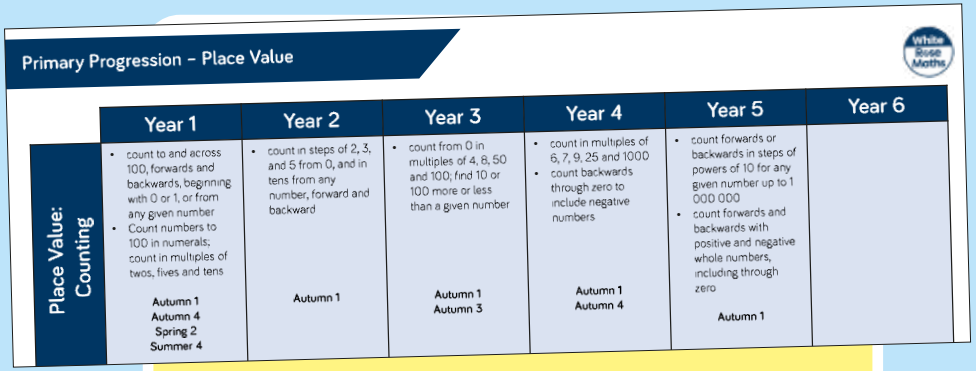


End-of-term assessments for a more summative view of where children are succeeding and where they may need more support.

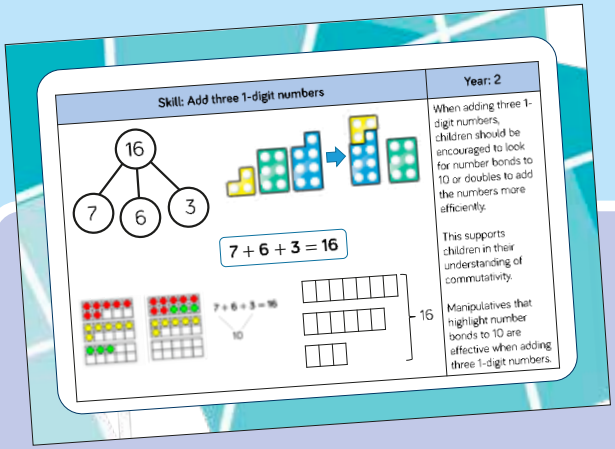
Each small step has an accompanying **home learning video** where one of our team of specialists models the learning in the step. These can also be used to support students who are absent or who need to catch up content from earlier blocks or years.



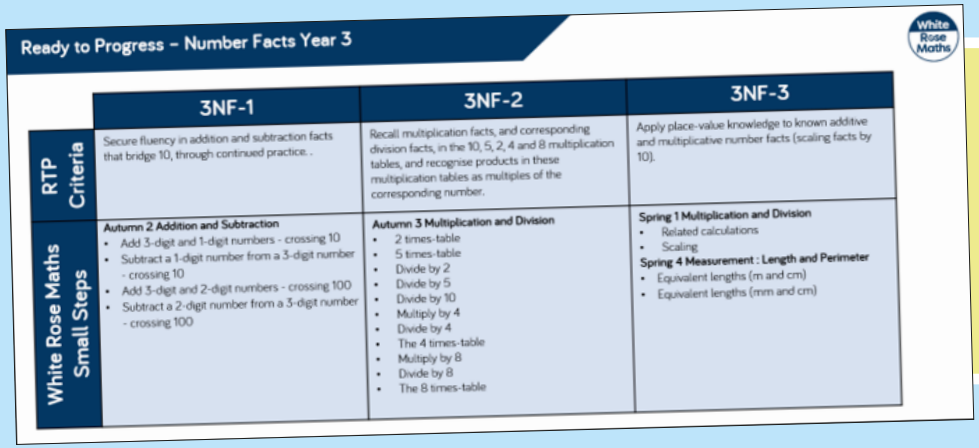
Free supporting materials



National Curriculum progression to indicate how the schemes of learning fit into the wider picture and how learning progresses within and between year groups.



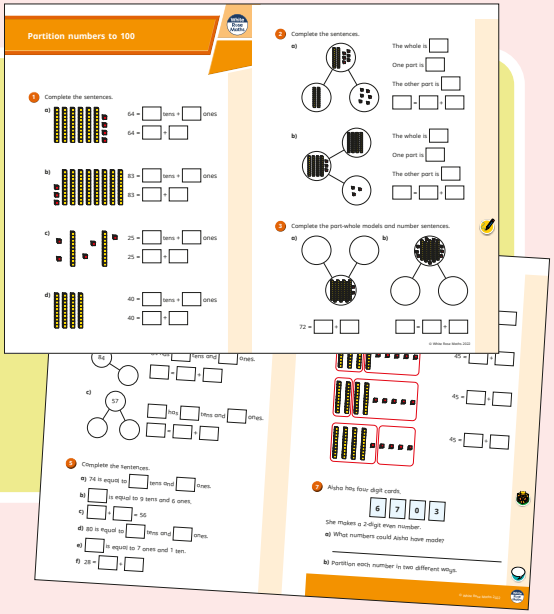
Calculation policies that show how key approaches develop from Year 1 to Year 6.



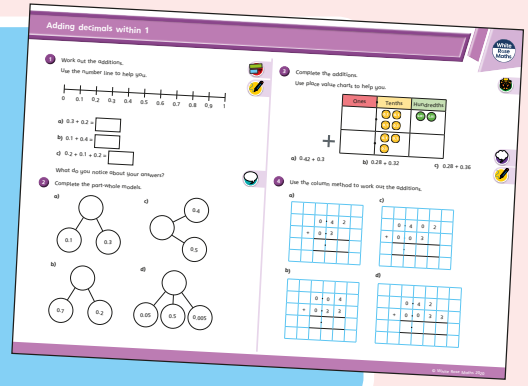
Ready to progress mapping that shows how the schemes of learning link to curriculum prioritisation.

Premium supporting materials

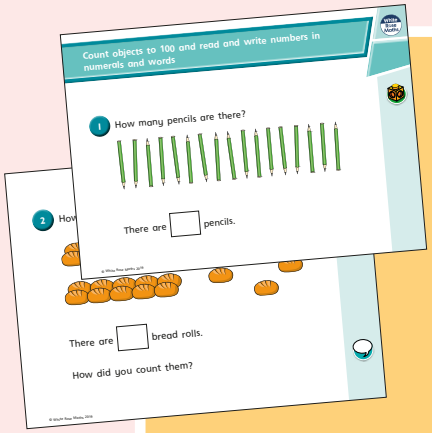
Worksheets to accompany every small step, providing relevant practice questions for each topic that will reinforce learning at every stage.



Display versions of the worksheet questions for front of class/whole class teaching.

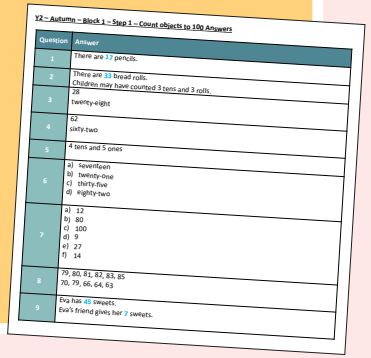


Also available as printed **workbooks**, per block.



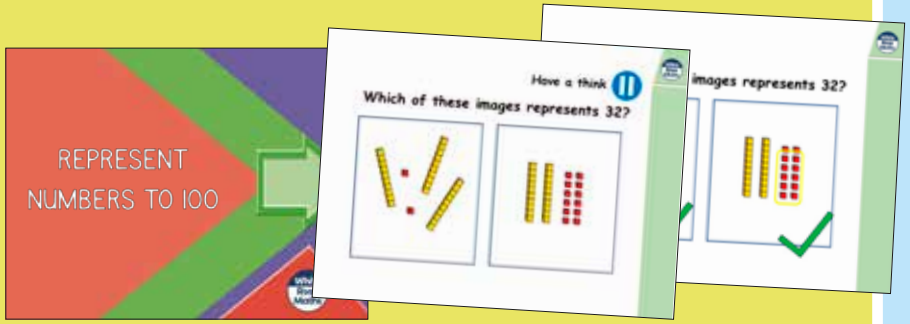
PowerPoint™ versions of the worksheet questions to incorporate them into lesson planning.

Answers to all the worksheet questions.

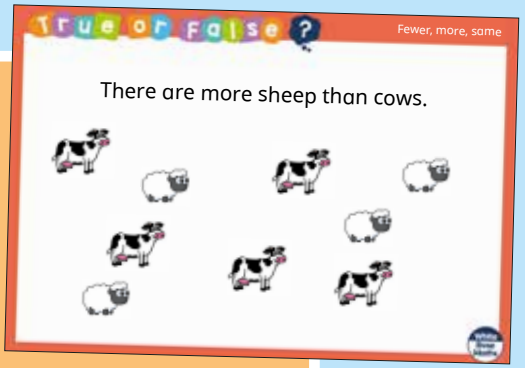


Premium supporting materials

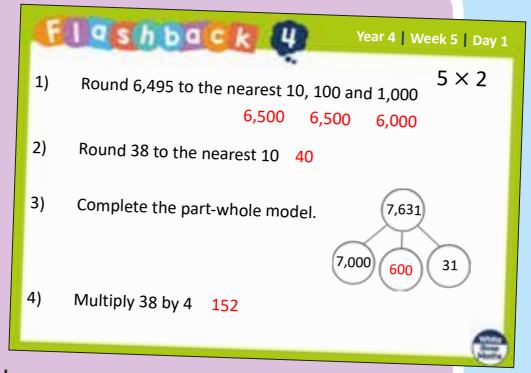
Teaching slides that mirror the content of our home learning videos for each step. These are fully animated and editable, so can be adapted to the needs of any class.

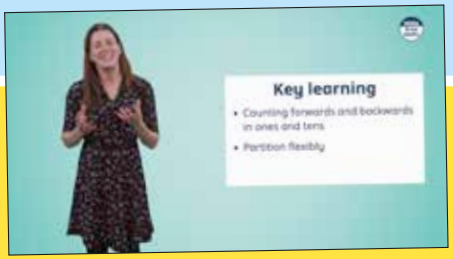


A **true or false** question for every small step in the scheme of learning. These can be used to support new learning or as another tool for revisiting knowledge at a later date.



Flashback 4 starter activities to improve retention.
Q1 is from the last lesson;
Q2 is from last week;
Q3 is from 2 to 3 weeks ago;
Q4 is from last term/year.
There is also a bonus question on each one to recap topics such as telling the time, times-tables and Roman numerals.





Topic-based CPD videos
As part of our on-demand CPD package, our maths specialists provide helpful hints and guidance on teaching topics for every block in our schemes of learning.

Meet the characters

Our class of characters bring the schemes to life, and will be sure to engage learners of all ages and abilities. Follow the children and their class pet, Tiny the tortoise, as they explore new mathematical concepts and ideas.

Yearly overview

The yearly overview provides suggested timings for each block of learning, which can be adapted to suit different term dates or other requirements.

	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	Number **Place value**				Number **Addition and subtraction**					Geometry **Shape**		
Spring	Measurement **Money**				Number **Multiplication and division**					Measurement **Length and height**		Measurement **Mass, capacity and temperature**
Summer	Number **Fractions**				Measurement **Time**			**Statistics**		Geometry **Position and direction**		**Consolidation**

Autumn Block 1

Place value

Small steps

Step 1	Numbers to 20
Step 2	Count objects to 100 by making 10s
Step 3	Recognise tens and ones
Step 4	Use a place value chart
Step 5	Partition numbers to 100
Step 6	Write numbers to 100 in words
Step 7	Flexibly partition numbers to 100
Step 8	Write numbers to 100 in expanded form

Small steps

Step 9	10s on the number line to 100
Step 10	10s and 1s on the number line to 100
Step 11	Estimate numbers on a number line
Step 12	Compare objects
Step 13	Compare numbers
Step 14	Order objects and numbers
Step 15	Count in 2s, 5s and 10s
Step 16	Count in 3s

Numbers to 20

Notes and guidance

In this small step, children revisit learning from Year 1 on numbers to 20. While children have already gone beyond this, the numbers from 11 to 15 often prove more difficult to understand, so this step provides an opportunity to revisit these numbers explicitly before moving on to look at numbers to 100 later in the block. If further consolidation is needed of numbers to 20, content from the previous year could be used.

In Year 1, children mainly focused on being able to recognise numerals written as words. In this small step, they shift their focus to independently writing numerals as words and vice versa, which will be built upon later in the block.

Things to look out for

- Numbers such as 11, 12, 13 and 15 can often be sticking points for children as the word does not make specific reference to the number of ones as it does later in the number system.
- Children may write, for example, 12 as "ten-two" in words rather than "twelve".
- Children may mix up the tens and ones digits when writing 2-digit numbers.

Key questions

- How many _____ are there?
- How did you count them?
- What number comes before/after _____?
- How do you write _____ in words?
- How do you write _____ in numerals?
- What number is made up of 1 ten and _____ ones?

Possible sentence stems

- There is 1 ten and _____ ones. The number is _____
- The number after _____ is _____
- The number before _____ is _____
- _____ in words is _____
- _____ in numerals is _____

National Curriculum links

- Read and write numbers from 1 to 20 in numerals and words (Y1)
- Read and write numbers to at least 100 in numerals and in words

Numbers to 20

Key learning

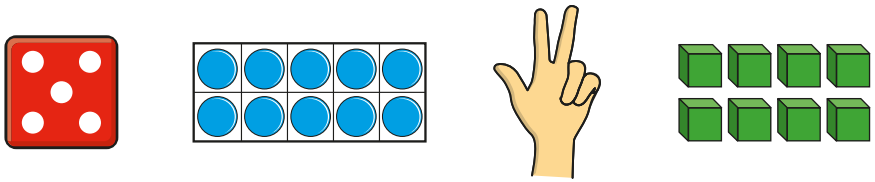
- Complete the number tracks.

0	1	2								

10	11	12								

	7	8					13	

- What numbers are shown?



Give your answers in numerals and words.

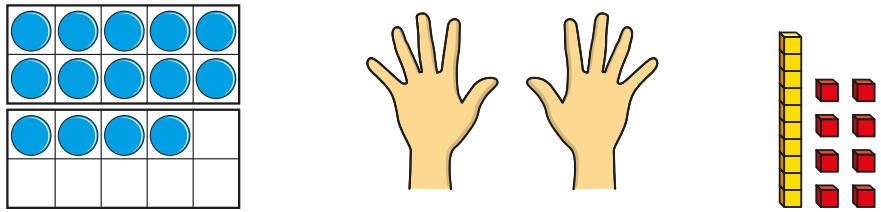
- Use words to complete the sentences.

The number after four is _____

The number before eight is _____

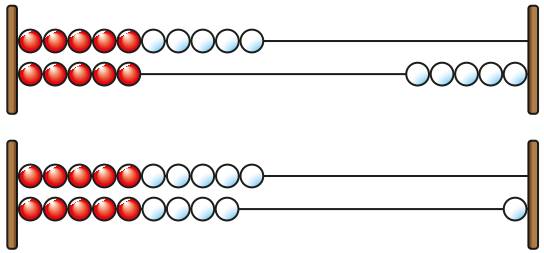
The number after nine is _____

- What numbers are shown?



Give your answers in numerals and words.

- What number is shown on each Rekenrek?



Give your answers in numerals and words.

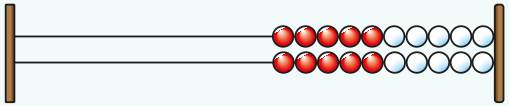
Make each number in three different ways.

19	fifteen	16	eleven

Numbers to 20

Reasoning and problem solving

Use a Rekenrek in the ready position.



Ask children to show a number on their Rekenrek.

Can they write the number in numerals?

Can they write the number in words?

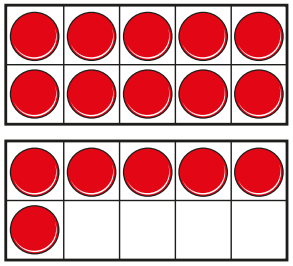
Can they say the number out loud?

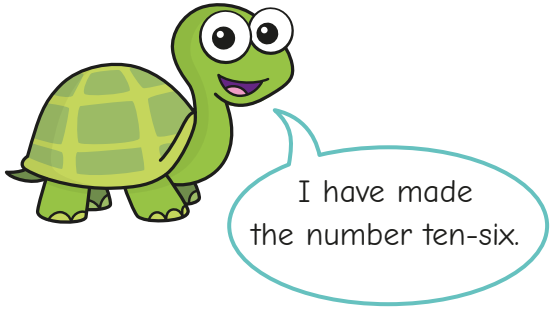
Get children to work with a partner to make numbers and write them in both numerals and words.

Encourage them to talk about how they have made the number, for example to make 13, they need to push 1 whole ten and then 3 more.

Answers will vary, depending on the number chosen.

Tiny uses counters and ten frames to make a number.





Do you agree with Tiny?

Talk about it with a partner.

No

Tiny has made sixteen.

Count objects to 100 by making 10s

Notes and guidance

Building on the previous small step, children revisit their earlier learning on numbers to 100

Children count objects to 100 by making tens. They see examples of objects that are grouped into tens and some that are not grouped, so they recognise the benefits of making groups of 10 to count. The use of straws can support this learning as children can physically bundle them into tens to support their counting. This then helps children to understand the structure of a number, for example 27 can be made up of 2 bundles of 10 straws and 7 more straws. In all the representations in this small step, the structure of the 10 is clearly visible. At this point, children do not need to be able to write these numbers in words, as this will be covered later in the block.

Things to look out for

- Children may try to count only in ones rather than making bundles of 10, which is less efficient and is more likely to result in basic counting errors.
- Children may find it harder to make numbers that have been said out loud, for example being told "thirty-five" rather than seeing "35" written.

Key questions

- How many _____ are there?
- How did you count them?
- How many _____ are in each group/bundle?
- How many extra are there?
- How many _____ are there in total?
- How do you write _____ in numerals?
- What number is made up of _____ tens and _____ ones?

Possible sentence stems

- There are _____ groups of 10 and _____ more.

  The number is _____

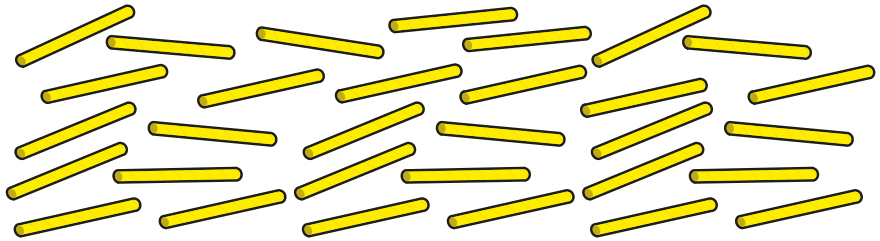
National Curriculum links

- Read and write numbers to at least 100 in numerals and in words
- Identify, represent and estimate numbers using different representations, including the number line
- Count in steps of 2, 3 and 5 from 0, and in 10s from any number, forward and backward

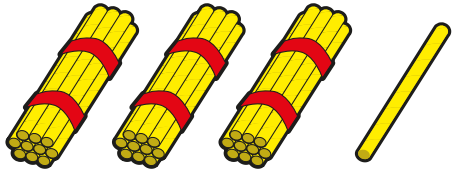
Count objects to 100 by making 10s

Key learning

- How many straws are there?

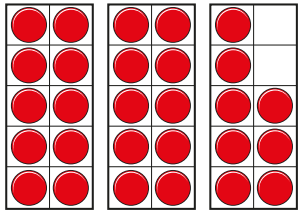


How many straws are there?



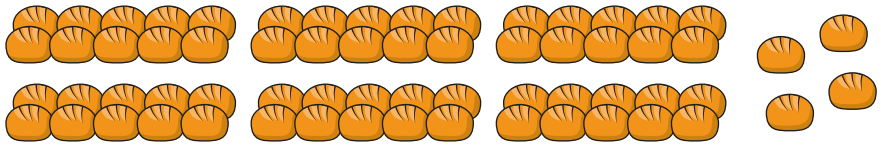
Which were easier to count?

- How many counters are there?



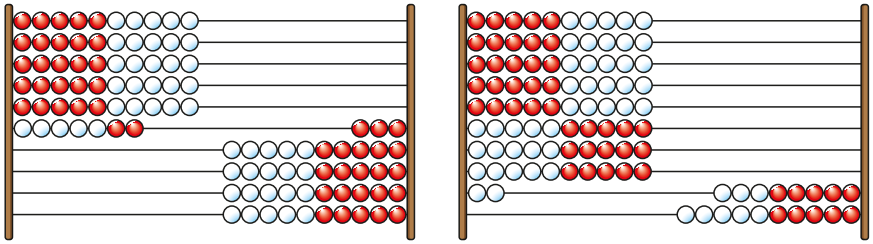
How do you know?

- How many bread rolls are there?



How do you know?

- What number is shown on each Rekenrek?



How do you know?

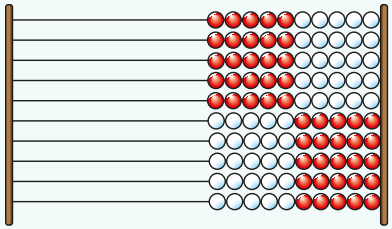
Make each number in three different ways.

35	41	22	50

Count objects to 100 by making 10s

Reasoning and problem solving

Use a Rekenrek in the ready position.



Ask children to show a number on their Rekenrek.

Can they write the number in numerals?

Can they say the number out loud?

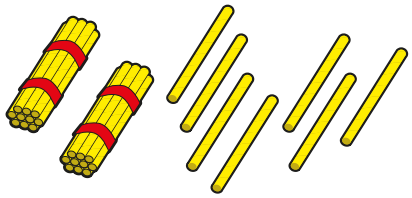
How did they make the number?

Get children to work with a partner to make numbers.

Encourage them to talk about how they have made the number, for example to make 43, they need to push 4 whole tens and then 3 more.

Answers will vary, depending on the number chosen.

Here are 27 straws.

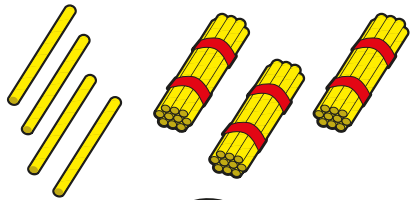


What does the 2 in 27 show?

What does the 7 in 27 show?

the number of tens

the number of ones



What mistake has Tiny made?

Tiny has mixed up the tens and the ones.

Recognise tens and ones

Notes and guidance

In this small step, children start to unitise the idea of a ten. In all the examples seen previously in the block, the structure of the ten within a number has been clearly visible. In this step, children transition to recognising when something is labelled as "ten" and understand its value relative to the corresponding one. This transition is gradual, as children first compare familiar representations such as ten frames and base 10 to see how the counters in ten frames can be separated but a base 10 rod cannot. They then move on to look at boxes of ten things, starting with examples labelled as "10", with the individual objects visible, before moving to more abstract examples. Examples are carefully chosen so that physical size can support number sense and it is not necessary to introduce place value counters.

Things to look out for

- Children may just count the total number of objects rather than consider the value of things.
- Some children may revert to counting in ones rather than using their earlier learning of making tens.
- Children may write the digits of a number in the incorrect order, particularly if the representations are not shown in value order.

Key questions

- How many _____ are there?
- How did you count them?
- What does each piece represent?
- Where can you see the ten?
- Do you need to count each one individually?
- How many _____ are there in each box/pack?

Possible sentence stems

- There are _____ groups of 10 and _____ more.

  There are _____ in total.
- There are _____ tens and _____ ones.

  The number is _____

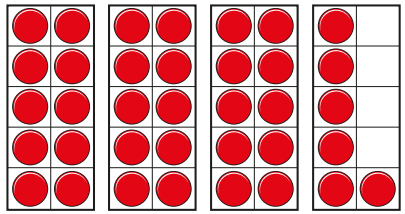
National Curriculum links

- Read and write numbers to at least 100 in numerals and in words
- Identify, represent and estimate numbers using different representations, including the number line

Recognise tens and ones

Key learning

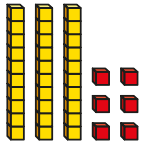
- What number is shown?



There are _____ tens and _____ ones.

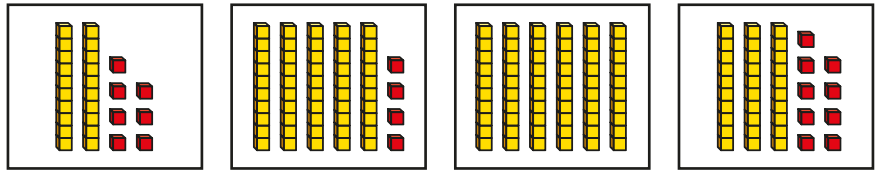
The number is _____

What number is shown?

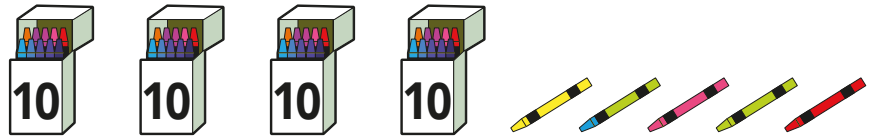


What is the same? What is different?

- What numbers are shown?



- How many crayons are there?



How did you count them?

- How many sweets are there?

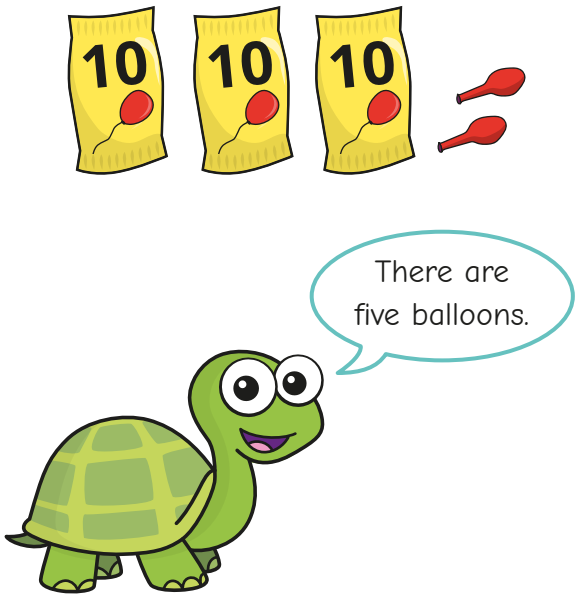
How did you count them?

- How many marbles are there?

How did you count them?

Recognise tens and ones

Reasoning and problem solving



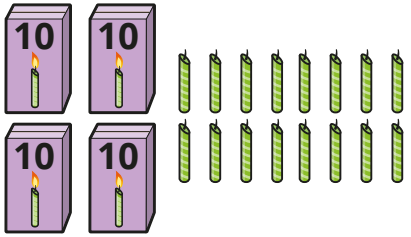
Do you agree with Tiny?

Talk about it with a partner.

No

Tiny has counted each bag as one balloon.

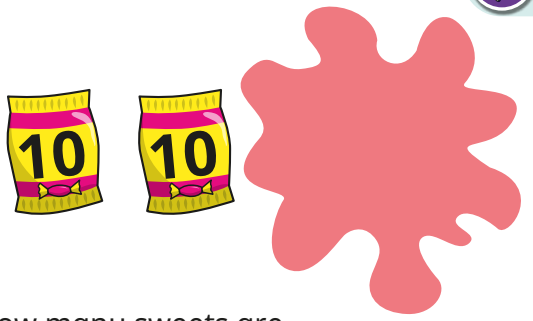
How many candles are there?



How did you count them?

56

There are 32 sweets in total.



How many sweets are covered up?

Will all the sweets be in a bag?

12 sweets

No. There will either be 1 bag of 10 sweets and 2 individual sweets or 12 individual sweets.

Use a place value chart

Notes and guidance

So far, children have looked in detail at numbers to 100, with an explicit focus on making tens. They now build on this to organise their representations in a place value chart, placing pieces of equipment under the correct place value headings.

Once children are comfortable with organising equipment into place value charts and understand the column headings, they begin to write numbers into place value charts with digits in the correct place and they will build on this throughout the block. Children will learn to recognise that they can only write the digits 0–9 in any single place value column, because if there were any more than this they would be able to make a ten.

There is no need at this stage to introduce children to place value counters.

Things to look out for

- Children may not understand when the place value headings are presented differently, for example using "T" and "O" rather than "Tens" and "Ones".
- Children may write the whole number in a single column, rather than considering the structure of the number.
- Children may write 20 in the tens column for two tens rather than just a 2

Key questions

- What number is represented?
- How many tens/ones are there?
- How does the place value chart show the number?
- What do you do if there are no ones?
- What does the digit _____ represent?
- Which column do you write _____ in?
- Why can you not write a digit greater than 9 in a place value column?

Possible sentence stems

- There are _____ tens and _____ ones.
  The number is _____
- _____ is made up of _____ tens and _____ ones.

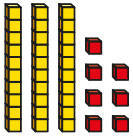
National Curriculum links

- Identify, represent and estimate numbers using different representations, including the number line
- Recognise the place value of each digit in a 2-digit number (tens, ones)

Use a place value chart

Key learning

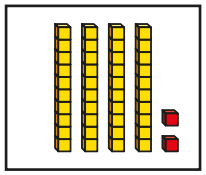
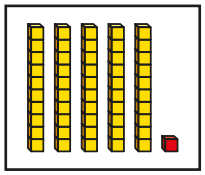
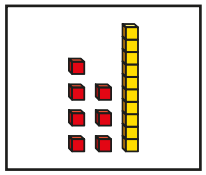
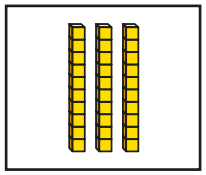
- What number is shown?



Draw the base 10 in the place value chart.

Tens	Ones

- Sam has made some numbers using base 10

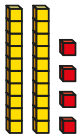





Draw the base 10 in a place value chart to show each number.

Tens	Ones

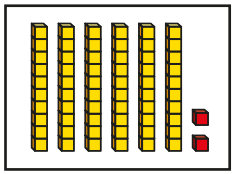
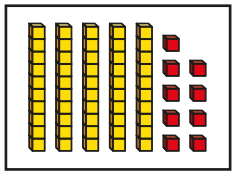
How did you know where to draw each piece?

- How does the place value chart match the base 10?



Tens	Ones
2	4

- Write digits in a place value chart to show each number.

Tens	Ones

- Complete the sentences to describe the number.

T	O
7	2

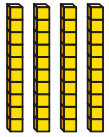
There are _____ tens and _____ ones.

The number is _____

Use a place value chart

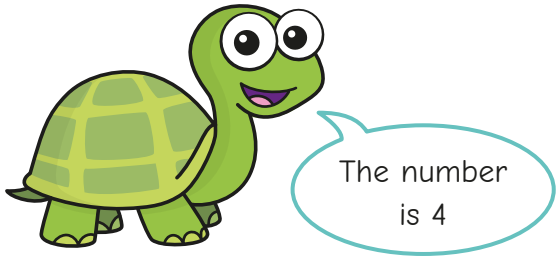
Reasoning and problem solving

Tiny uses base 10 to make a number.



Tiny writes the number in a place value chart.

Tens	Ones
	4



Explain the mistake that Tiny has made.

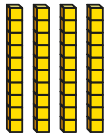
Tiny has written the 4 in the wrong column. There are 4 tens, not 4 ones.

There needs to be a zero as a placeholder in the ones column.

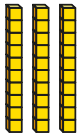
The number is 40

Ron and Max have each made a number in a place value chart.

Ron

Tens	Ones
	

Max

Tens	Ones
	

Is the statement true or false?

> Ron and Max have made the same number.

Talk about it with a partner.

True

They have both made 45

Partition numbers to 100

Notes and guidance

In this small step, children use their understanding from earlier in the block and begin to partition numbers to 100. The focus here is on standard partitioning; flexible partitioning will be looked at later in the block.

Counting objects to 100 with a focus on bundling tens, organising representations into place value charts and writing digits in place value charts are all essential prerequisite knowledge for this small step. Children understand that if, for example, 32 is made up of "3 whole tens" and "2 ones", then the 3 represents 30 and the 2 represents 2. Therefore, 32 can be partitioned into 3 tens and 2 ones or 30 and 2

Partitioning with representations should be looked at first, followed by abstract numbers. At this point, all partitioning will be recorded in part-whole models rather than as an addition statement.

Things to look out for

- Children may partition a number into its digits rather than considering the value of each digit, for example stating that 32 is made up of 3 and 2
- When the parts of a part-whole model are "the wrong way round", children may interpret the whole incorrectly.

Key questions

- How many tens are there?
- How many ones are there?
- What is the number?
- What is the whole?
- What are the parts?
- Does it matter which way round you draw the parts?

Possible sentence stems

- There are _____ tens and _____ ones.
- The number is _____
- _____ is a part and _____ is a part.
  The whole is _____

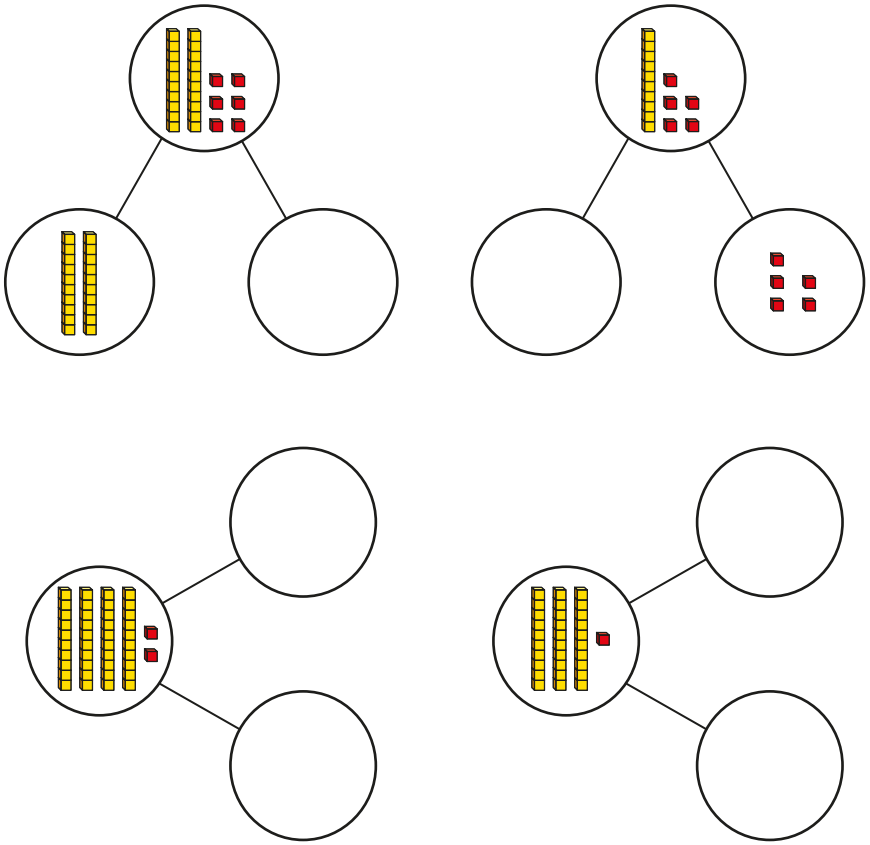
National Curriculum links

- Identify, represent and estimate numbers using different representations, including the number line
- Recognise the place value of each digit in a 2-digit number (tens, ones)

Partition numbers to 100

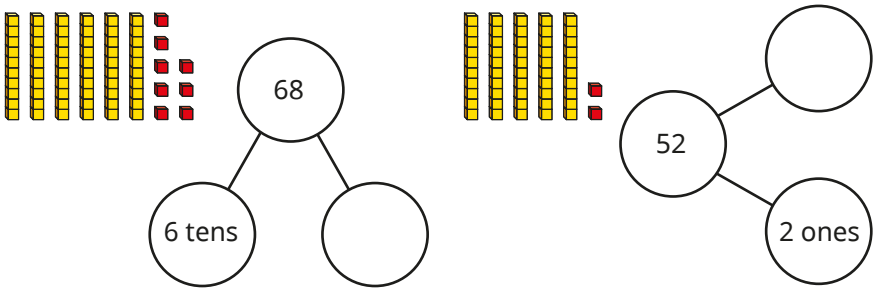
Key learning

- Draw base 10 to complete the part-whole models.

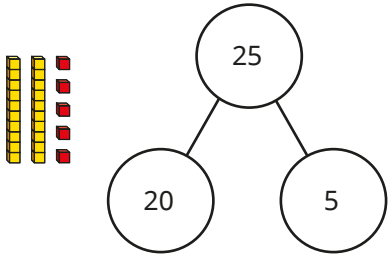


How many tens and ones are there in each number?

- Complete the part-whole models to match the base 10



- How does the part-whole model match the base 10?



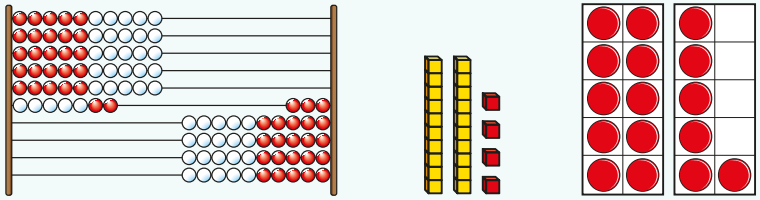
- Use a part-whole model to partition each number into tens and ones.

42	63	78	95	18

Partition numbers to 100

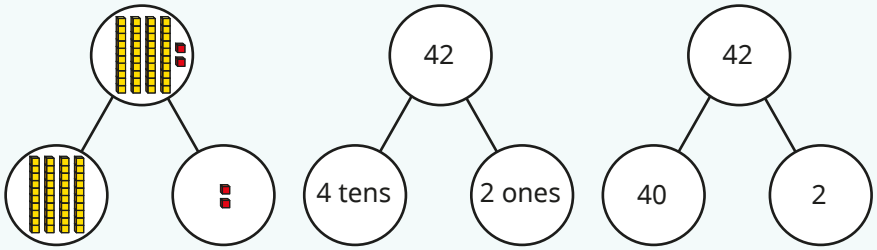
Reasoning and problem solving

Ask children to use some equipment from this block to make numbers to 100

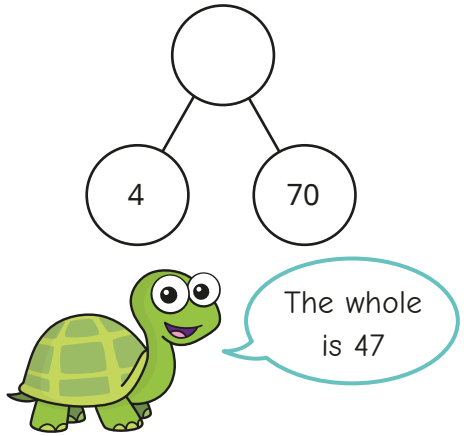


Ask children to partition their number into tens and ones using a part-whole model.

They should be able to complete the part-whole model in different ways. For example, here are some ways they could partition 42



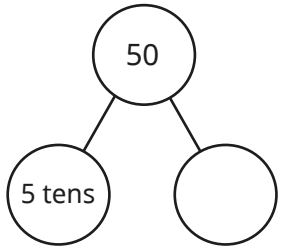
Answers will vary, depending on the numbers chosen.



What mistake has Tiny made?

Tiny has not noticed the order of the parts.

The whole is 74



What is the missing part?

How do you know?

0 ones

Write numbers to 100 in words

Notes and guidance

Earlier in the block, children wrote numbers to 20 in words. Since then, they have focused on numbers to 100, and while they may have seen numbers presented in words, they have not been expected to write them in words. In this small step, they do this for the first time.

The focus is first on the tens within 100 and understanding that, for example, 4 tens are forty. It is essential that children grasp this first, as this will form the basis for all other numbers. Once children have this understanding, they begin to write numbers with both tens and ones in words.

When working beyond 20, our number system follows a more logical pattern and children should be encouraged to spot this to support them in writing. If they know that 4 tens are forty, and that 3 ones are three, then using previous learning on partitioning they can write 43 as forty-three.

Things to look out for

- Children may write each individual digit as a word rather than considering its place value. For example, they may write 27 as "two-seven" rather than "twenty-seven".
- If children are not secure with partitioning from the earlier step, they may struggle when writing numbers in words.

Key questions

- How many tens are there?
- How do you write that in words?
- How many ones are there?
- How do you write that in words?
- How do you write _____ in words?
- How do you write _____ in numerals?

Possible sentence stems

- _____ tens in words is _____ and _____ ones in words is _____
- There are _____ tens. In words, this is _____
  There are _____ ones. In words, this is _____
  _____ in words is _____

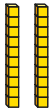
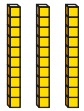
National Curriculum links

- Read and write numbers to at least 100 in numerals and in words
- Recognise the place value of each digit in a 2-digit number (tens, ones)

Write numbers to 100 in words

Key learning

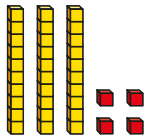
- Complete the table.

Base 10	Numerals	Words
		ten
	20	
		

What would come next?

Continue the pattern to 100

- Complete the sentences to describe the number.



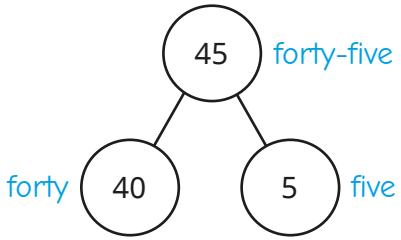
There are _____ tens. In words, this is _____

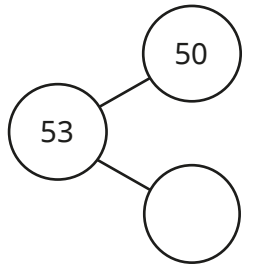
There are _____ ones. In words, this is _____

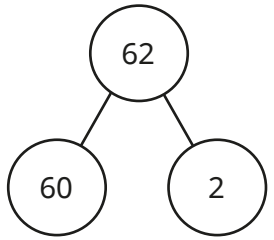
34 in words is _____

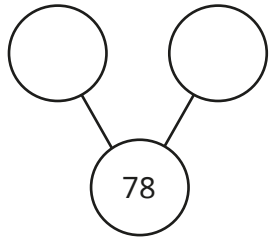
- Complete the part-whole models and write the numbers in words.

The first one has been done for you.









- Write each number in words.

52	38	26	81	77

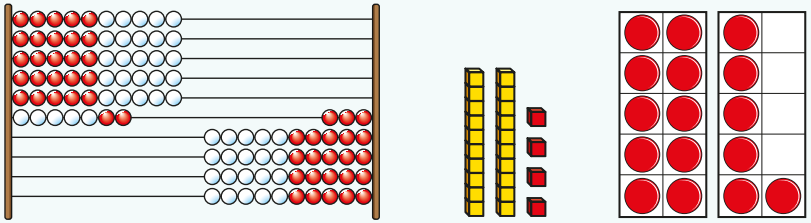
- Write each number in numerals.

fifty-one	eighty-nine	seventy-three
sixty	ninety-four	

Write numbers to 100 in words

Reasoning and problem solving

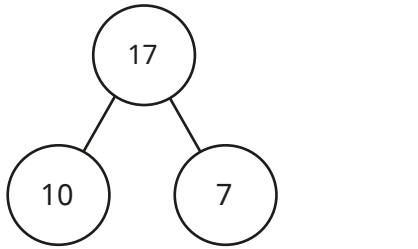
Consolidate learning from this block by making numbers in a variety of different ways.



Ask children to partition their numbers and then use the partitions to help them write the numbers in words.

Encourage children to work through a series of consecutive numbers, for example 72, 73, 74, and discuss with a partner any patterns that they notice.

Answers will vary, depending on the numbers chosen.



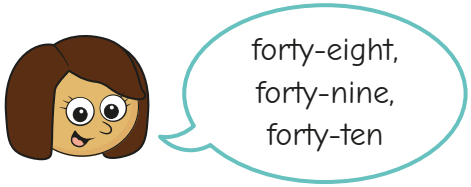
Do you agree with Mo?

Talk about it with a partner.

No

It is seventeen.

Kim is counting.



Explain the mistake that Kim has made.

Fifty comes after forty-nine, because she has reached the next ten.

Flexibly partition numbers to 100

Notes and guidance

So far, children have only partitioned numbers in a standard way. In this small step, they are introduced to the idea of flexible partitioning.

The use of straws or other familiar representations can support children with this. If children know that 27 is made up of 2 bundles of 10 straws and 7 more straws, then by physically unbundling 1 group of 10 straws they see that 27 could also be made up of 1 bundle of 10 straws and 17 more straws.

While there are numerous ways to partition numbers flexibly, the focus here is on "unbundling" 10s rather than more unusual partitions. This knowledge will prove essential later in the year when looking at calculations that cross a ten boundary and is also fundamental to later learning in higher key stages.

Things to look out for

- Children may think you are not "allowed" to have more than 9 individual objects, such as 1 bundle of 10 straws and 17 more straws.
- If children partition a number flexibly into, for example, 2 tens and 15 ones for 35, they may also think that 35 can be written as 215

Key questions

- How many tens are there?
- How many ones are there?
- How many straws are there in each bundle?
- If you unbundle one lot of 10, how many tens are there now? How many ones?
- How many ones are there in each ten?
- How else can you partition the number?

Possible sentence stems

- There are _____ tens and _____ ones.
  The number is _____
- _____ can be partitioned into _____ and _____

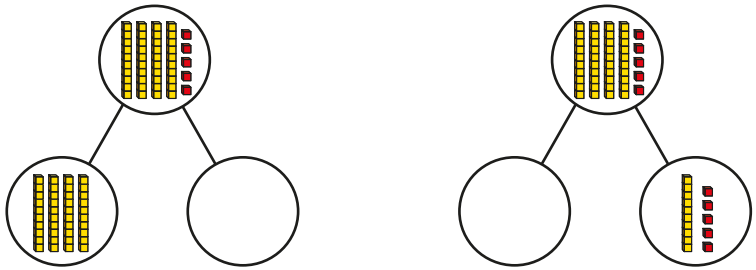
National Curriculum links

- Identify, represent and estimate numbers using different representations, including the number line
- Recognise the place value of each digit in a 2-digit number (tens, ones)

Flexibly partition numbers to 100

Key learning

- Draw base 10 to complete the part-whole models.



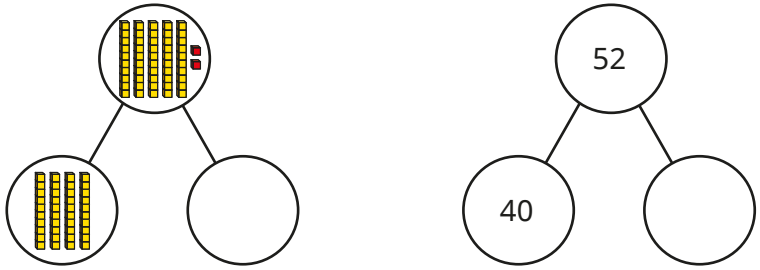
What is the same about the part-whole models?
What is different?

Complete the sentences to describe 45

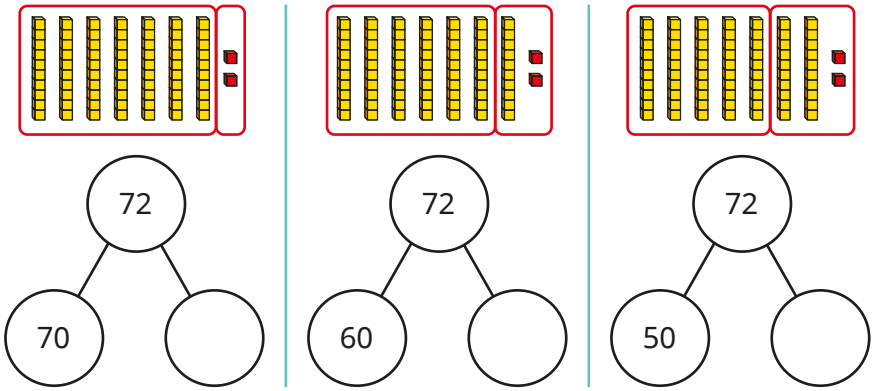
- 45 can be partitioned into 40 and _____
- 45 can also be partitioned into _____ and 15

Can you partition 45 in any other ways?

- Complete the part-whole models.



- Complete the part-whole models to match the base 10



- Use base 10 to help you complete the sentences.
  - 53 can be partitioned into 50 and _____
  - 53 can be partitioned into 40 and _____
  - 82 can be partitioned into 70 and _____
  - 38 can be partitioned into 18 and _____
  - 74 can be partitioned into _____ and 40

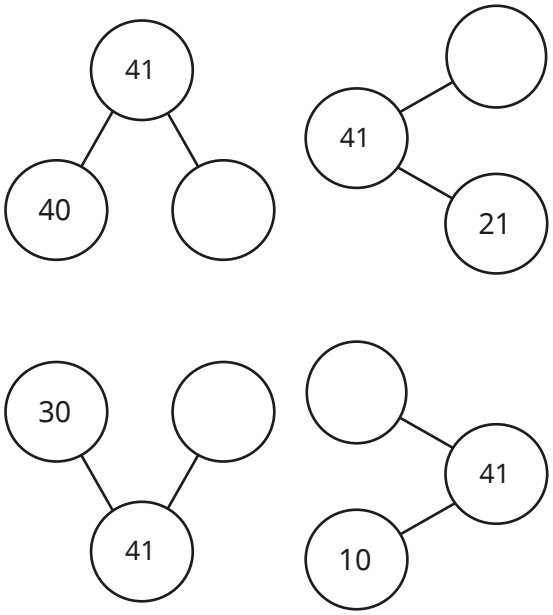
- Partition each number in three different ways.

35	forty-nine	sixty-three	82

Flexibly partition numbers to 100

Reasoning and problem solving

Complete the part-whole models to partition 41 in four different ways.

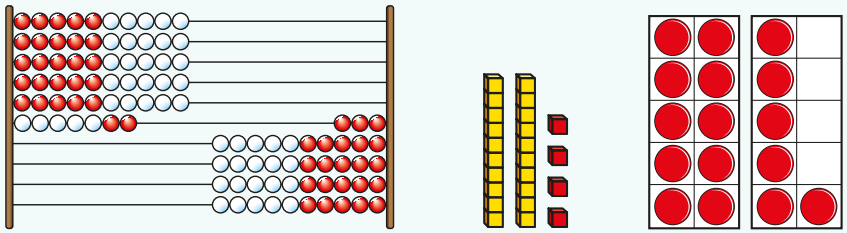


What patterns can you see?

1, 20

11, 31

Ask children to use different representations from this block to make a number.



Ask them to partition their number in a part-whole model.

Can they partition it in another way?

Get children to work in pairs to partition numbers in different ways and describe any patterns that they notice.

Children could explore what happens when they move ones rather than just moving tens, although this is not essential.

Answers will vary, depending on the numbers chosen.

Write numbers to 100 in expanded form

Notes and guidance

By this stage, children should be confident in partitioning numbers to 100 in a standard way, and also understand that numbers can be partitioned more flexibly. The purpose of this small step is to formalise this partitioning to further support children's understanding of the structure of numbers.

From earlier steps, children can explain that 32 is made up of 3 tens and 2 ones, or 30 and 2. The difference between that learning and the learning in this step is the way it is presented. By the end of this small step, children should be able to write this as 32 = 30 + 2 and say "32 is equal to 30 plus 2".

Children were introduced to the + and = symbols in Year 1, but may need reminding of them.

Things to look out for

- Incorrect mathematical language can hinder understanding. For example, if children refer to the = symbol as "makes", then "32 makes 30 plus 2" makes less sense than "32 is equal to 30 plus 2".
- Children may only consider the digit in a place value column rather than its value, for example writing 45 = 4 + 5 rather than 40 + 5

Key questions

- How many tens are there in _____?
- How many ones are there in _____?
- How do you write that as a number sentence?
- What number is equal to _____ + _____?
- How does the part-whole model link to the number sentence?
- How can you write the other partitions as a number sentence?

Possible sentence stems

- There are _____ tens and _____ ones.
  The number is _____
- _____ is a part, _____ is a part and the whole is _____
- _____ is made up of _____ tens and _____ ones.
- _____ is equal to _____ plus _____

National Curriculum links

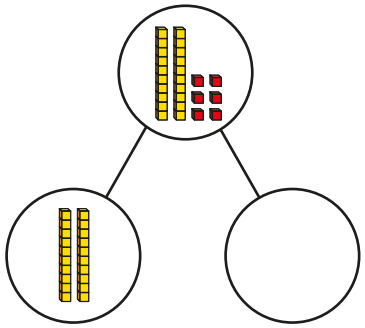
- Identify, represent and estimate numbers using different representations, including the number line
- Recognise the place value of each digit in a 2-digit number (tens, ones)

Write numbers to 100 in expanded form

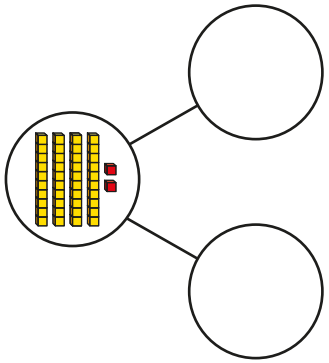
Key learning

- Draw base 10 to complete the part-whole models.

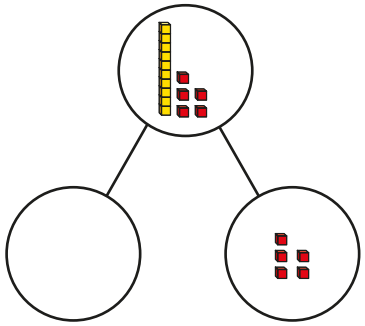
  Complete the number sentence to match each part-whole model.



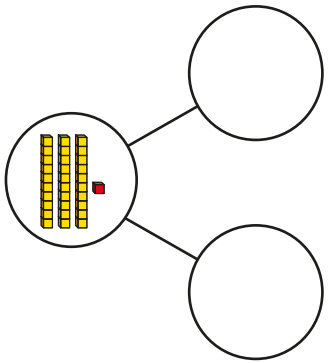
26 = 20 + _____



42 = _____ + _____



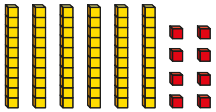
15 = _____ + 5



_____ + _____ = 31

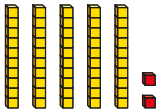
- Complete the number sentences to partition each number.

  You can use a part-whole model to help you.



68 = 6 tens + _____ ones

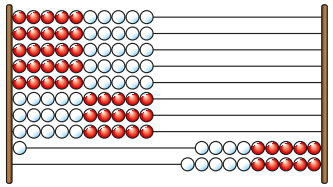
68 = 60 + _____

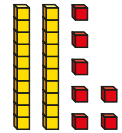


52 = _____ tens + _____ ones

52 = _____ + _____

- Complete the number sentences to describe each number.





_____ = _____ tens + _____ ones

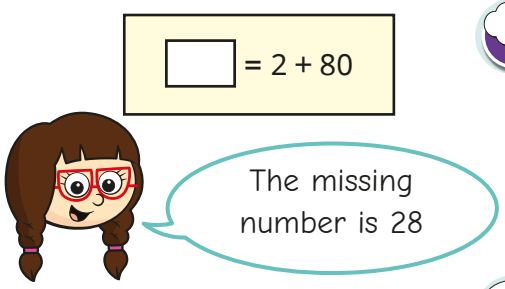
_____ = _____ + _____

- Complete the number sentences.

  - 42 = 40 + _____
  - _____ + 9 = 79
  - 30 + 6 = _____
  - 55 = _____ + 50

Write numbers to 100 in expanded form

Reasoning and problem solving

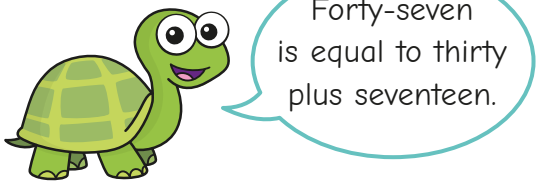


Explain the mistake that Jo has made.

What is the missing number?

Jo has mixed up the tens and ones.

82



Do you agree with Tiny?

Talk about it with a partner.

Yes

Complete the number sentences.

54 = 50 + _____

54 = 40 + _____

54 = _____ + 24

Continue the pattern.

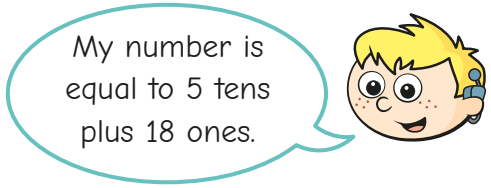
What do you notice?

4 14 30

54 = 20 + 34

54 = 10 + 44

Max is thinking of a number.



What is Max's number?

68

10s on the number line to 100

Notes and guidance

Children were introduced to the number line to 100 in Year 1, and in this small step and the next they look at it in more detail.

The focus of this small step is the position of 10s on the number line. Children should be exposed to examples with different start and end point values, as well as the standard 0 to 100 number line.

Children use their knowledge of counting in multiples of 10 to label number lines. Building on this, they identify and find the position of given numbers on the number line.

While it is not always necessary to label every division when identifying or finding the position of a number, it can promote good habits, so encourage children to do this step as a method of checking their answers.

Things to look out for

- Children may assume that all number lines start at 0 and end at 100, and therefore label the divisions on a short number line incorrectly.
- Children may think that the interval in the number line represents the number rather than the division at the end of the interval.

Key questions

- What is the value at the start point of the number line?
- What is the value at the end point of the number line?
- How many intervals are there?
- What is the number line counting up in? How do you know?
- Where would _____ be on the number line? How do you know?
- What number is the arrow pointing to? How do you know?

Possible sentence stems

- The start point is _____ and the end point is _____

  There are _____ intervals on the number line.

  Each interval is worth _____

  The number line is counting up in _____s.

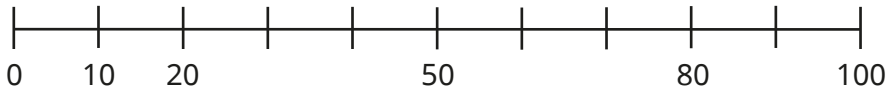
National Curriculum links

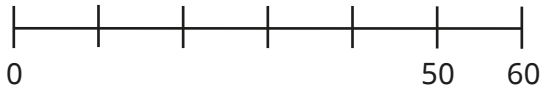
- Count in steps of 2, 3 and 5 from 0 and in 10s from any number, forward and backward
- Identify, represent and estimate numbers using different representations, including the number line

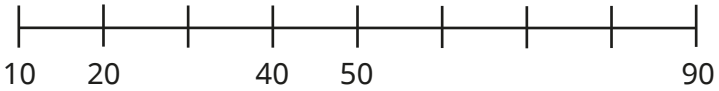
10s on the number line to 100

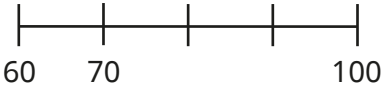
Key learning

- Complete the number lines.



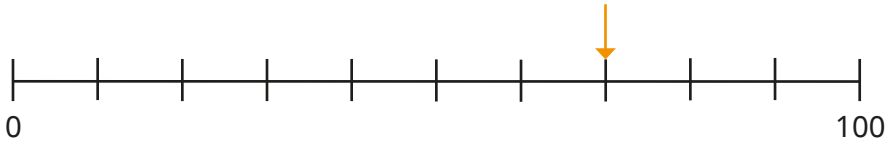


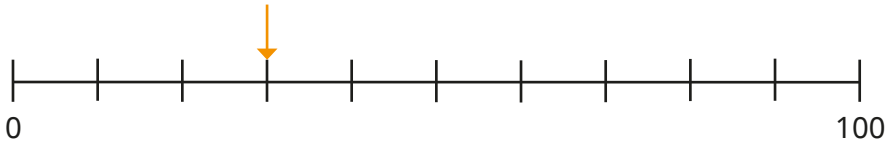


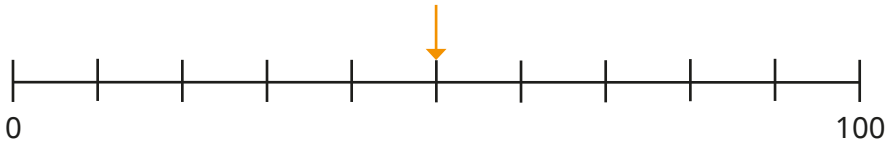


What is the same about the number lines? What is different?

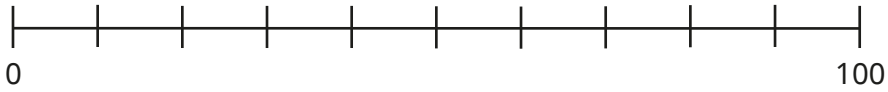
- What numbers are the arrows pointing to?







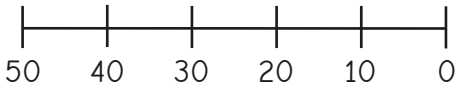
- Draw arrows to show where the numbers belong on the number line.

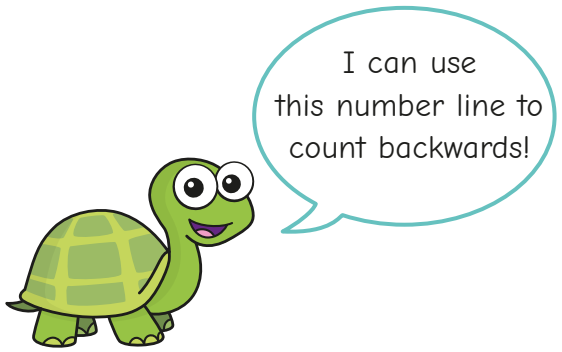


10s on the number line to 100

Reasoning and problem solving

Tiny has drawn a number line from 0 to 50





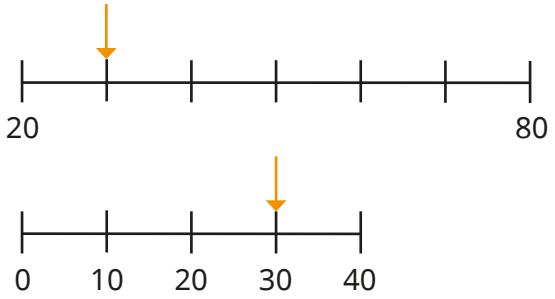
Explain the mistake that Tiny has made.

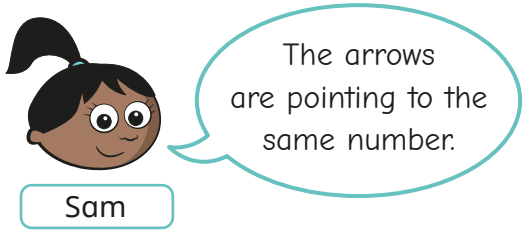
Draw a number line from 0 to 50

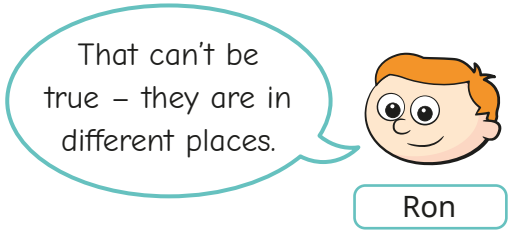
How can you use the number line to count backwards?

Number lines count up from left to right.

To count backwards, read from right to left.







Who is correct?

Talk about it with a partner.

Sam is correct.

Both arrows are pointing to 30

10s and 1s on the number line to 100

Notes and guidance

In the previous step, children looked only at intervals on a number line that were multiples of 10. In this small step, they consider the numbers that lie between multiples of 10 as they look at 10s and 1s on a number line.

Children start by considering number lines with start and end points that are a multiple of 10, before exploring other number lines with more varied start and end points and a different number of intervals. All the number lines count up in 1s.

As in the previous small step, it is important that children can label a number line. Using this knowledge, they can identify and find the position of given numbers on the number line.

Encourage children to complete the labels on a number line as a method of checking answers, in order to promote good habits.

Things to look out for

- Children may have finished the previous small step thinking that number lines only count up in 10s and hence label them incorrectly in this step.
- Children may think that the interval in the number line represents the number rather than the division at the end of the interval.

Key questions

- What is the value at the start point of the number line?
- What is the value at the end point of the number line?
- How many intervals are there?
- What is the number line counting up in? How do you know?
- Where would _____ be on the number line? How do you know?
- What number is the arrow pointing to? How do you know?

Possible sentence stems

- The start point is _____ and the end point is _____

  There are _____ intervals on the number line.

  Each interval is worth _____

  The number line is counting up in _____

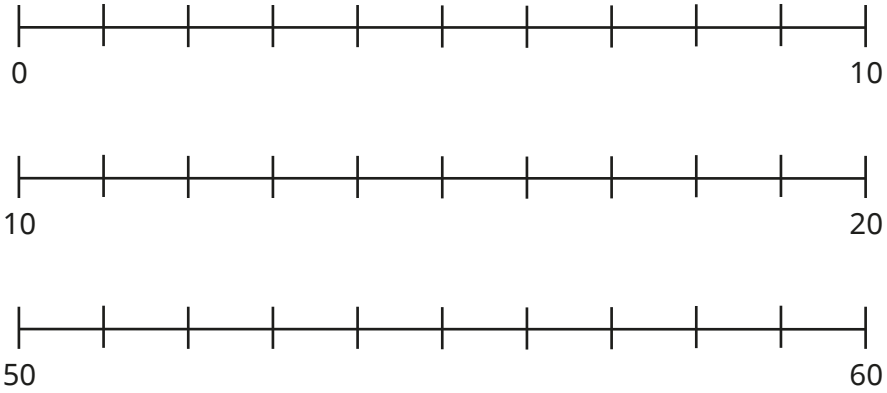
National Curriculum links

- Count in steps of 2, 3 and 5 from 0 and in 10s from any number, forward and backward
- Identify, represent and estimate numbers using different representations, including the number line

10s and 1s on the number line to 100

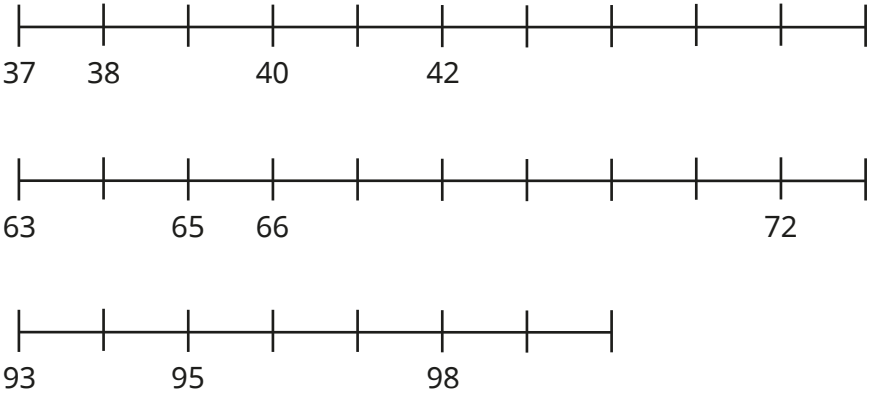
Key learning

- Label the number lines.

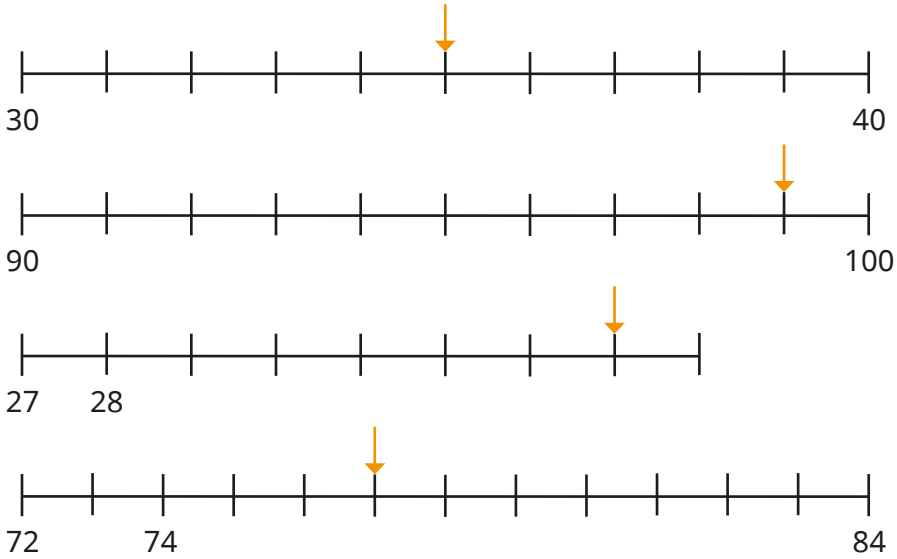


What is the same about the number lines? What is different?

- Complete the number lines.



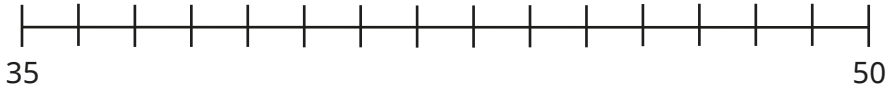
- What number is each arrow pointing to?



Give your answers in numerals and words.

- Draw arrows to show where the numbers belong on the number line.

36	41	forty-eight	40



10s and 1s on the number line to 100

Reasoning and problem solving

Get children to stand in a line to represent a number line.

Give the first and last child a number.

What number is everyone else?

Give the first or last child a number.

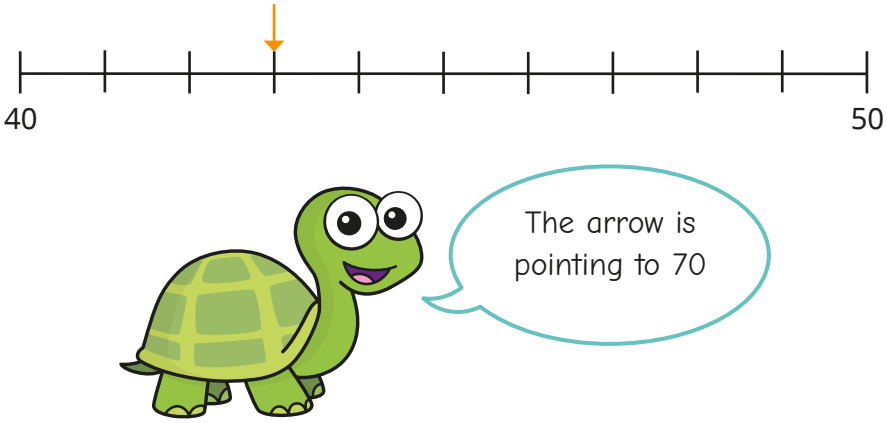
What number is everyone else?

If this person is this number, where is this number?

If this person is this number, can number _____ put their hand up?

Consolidate this and the previous step by including number lines in 10s as well as in 1s.

Answers will vary, depending on the number chosen.



What mistake has Tiny made?

Talk about it with a partner.

Tiny has not recognised that the number line is going up in 1s. Instead, Tiny has counted up in 10s.

The arrow is pointing to 43

Estimate numbers on a number line

Notes and guidance

In the previous two steps, children considered exact positions of numbers on the number line to 100, focusing first on multiples of 10 and then on the values in between. In this small step, children estimate the position of numbers on number lines.

Using the number lines counting in 10s that they worked with in Step 9, they position numbers made up of tens and ones. Encourage children to use their number sense to first decide which two intervals a number lies between, before going further with their thought process to consider its position relative to halfway by deciding which multiple of 10 a number is closer to.

Examples include both estimating the position and estimating the value of a given position.

Things to look out for

- Children may think they have the wrong answer if it is slightly different from their partner's answer, but they need to recognise that since they can only estimate they could both be correct.
- Children may think that numbers can only lie on the divisions and not between them and hence label the positions of numbers incorrectly.

Key questions

- What is the value at the start point? What is the value at the end point?
- Which two intervals is _____ between?
- What number is halfway between _____ and _____?
- Which multiple of 10 is _____ closer to?
- Why can you only estimate the position of _____ on the number line?

Possible sentence stems

- The start point is _____ and the end point is _____

  There are _____ intervals on the number line.

  Each interval is worth _____

  The number line is counting up in _____
- _____ is closer to _____ than to _____

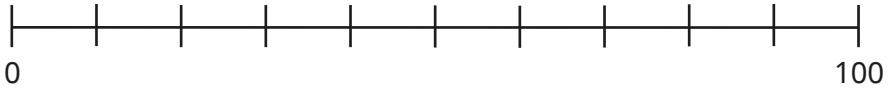
National Curriculum links

- Count in steps of 2, 3 and 5 from 0 and in 10s from any number, forward and backward
- Identify, represent and estimate numbers using different representations, including the number line

Estimate numbers on a number line

Key learning

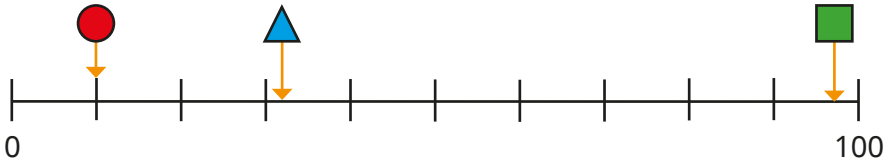
- Label the number line.



Estimate where each number belongs on the number line.

45	75	35

- The shapes show the positions of three numbers on the number line.

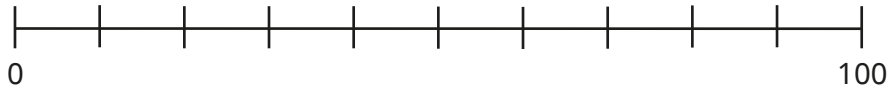


Match the shapes to the numbers.

●	▲	■
32	97	10

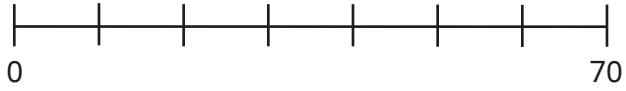
- Draw arrows to estimate where the numbers belong on the number line.

15	95	28	41

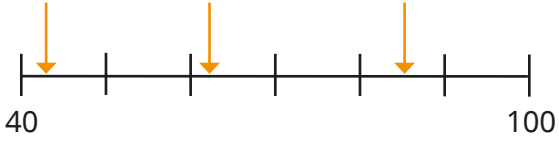


- Draw arrows to estimate where the numbers belong on the number line.

21	thirty-three	seventeen	68



- Estimate the numbers the arrows are pointing to.

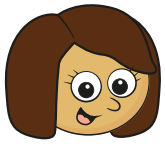


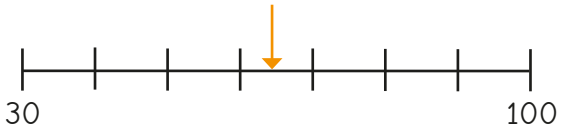
Compare answers with a partner.

Estimate numbers on a number line

Reasoning and problem solving

Kim draws an arrow on a number line to show a number.





What could Kim's number be?

What can Kim's number **not** be?

What numbers must Kim's number be between?

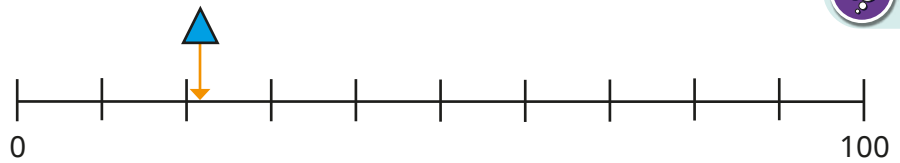
Compare answers with a partner.

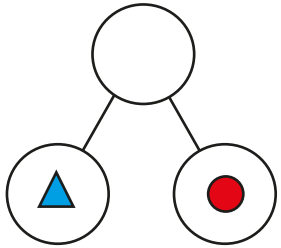
Do you have exactly the same answers?

e.g. 64

less than 60 or greater than 70

between 60 and 70





Complete the part-whole model.

Give your answer in numerals and words.

Compare methods with a partner.

Answers will vary depending on the estimated value of the triangle.

e.g. 72, seventy-two

Compare objects

Notes and guidance

In this small step, children combine all their learning so far from this block as they begin to compare objects to 100

Children identify which quantity is greater, explaining their reasoning. The language of "more than" and "fewer than" will be used in the context of quantity.

When using objects as a representation of number, children should use the language of "greater than", "less than" and "equal to" alongside the inequality symbols to compare. This will be explored further when comparing numbers in the next small step.

Things to look out for

- Children may only count the total number of objects rather than considering the value of each individual object.
- The use of the inequality symbols can often be a sticking point and some children will require a recap of these.
- If objects are spread out, children may think there are more than if the objects are grouped closely together. Ensure children are exposed to different examples.

Key questions

- How can you arrange the objects to make them easy to compare?
- How did you count the objects?
- Do groups of 10 help you to count? Why?
- Do groups of 10 help you to compare? Why?
- Which shows more? How do you know?

Possible sentence stems

- There are _____ objects in set A than in set B.
- Tom has _____ objects.

  Kim has _____ objects.

  Tom has _____ objects than Kim.

  Kim has _____ objects than Tom.

National Curriculum links

- Recognise the place value of each digit in a 2-digit number (tens, ones)
- Compare and order numbers from 0 up to 100; use <, > and = signs

Compare objects

Key learning

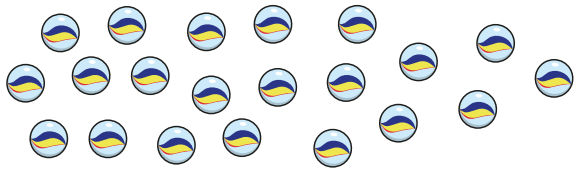
- A packet of sweets contains 10 sweets.

Sam's sweets **Ben's sweets**

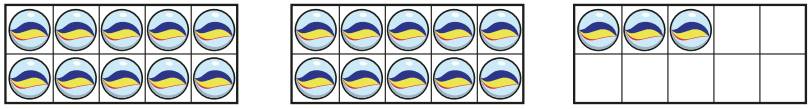
Who has more sweets?

- Ann and Mo are both counting marbles.

Ann arranges her marbles like this.



Mo arranges his marbles like this.



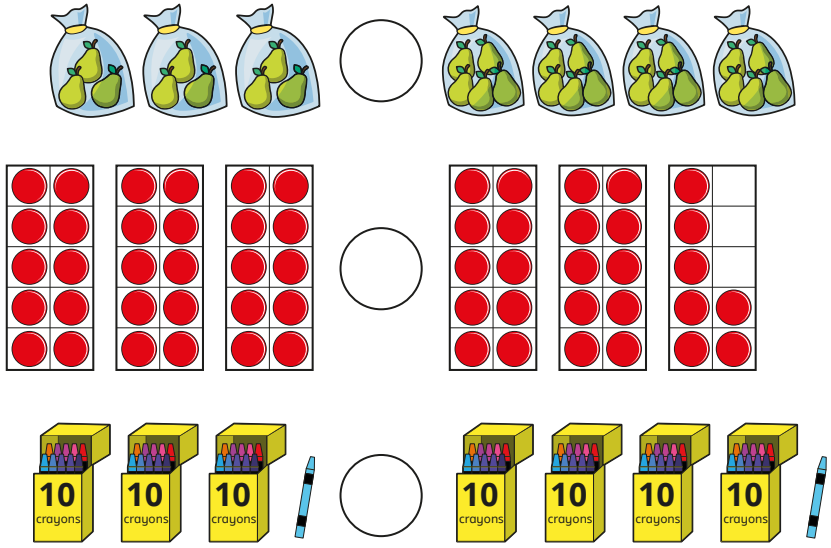
Who has fewer marbles?

Whose marbles are easier to count?

- Use cubes to show that the statements are true.

Eleven is less than fifteen.	2 tens is equal to 20
19 is greater than 9	8 < 10

- Write <, > or = to compare the numbers of objects.

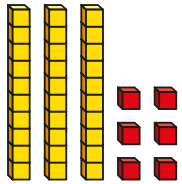


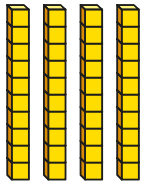
Compare objects

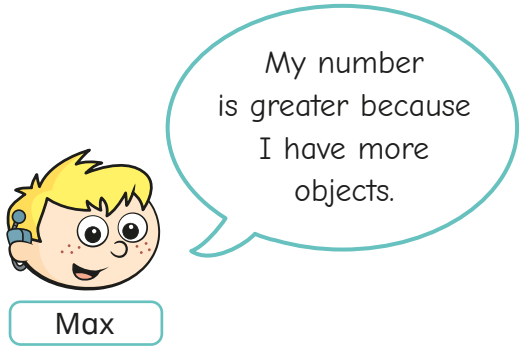
Reasoning and problem solving

Max and Jo are comparing numbers.

Max's number **Jo's number**







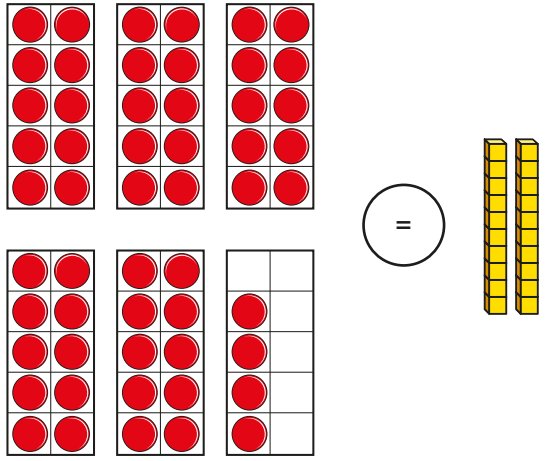
Is Max correct?

Explain your answer.

No

Sam is comparing two numbers.

Draw base 10 to make the statement correct.



How much did you add to make the numbers equal?

add 3 tens and 4 ones

34

Compare numbers

Notes and guidance

In the previous small step, children looked at comparing quantities using objects and compared objects where the objects were used as a representation of number.

In this small step, children compare numbers in a more abstract way. The language of "greater than", "less than" and "equal to" should be used alongside the inequality symbols throughout.

The use of a number line supports children's understanding. They understand that the further to the right on a number line a number is, the greater it is in value.

Concrete resources can continue to be used in this small step. For children who require more support, this can help them with comparing numbers: for children who are more confident, concrete resources can be used as a method of justifying their answers.

Things to look out for

- Children may only compare the digit with the greatest value in each number.
- Children may only compare the tens or only compare the ones in a number.
- The use of the inequality symbols can often be a sticking point and some children will require a recap of these.

Key questions

- Can you show your answers using base 10/counters/cubes?
- Can you show your answers by drawing a picture?
- Is there more than one answer?
- How does a number line help you to compare numbers?
- Do you need to work out the number sentences to decide which is greater/smaller?

Possible sentence stems

- _____ is equal to _____ tens and _____ ones.
- _____ tens is _____ than _____ tens.
- _____ is greater than _____ because ...
- _____ is less than _____ because ...

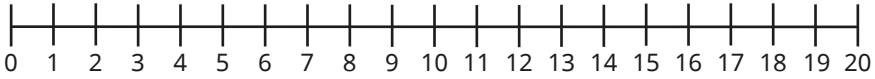
National Curriculum links

- Recognise the place value of each digit in a 2-digit number (tens, ones)
- Compare and order numbers from 0 up to 100; use <, > and = signs

Compare numbers

Key learning

- Circle 11 and 17 on the number line.

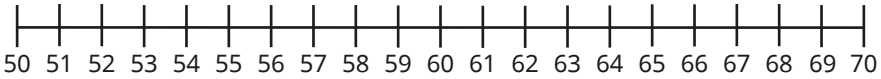


Choose a phrase to complete the sentence.

less than | greater than | equal to

11 is _____ 17

Circle 61 and 67 on the number line.



Choose a phrase to complete the sentence.

less than | greater than | equal to

61 is _____ 67

What is the same and what is different about comparing 11 and 17, and 61 and 67?

- Choose a phrase to complete each sentence.

less than | greater than | equal to

  - 42 is _____ 46
  - 81 is _____ 60 + 4
  - 30 + 8 is _____ thirty-eight

- Complete the number sentences.

  - 4 tens and 9 ones > _____
  - _____ < 70 + 5
  - _____ = eight tens

- Write <, > or = to make the statements correct.

28 ◯ 30 30 + 23 ◯ 40 + 13

90 ◯ 70 + 28 20 + 14 ◯ 24

Compare numbers

Reasoning and problem solving

What is the missing number?

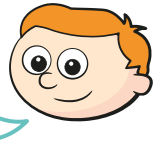
$13 < \square < 20$

Is there more than one answer?

six possible numbers:

14, 15, 16, 17, 18, 19

When comparing numbers, the number with more ones is always the greater number.



Do you agree with Ron?

Give some examples to support your answer.

No

For example, 19 is less than 21

Is the statement true or false?

1 ten and 12 ones is greater than 2 tens.

How do you know?

True

Here are some digit cards.

4	7	8	9

Use the digit cards to make the statement correct.

__ 7 > 8 __ > __ __

How many answers can you find?

multiple answers
e.g. 97 > 87 > 84

Order objects and numbers

Notes and guidance

In this small step, children use their knowledge of comparing both objects and numbers from the previous two steps to order objects and numbers. The language of "most", "fewest", "least" and "greatest" will be used throughout, as sets of objects and numbers are ordered. Notice the difference in language: when comparing two numbers or objects, we refer to one being "more" or "greater", whereas when working in a set, the one with the highest value is the "most" or the "greatest".

Children should be encouraged to use concrete resources and other representations to support their thinking. Incorporating the earlier learning of number lines can also help children with ordering lists of numbers, as when positioned on a number line the values will naturally be in ascending order. The use of the inequality symbols continues throughout this small step.

Things to look out for

- Children may use inequality symbols incorrectly, thinking that they can write, for example, $3 < 5 > 1$. Make children aware that inequality symbols cannot be used in this way and that the correct way to record this would be either $1 < 3 < 5$ or $5 > 3 > 1$. When using more than one symbol in a chain, it should be the same symbol.

Key questions

- How does the number line help you order the numbers?
- How does base 10 show that your order is correct?
- How do you know which picture shows the smallest/greatest number?
- Did you look at the tens or ones to help you order?

Possible sentence stems

- _____ has the most balloons because ...
- _____ is greater than _____ because ...
- _____ is less than _____ because ...
- The greatest number is _____ because ...
- The smallest number is _____ because ...

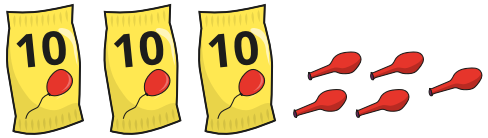
National Curriculum links

- Recognise the place value of each digit in a 2-digit number (tens, ones)
- Compare and order numbers from 0 up to 100; use <, > and = signs

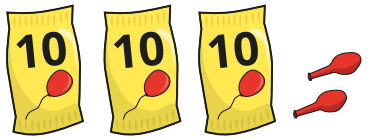
Order objects and numbers

Key learning

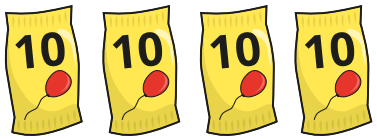
- Kim has 35 balloons.



Mo has 32 balloons.



Jo has 40 balloons.



Who has the most balloons?

Who has the fewest balloons?

- Circle the numbers 48, 43 and 50 on the number line.

Put the numbers 48, 43 and 50 in order.

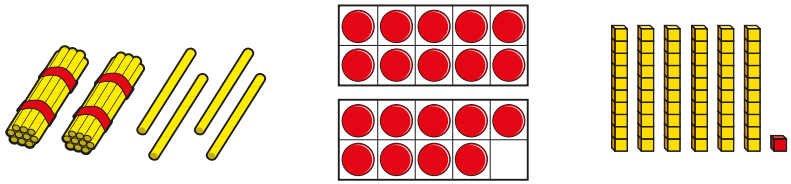
Start with the smallest.

- Use base 10 to make the numbers.

17, 12, 21	71, 29, 40
52, 32, 42	sixty, sixteen, twenty-six

Write each set of numbers in order. Start with the greatest number.

- The pictures show different numbers.



Which is the smallest number?

Which is the greatest number?

Complete the number sentence.

_____ < _____ < _____

- Which sets of numbers are ordered from smallest to greatest?

62, 55, 47	42, 49, 100
9, 38, 50	thirty-six, seventeen, zero

Order objects and numbers

Reasoning and problem solving

Ask each child to write a 2-digit number on a whiteboard.

Ask the children as a class to order their numbers from:

- smallest to greatest
- greatest to smallest.

Prompt children to talk about what happens if they have written the same number.

Answers will vary, depending on the numbers chosen.

42, 40, 56, 71, 99

Write the numbers in order, from smallest to greatest.

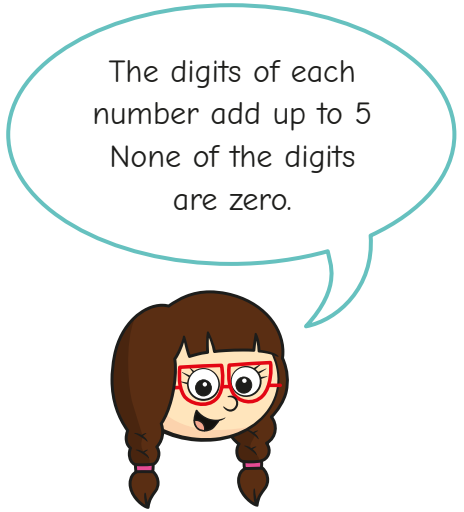
Write the numbers in order, from greatest to smallest.

What do you notice?

40, 42, 56, 71, 99

99, 71, 56, 42, 40

Jo writes a list of four 2-digit numbers.



What are Jo's numbers?

Write the numbers in order, from smallest to greatest.

How did you do it?

14, 23, 32, 41

Count in 2s, 5s and 10s

Notes and guidance

In Year 1, children covered counting in 2s, 5s and 10s. This small step provides an opportunity to revisit those skills in preparation for later in the year when working on topics such as money.

It is essential that children can count both forwards and backwards in 2s, 5s and 10s. When counting in 2s and 5s, the starting number should be a multiple of 2 or 5 respectively. Children should, however, be able to count both forwards and backwards in 10s from any number.

The use of concrete resources such as counters and Rekenreks can support children's understanding of counting in multiples of 2, 5 and 10. Encourage them to spot patterns within numbers when counting, for example recognising that when counting in 10s, the ones digit does not change.

Things to look out for

- When counting in 10s starting from a number such as 13, children may jump to the next multiple of 10 and then keep counting in 10s.
- Children may confuse the multiples they are counting in, for example starting to count in 5s, then changing to count in 10s once they reach a multiple of 10

Key questions

- How many do you need to count on each time? How do you know?
- When counting forwards, do the numbers get greater or smaller?
- When counting backwards, do the numbers get greater or smaller?
- Do you notice any patterns?
- What happens to the ones digit when counting in 10s?
- What do you notice about the numbers when you are counting in 5s?
- What do you notice about the numbers when you are counting in 2s?

Possible sentence stems

- When counting forwards/backwards in 2s/5s/10s, the number after _____ is _____

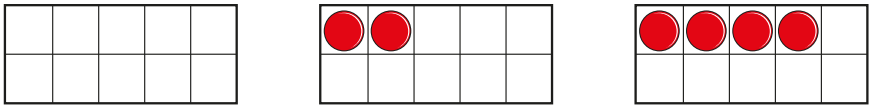
National Curriculum links

- Count in steps of 2, 3 and 5 from 0, and in 10s from any number, forward and backward

Count in 2s, 5s and 10s

Key learning

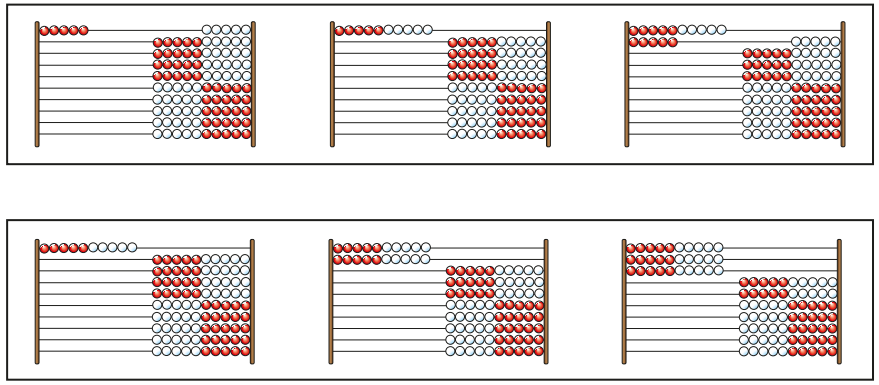
- What numbers are shown?



Make the next two numbers in the pattern.

What numbers have you made?

- What numbers are shown?



Make the next two numbers in each pattern.

What numbers have you made?

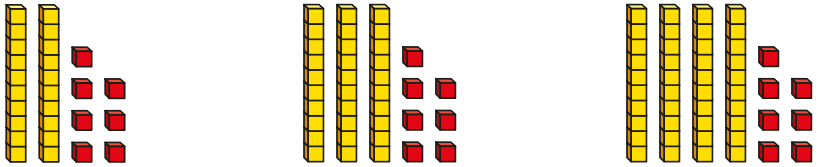
- Count backwards in 5s from 40 to zero.

- Complete the number tracks.

10	15	20							
90	80	70							
12		16	18						

- Circle the number that does not fit the pattern.
  - 2, 4, 6, 8, 9, 10, 12 ...
  - 35, 30, 25, 20, 12, 10 ...
  - 0, 5, 10, 20, 30, 40 ...
  - 28, 26, 24, 22, 20, 10 ...

- What numbers are shown?



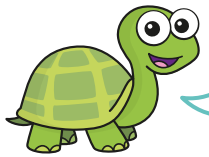
Make the next two numbers in the pattern.

What numbers have you made?

Count in 2s, 5s and 10s

Reasoning and problem solving

Tiny is counting in 5s.



When counting forwards in 5s from zero, all the numbers end in either zero or 5

Is Tiny correct?

Explain your answer.

Yes

Are the statements always true, sometimes true or never true?

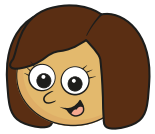
When counting in 2s from zero, the numbers you say are even.	always
When counting in 5s from zero, the numbers you say are even.	sometimes
When counting in 10s from zero, the numbers you say are even.	always

Mo and Kim are counting backwards from 100

I am going to count in 2s.

Mo

I am going to count in 5s.



Kim

What numbers will they both say?

What do you notice?

100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

All the numbers are multiples of 10

Count in 3s

Notes and guidance

In this small step, children count in 3s for the first time. They use concrete resources to physically make each number and begin to spot patterns when counting in 3s.

Children explore problems in the abstract by drawing jumps on number lines, completing number tracks or using a hundred square to support them in counting and spotting patterns.

Some children may need support when crossing a 10 boundary while counting in 3s and the use of the techniques outlined above can support with this. By the end of the small step, children should be able to count both forwards and backwards from any given multiple of 3 and recognise mistakes in any given number sequence.

Things to look out for

- When counting on their fingers, children may count the number they are starting on, meaning that they are only counting up in 2s.
- When counting backwards, children may stop at 3 and not go as far as zero.
- Children may not cross the 10 boundary and instead use 3 ones as the starting point each time.

Key questions

- How many do you need to count on each time? How do you know?
- When counting forwards, do the numbers get greater or smaller?
- When counting backwards, do the numbers get greater or smaller?
- Do you notice any patterns?
- What do you notice about the numbers when you are counting in 3s?
- What is different about counting in 2s and counting in 3s?
- How many jumps do you need to draw on the number line each time? How do you know?

Possible sentence stems

- When counting forwards in 3s, the number after _____ is _____
- When counting backwards in 3s, the number after _____ is _____

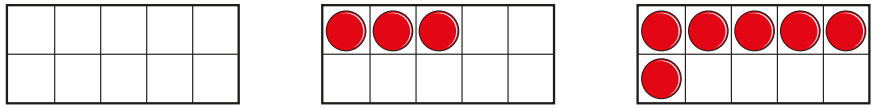
National Curriculum links

- Count in steps of 2, 3 and 5 from 0, and in 10s from any number, forward and backward

Count in 3s

Key learning

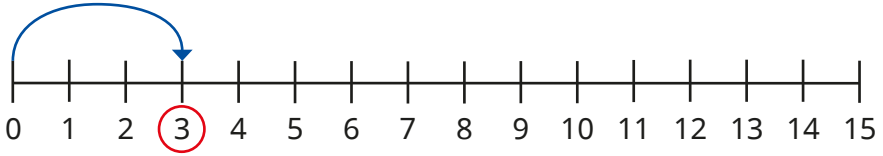
- What numbers are shown?



Make the next two numbers in the pattern.

What numbers have you made?

- Continue the jumps on the number line to count forwards in 3s.

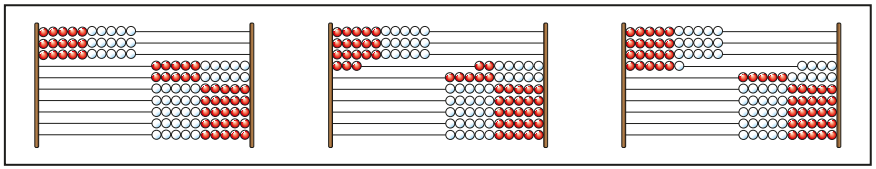


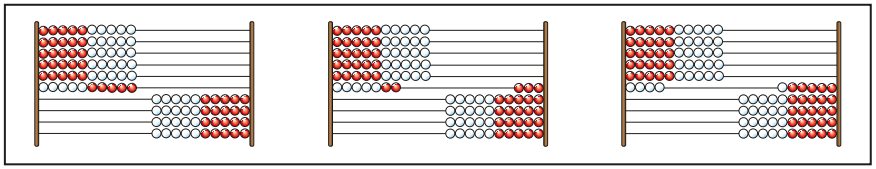
What number will you say after 15?

- Continue the jumps on the number line to count backwards in 3s.

What number will you say after 15?

- What numbers are shown?





Make the next two numbers in each pattern.

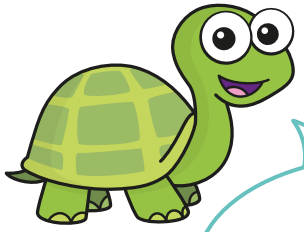
What numbers have you made?

- Complete the number tracks.

0	3	6							
30	27	24							
15		21	24						

Count in 3s

Reasoning and problem solving



If I start at zero and count in 3s, I will say the number 14

Is Tiny correct?

Explain your answer.

No

Ben has 15 stickers.

He collects 3 more stickers each day.

How many stickers will he have after 6 days?

33

Mo is counting in 2s and Kim is counting in 3s.

Mo	2	4	6	8
Kim	3	6	9	12
Total				

If we add our numbers together as we count, we can make a new number pattern.

What pattern do they make?

Sam and Ron count in 5s and add their numbers together as they count.

What new pattern do they make?

They count in 5s.

They count in 10s.

Autumn Block 2

Addition and subtraction

Small steps

Step 1	Bonds to 10
Step 2	Fact families - addition and subtraction bonds within 20
Step 3	Related facts
Step 4	Bonds to 100 (tens)
Step 5	Add and subtract 1s
Step 6	Add by making 10
Step 7	Add three 1-digit numbers
Step 8	Add to the next 10

Small steps

Step 9	Add across a 10
Step 10	Subtract across 10
Step 11	Subtract from a 10
Step 12	Subtract a 1-digit number from a 2-digit number (across a 10)
Step 13	10 more, 10 less
Step 14	Add and subtract 10s
Step 15	Add two 2-digit numbers (not across a 10)
Step 16	Add two 2-digit numbers (across a 10)

Small steps

Step 17	Subtract two 2-digit numbers (not across a 10)
Step 18	Subtract two 2-digit numbers (across a 10)
Step 19	Mixed addition and subtraction
Step 20	Compare number sentences
Step 21	Missing number problems

Bonds to 10

Notes and guidance

In Year 1, children looked at number bonds both to and within 10 in detail. This small step provides the opportunity for children to revisit and consolidate this learning, with a specific focus on number bonds to 10. This learning is essential prerequisite knowledge for later in the block.

The use of concrete resources such as counters and ten frames, Rekenreks or even their fingers can support children in finding bonds for numbers within 10. While these manipulatives can be used to support children initially, they should ultimately become fluent in recalling their number bonds to 10, as this will improve their efficiency and reduce cognitive load when completing calculations with greater numbers later in this block.

Things to look out for

- Children may not use efficient strategies when working out an answer to a calculation. For example, when calculating 3 + 7, they may start at 3 and count on 7 rather than start at 7 and count on 3
- When counting on their fingers, children may count the starting number as the first finger, resulting in an incorrect answer.

Key questions

- How many _____ have you got?
- How many more do you need to make 10?
- What is the bond to 10 for _____?
- What number are you starting with?
- What do you need to add to make 10?
- If 4 + 5 = 9, what is the missing number in 4 + _____ = 10? How do you know?

Possible sentence stems

- If I have _____ counters, I need to add _____ more counters to make 10
- I need to add _____ to _____ to make 10

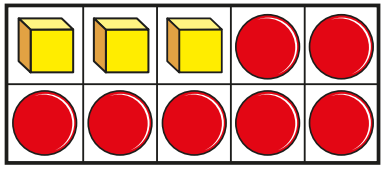
National Curriculum links

- Represent and use number bonds and related subtraction facts within 20 (Y1)
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Bonds to 10

Key learning

- Here is a ten frame.



How many cubes are there?

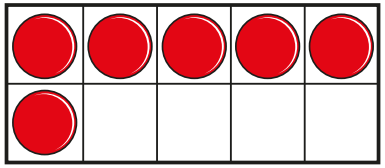
How many counters are there?

How many objects are there in total?

Complete the number sentence.

_____ + _____ = 10

- Sam puts some counters on a ten frame.



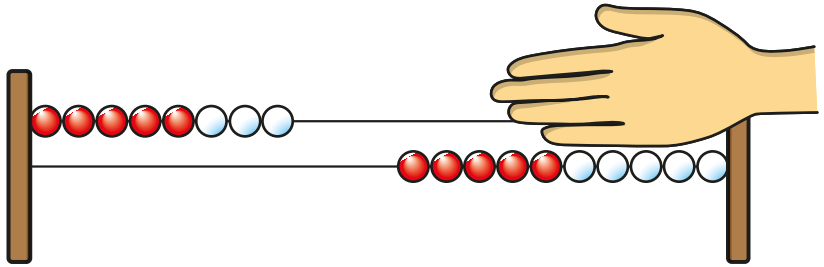
How many more counters does she need to fill the ten frame?

Write a number sentence to show the bond to 10

Give children red and yellow counters to fill a ten frame.

Ask them how many different ways they can do it, and to write a number sentence for each ten frame.

- Here is a Rekenrek.



How many beads is the hand covering?

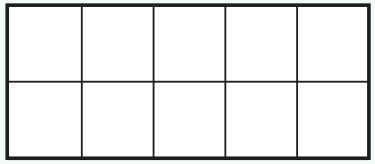
Write a number sentence to show the bond to 10

- Complete the number sentences.
  - 1 + _____ = 10
  - 10 = 6 + _____
  - _____ + 5 = 10
  - 10 = _____ + 0

Bonds to 10

Reasoning and problem solving

Start with an empty ten frame.



Ask children how many counters they need to make 10

Show 1 on the ten frame.

Ask children, again, how many counters are needed to make 10

Work systematically with the children to find all the number bonds to 10

Encourage fluent recall rather than counting, and write a number sentence for each bond.

Ask children if any of the number sentences show the same number bond.

Children should notice that, for example, 4 + 6 and 6 + 4 are the same number bond.

Jo has made a number using counters.

I need 4 more counters to make 10

What number has Jo made?

How do you know?

6

Tiny is finding bonds to 10

$1 + \boxed{0} = 10$

Explain the mistake Tiny has made.

What is the missing number?

9

Fact families – addition and subtraction bonds within 20

Notes and guidance

Building on the previous small step, children look at number bonds to and within 20. Links should be made to number bonds to 10, so that children recognise how knowing these bonds supports this learning.

As in the previous step, the use of concrete resources can support children in initially identifying bonds to a given number. While recall will ultimately improve efficiency, it is less essential for children to be able to automatically recall these bonds. Instead, they should have the strategies required to work them out quickly.

Children looked at fact families in Year 1 and these are reintroduced here to write the addition and subtraction statements for number bonds. This is a good opportunity to remind children of the commutative property of addition. While they should know the effect commutativity has, they do not need to be able to describe it in these words.

Things to look out for

- Children may assume that as addition is commutative, then subtraction must also be commutative.
- Some children may think that because 4 + 6 = 10, they can add 10 to each number to give 14 + 16 = 20

Key questions

- How many _____ have you got?
- How many more do you need to make _____?
- What is the bond to _____ for _____?
- What number are you starting with?
- What do you need to add to make _____?
- If 4 + 5 = 9, what is the missing number in 14 + _____ = 19? How do you know?

Possible sentence stems

- If I have _____ counters, I need to add _____ more counters to make _____
- I need to add _____ to _____ to make _____

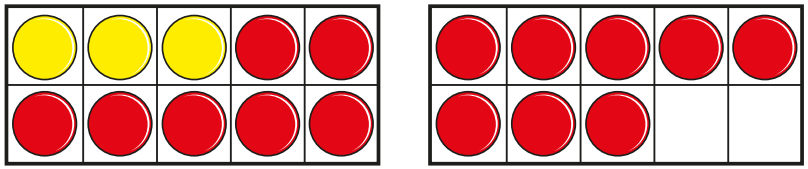
National Curriculum links

- Represent and use number bonds and related subtraction facts within 20 (Y1)
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Fact families – addition and subtraction bonds within 20

Key learning

- Here is a number shown on ten frames.



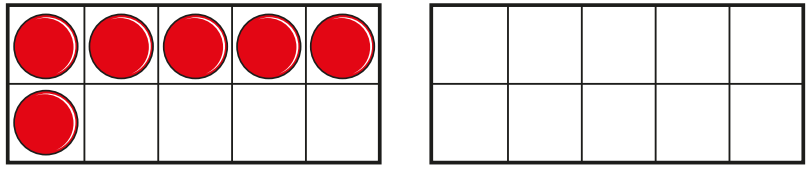
Complete the fact family to match the ten frames.

_____ + _____ = 18 18 – _____ = _____

_____ + _____ = 18 18 – _____ = _____

Can you write any of the facts another way?

- Ann puts some counters on a ten frame.

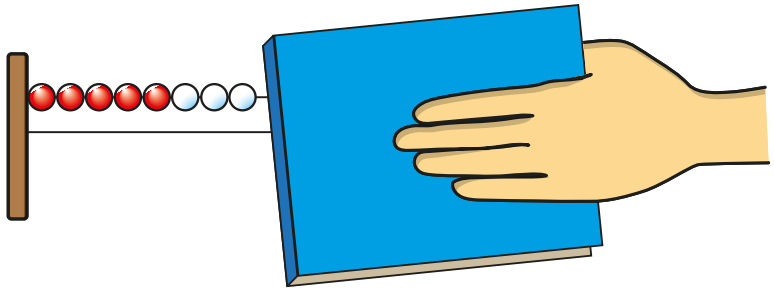


How many more counters does Ann need to make 20?

Write a number sentence to show the bond to 20

Write the fact family for the number sentence.

- Here is a Rekenrek.



How many beads are covered?

Write a number sentence to show the bond to 20

Write the fact family.

As a class, use a Rekenrek to find bonds to 20

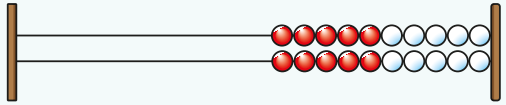
Ask children how many different bonds they can find, and to write a fact family for each bond.

- Complete the number sentences.
  - 13 + _____ = 15
  - _____ + 16 = 18
  - 20 = 11 + _____
  - 12 = _____ + 0

Fact families – addition and subtraction bonds within 20

Reasoning and problem solving

Start with a Rekenrek in the ready position.



Ask children to make a number on the Rekenrek and to tell you its bond to 20

Ask them to write the fact family for this number bond.

Get children to work in pairs to find bonds to 20

Encourage them to work systematically to find all the number bonds and to write the fact family for each.

Ask children if any of the number sentences show the same number bond.

Children should notice that, for example, 14 + 6 and 6 + 14 are the same number bond.

Complete the number sentences.

4 + _____ = 10

14 + _____ = 20

4 + _____ = 20

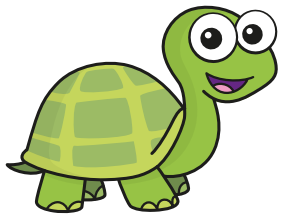
What do you notice?

6

6

16

Tiny has found a pattern in number bonds.



11 + 1 = 12

11 + 2 = 13

11 + 3 = 14

What pattern has Tiny found?

Continue the pattern up to 20

11 + 4 = 15

11 + 5 = 16

11 + 6 = 17

11 + 7 = 18

11 + 8 = 19

11 + 9 = 20

Related facts

Notes and guidance

In this small step, children use their knowledge of number bonds within 10, developed in the previous steps, to identify related facts for both addition and subtraction calculations.

If children know that 2 + 5 = 7, then they should be able to use this knowledge to state that 20 + 50 = 70. Unitising tens and ones within a calculation can support children's understanding and help to avoid common misconceptions. If 2 ones plus 5 ones is equal to 7 ones, then 2 tens plus 5 tens must be equal to 7 tens. This will avoid errors such as 20 + 50 = 700, which stems from thinking that there must be two zeros in the answer.

Concrete resources can be used to support understanding of this. Base 10 is particularly useful and will support children in not only identifying the correct answer, but also using the correct vocabulary of tens and ones when explaining their answers.

Things to look out for

- Children may think that if 8 – 3 = 5, then 80 – 30 = 5 because the zeros cancel each other out.
- Some children may think that, for example, 20 + 30 = 500 because 2 + 3 = 5 and there are two zeros.

Key questions

- If 2 ones plus 3 ones is equal to 5 ones, what is 2 tens plus 3 tens?
- What is the same about the number sentences? What is different?
- If 3 + 5 = 8, what is 30 + 50? How do you know?
- If 6 – 2 = 4, what is 60 – 20? How do you know?
- Show each number sentence using base 10. What is the same? What is different?

Possible sentence stems

- _____ ones + _____ ones = _____ ones,
  so _____ tens + _____ tens = _____ tens
  This means that _____ + _____ = _____
- _____ ones – _____ ones = _____ ones,
  so _____ tens – _____ tens = _____ tens
  This means that _____ – _____ = _____

National Curriculum links

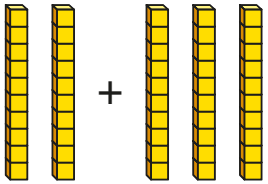
- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Related facts

Key learning

- Complete the sentences to match the base 10
  - 

    _____ ones + _____ ones = _____ ones

    _____ + _____ = _____
  - 

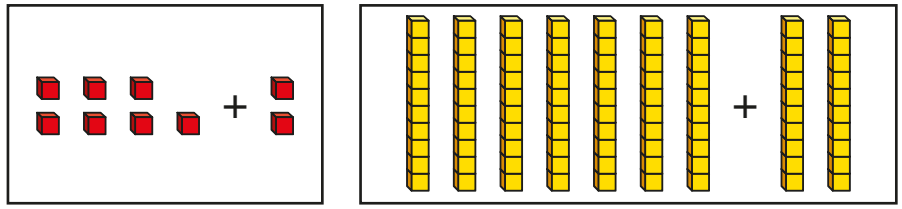
    _____ tens + _____ tens = _____ tens

    _____ + _____ = _____

  What is the same about the number sentences?

  What is different?

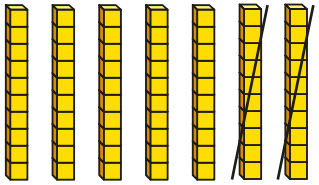
- Write number sentences to match the base 10

  What is the same? What is different?

- Complete the sentences to match the base 10
  - 

    _____ ones – _____ ones = _____ ones

    _____ – _____ = _____
  - 

    _____ tens – _____ tens = _____ tens

    _____ – _____ = _____

  What is the same about the number sentences?

  What is different?

- Complete the related facts.

  1 + 4 = _____ 4 + 5 = _____ 9 – _____ = 2

  10 + 40 = _____ 40 + 50 = _____ 90 – _____ = 20

Related facts

Reasoning and problem solving

Mo is finding related facts.

I know that 3 ones plus 5 ones is 8 ones, so 3 tens plus 5 tens must be 8 tens.

Explain why Mo is correct.

How else can Mo write 8 tens?

Give your answer in numerals and words.

80, eighty

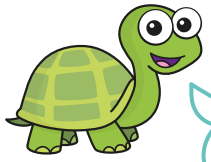
Is the number sentence true or false?

$10 + 70 = 800$

How do you know?

False

Tiny is working out the missing number.



$60 - \square = 10$

The missing number is 5, because $6 - 5 = 1$

Do you agree with Tiny?

Explain your answer.

No

Complete the number sentences.

$100 - 10 =$ _____

$100 - 20 =$ _____

$100 - 30 =$ _____

$100 - 40 =$ _____

What do you notice?

Continue the pattern.

90, 80, 70, 60

Bonds to 100 (tens)

Notes and guidance

In this small step, children build on their previous learning of number bonds to 10 and related facts to find bonds to 100. The focus is on multiples of 10 that have bonds to 100. Children may have seen examples of these in the previous step, and here they focus on them explicitly. By this stage, children should be more confident in automatically recalling their number bonds to 10, and if they know that 4 + 6 = 10, then they also know that 40 + 60 = 100

A Rekenrek and base 10 are useful concrete resources to support this learning. While base 10 supports the link between related facts, the Rekenrek ensures that children keep the 100 visible at all times. A hundred square can also be used.

As with number bonds to 10, the more fluent children are in their bonds to 100 made from multiples of 10, the more efficient they will be in later steps.

Things to look out for

- Children may think that if 3 + 7 = 10, then 30 + 7 = 100, because they need to add a zero.
- If children found any particular bonds to 10 challenging, they are likely to carry this through to this step.

Key questions

- How many tens are there in 100?
- How many tens are there?
- How many more do you need to make 100?
- What is the bond to 100 for _____?
- What number are you starting with?
- What do you need to add to make 100?
- If 4 + 6 = 10, what is the missing number in 40 + _____ = 100? How do you know?

Possible sentence stems

- If _____ ones + _____ ones = 10,

  then _____ tens + _____ tens = 100
- If I have _____ tens, I need to add _____ more tens to make 100
- I need to add _____ to _____ to make 100

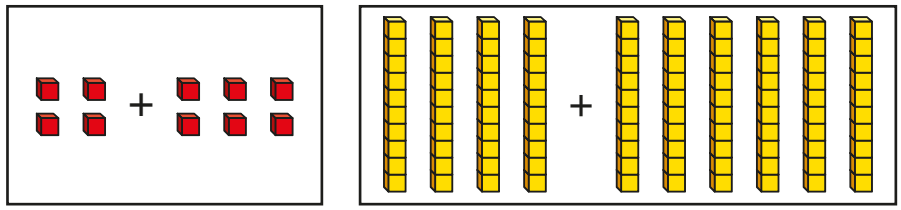
National Curriculum links

- Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

Bonds to 100 (tens)

Key learning

- Here are some number bonds.



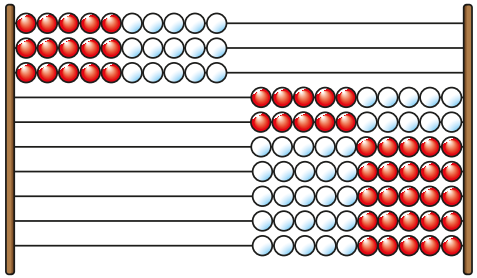
How many ones are there?

How many tens are there?

Write the number sentence for each bond.

What do you notice?

- The Rekenrek shows a bond to 100



Complete the number sentence to show the bond.

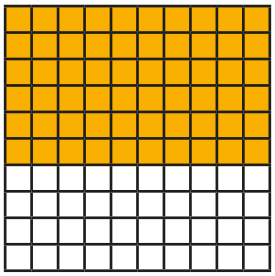
_____ + _____ = 100

- Here is a hundred square.

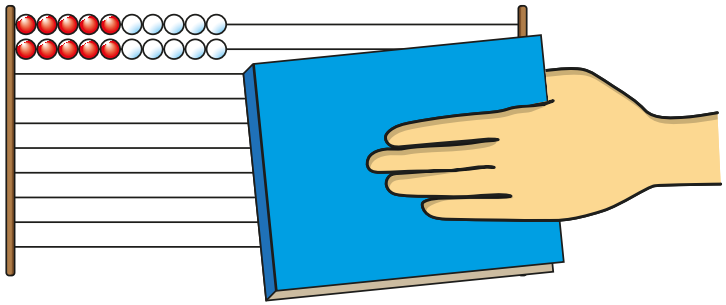
How many squares are shaded?

How many squares are not shaded?

Write the bond to 100



- Here is a Rekenrek.



How many beads are covered? How do you know?

Write the bond to 100

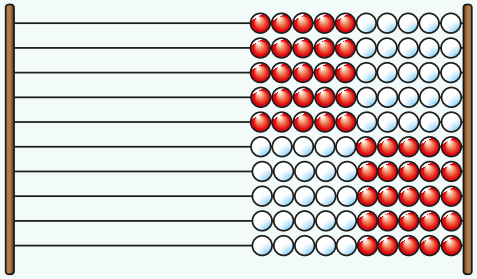
- Use a Rekenrek to find the bond to 100 for each number.

10	50	0	100

Bonds to 100 (tens)

Reasoning and problem solving

Start with a Rekenrek in the ready position.



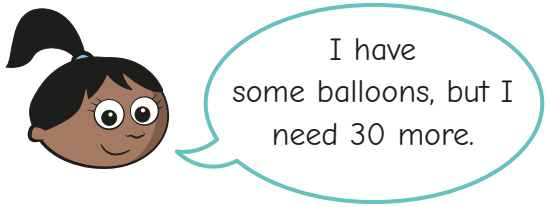
Show children a multiple of 10 and ask them to identify the bond to 100.

Work towards children being able to fluently recall their number bonds to 100. Ask children to work in pairs with a Rekenrek. Encourage them to work systematically to identify all the bonds to 100 using tens.

Consider how these bonds compare to the bonds to 10

Children should notice that, for example, 8 + 2 = 10 and 80 + 20 = 100 are related facts.

Sam needs 100 balloons.

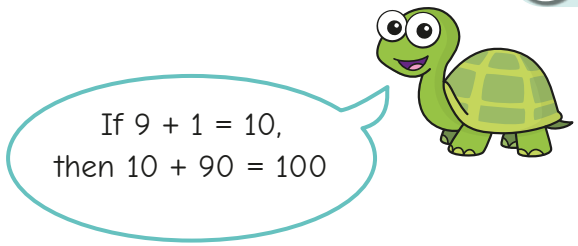


How many balloons does Sam have?

How do you know?

70

Tiny is finding bonds to 100



Is Tiny correct?

How do you know?

Yes

Add and subtract 1s

Notes and guidance

In this small step, children add and subtract ones from a given number. Children should start to spot patterns when adding and subtracting 1s and link these to their knowledge of number bonds from earlier in the block. If children know, for example, that 3 + 1 = 4, then they can use this to understand that 23 + 1 = 24 and 53 + 1 = 54. The focus of this small step is the way in which the ones digit changes, and calculations that cross a 10 boundary are not included at this point.

It is important that children make connections between adding 1 and, for example, adding 2, which is the same as adding 1 and then adding another 1. Once children are confident in adding and subtracting 1, they then go on to add and subtract different numbers of ones.

Things to look out for

- Children may add to the wrong digit, for example 23 + 1 = 33
- When a calculation is written with the smallest number first, for example 2 + 35, children may try to count on 35 rather than use the commutative property of addition to support them.

Key questions

- How many ones are there in _____?
- How many ones do you need to add/subtract?
- What is _____ ones + _____ ones?
- What is _____ + _____?
- What happens to the tens?
- What happens to the ones?

Possible sentence stems

- _____ has _____ tens and _____ ones.

  _____ ones + _____ ones = _____ ones,

  so _____ + _____ = _____
- To subtract _____ ones, I need to subtract 1 _____ times.

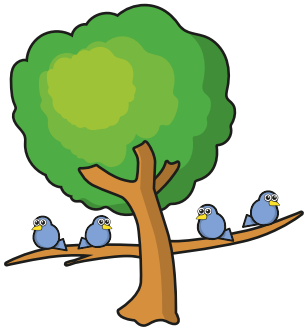
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

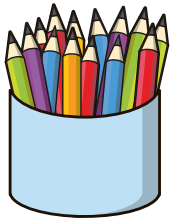
Add and subtract 1s

Key learning

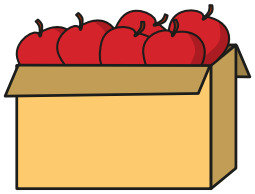
- There are 4 birds on a tree.
  - 1 more bird lands on the tree.
    How many birds are there now?
  - Another bird lands on the tree.
    How many birds are there now?



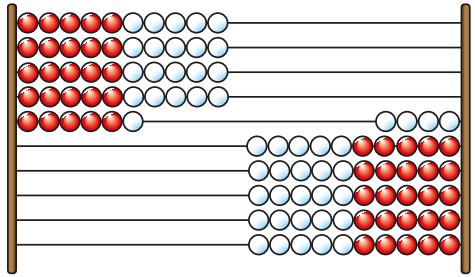
- There are 14 pencils in a pot.
  2 pencils are added to the pot.
  How many pencils are there now?



- There are 57 apples in a box.
  - Mo takes 1 apple out of the box.
    How many apples are there now?
  - Mo takes another apple.
    How many apples are there now?



- The Rekenrek shows 46



Use the Rekenrek to complete the number sentences.

- 46 + 1 = _____
  46 + 2 = _____
  46 + 3 = _____
- 46 – 1 = _____
  46 – 2 = _____
  46 – 3 = _____

What do you notice?

- Kay has these stickers.

Her teacher gives her five more stickers.

How many stickers does she have now?

Add and subtract 1s

Reasoning and problem solving

Max is subtracting 1s.

22 = 29 – 7

22 = 28 – 6

22 = 27 – 5

I can see a pattern!

22 = 26 – 4

22 = 25 – 3

22 = 24 – 2

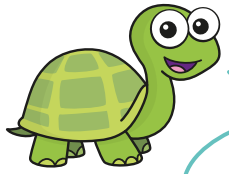
22 = 23 – 1

22 = 22 – 0

What pattern can Max see?

Continue the pattern.

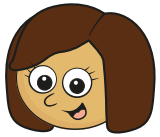
Tiny and Kim use different methods to work out 6 + 72



Tiny

I am going to start at 6 and count on 72

I am going to use the fact that 6 + 2 = 8 to help me.



Kim

78

96

Choose a method to work out the additions.

6 + 72	5 + 91

Did you choose the same method as your partner?

Add by making 10

Notes and guidance

In this small step, children use their knowledge of number bonds to 10 to add numbers within 20. Children are familiar with using the counting on method for calculations that cross a 10, but the purpose of this step is to improve both efficiency and accuracy using number bonds.

Children need to be able to partition a number into two parts in order to use number bonds to 10 to simplify a calculation.

Different concrete resources and representations can support children's understanding. Counters and ten frames, Rekenreks and number lines can help children to represent a calculation and work out the answer, and part-whole models can provide support when partitioning a number. Children can then use the knowledge gained from this to move towards a mental strategy.

Things to look out for

- If children are not confident in recalling their number bonds to 10, this will cause difficulty in this small step.
- Children may not partition the number they are adding in a way that simplifies the calculation.
- Some children may identify the jump to 10, but then still rely on their fingers to count beyond 10

Key questions

- What numbers do you need to add together?
- What is the bond to 10 for _____?
- What do you need to add to _____ to make _____?
- What can you partition _____ into?
- How many more do you need to add to 10?
- What is _____ plus _____?
- Why does partitioning _____ into _____ and _____ help with this question?

Possible sentence stems

- _____ can be partitioned into _____ and _____

  _____ + _____ = 10

  10 + _____ = _____

  So _____ + _____ = _____

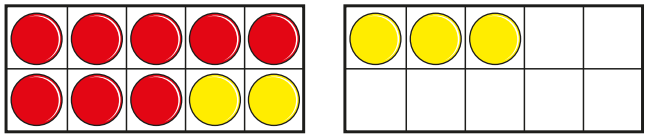
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add by making 10

Key learning

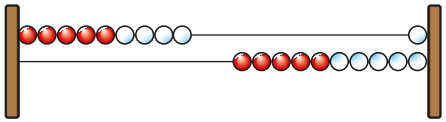
- The counters show that 8 + 5 = 10 + 3

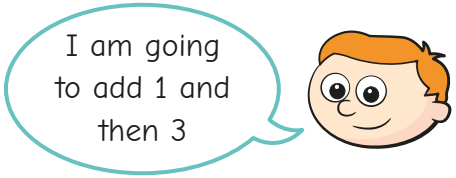


Use counters and ten frames to fill in the missing numbers.

- 9 + 5 = 10 + _____
- 8 + 4 = 10 + _____
- 4 + 7 = 10 + _____
- 7 + 9 = 10 + _____

- Ron is using a Rekenrek to work out 9 + 4





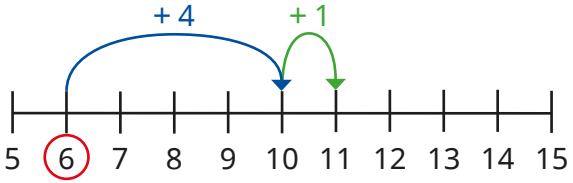
Why does Ron do this?

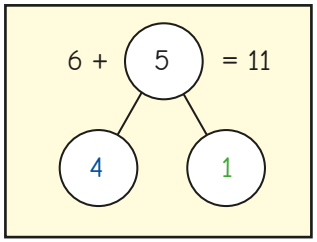
What is 9 + 4?

Use a Rekenrek to work out the additions.

8 + 6	7 + 5	5 + 6	3 + 9

- Here is Jo's method for working out 6 + 5





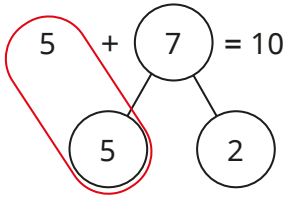
Use Jo's method to work out the additions.

4 + 8	2 + 9	7 + 6	9 + 9

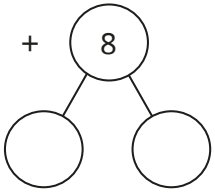
- Use bonds to 10 to complete the additions.

The first one has been started for you.

- 5 + 7 = 10 + _____ = _____



- 3 + 8

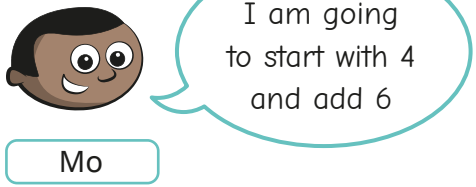


- 8 + 9
- 7 + 8

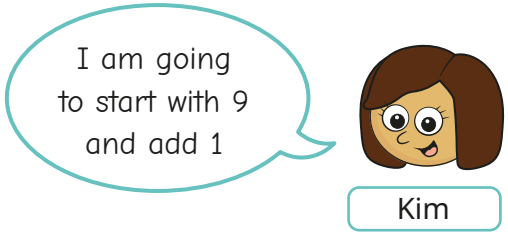
Add by making 10

Reasoning and problem solving

Mo and Kim are working out 4 + 9



What will Mo do next?



What will Kim do next?

What is 4 + 9?

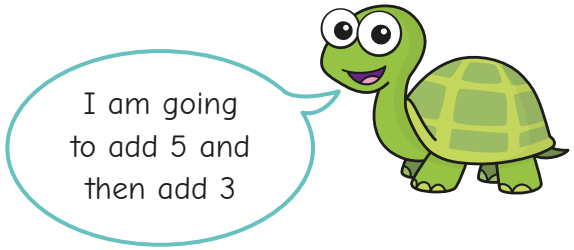
Why do both methods work?

add 3

add 3

13

Tiny is working out 3 + 8



Will Tiny get the correct answer?

Is there a better way to work out the addition?

Yes

Tiny could use bonds to 10

Work out the missing number.

$9 + 8 = \square + 10$

How did you do it?

7

Add three 1-digit numbers

Notes and guidance

Children should now be confident in adding two 1-digit numbers. In this small step, they explore adding three 1-digit numbers. The use of concrete resources can support with this, and counters with ten frames or a Rekenrek are particularly helpful.

Children recognise that to add three numbers, they just need to add two of them and then add the third to the answer.

Initially, the focus is just on completing the calculations, but children then use their knowledge of the commutative property of addition to complete calculations in the most efficient way. For example, when working out 4 + 3 + 6, while children would get the correct answer by working out 4 + 3 and then adding on 6, using the number bond to 10 within the calculation simplifies their workings.

Things to look out for

- Children may add two pairs of numbers and then add the answers. For example, when working out 4 + 3 + 6, they might add 4 and 3 to give 7, add 3 and 6 to give 9 and then add the 9 to the 7
- Children may make numerical errors when crossing 10

Key questions

- What is _____ ones + _____ ones?
  If you add _____ more ones, what do you get?
- What is _____ + _____ + _____?
- Does it matter what order you add the numbers in?
- Can you see any number bonds in the calculation?
- What is the most efficient way to complete the calculation?

Possible sentence stems

- _____ ones + _____ ones = _____ ones

  So _____ ones + _____ ones + _____ ones = _____ones
- _____ and _____ are a bond to _____

  10 + _____ = _____

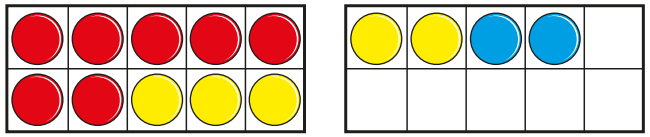
  So _____ + _____ + _____ = _____

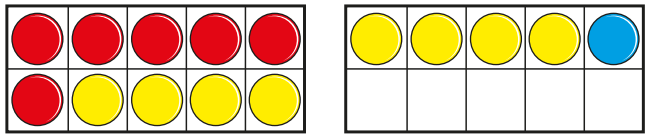
National Curriculum links

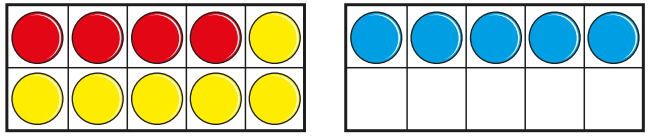
- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add three 1-digit numbers

Key learning

- Use the ten frames to complete the additions.
  - 

    7 + 5 + 2 = _____
  - 

    6 + 8 + 1 = _____
  - 

    4 + 6 + 5 _____

- Work out the additions.

  2 + 5 + 8 | 2 + 8 + 5 | 5 + 8 + 2

  What do you notice?

  Which addition was easiest?

- Ron is working out 6 + 9 + 4

  $$\underline{6} + 9 + \underline{4} = \underline{6 + 4} + 9$$
  $$= 10 + 9$$
  $$= 19$$

  Why has Ron worked it out this way?

  Use Ron's method to work out the additions.

  3 + 5 + 7 | 2 + 9 + 1 | 8 + 1 + 2 | 5 + 3 + 5

- Find the total of each row and column.

5	4	2	
3	7	8	
5	7	3	

Add three 1-digit numbers

Reasoning and problem solving

Tom has 8 sweets.

Ben gives him 7 more sweets.

Kim gives him 2 more sweets.

How many sweets does Tom have now?

How did you work this out? Talk about it with a partner.

17

Tiny is working out 9 + 8 + 1

How can Tiny simplify the addition?

What is the answer?

18

Work out the missing numbers.

3 + _____ + 7 = 19

_____ + 4 + 6 = 11

2 + 6 + _____ = 16

1 + _____ + 3 = 13

9

1

8

9

7 + 9 + 3 | 7 + 3 + 9

Why do both additions have the same answer?

The numbers are the same, and addition can be done in any order.

Add to the next 10

Notes and guidance

In this small step, children add to the next ten using their knowledge of number bonds, adding by making 10 and related facts. They also identify missing numbers in a given calculation using the learning from earlier in the block. For example, to find the missing number in 28 + _____ = 30, they can use the fact that 8 + 2 = 10

Encourage children to make connections between the ones in calculations. For example, if they know that 25 + 5 = 30, they can use this to identify the missing number in 26 + _____ = 30: 26 is 1 more than 25 so the missing number must be 1 less than 5

Useful concrete resources to support this learning are base 10 and Rekenreks, as children can physically see the 10 they are making. It is important they do not rely on counting the individual ones and so move towards a mental strategy.

Things to look out for

- Calculations presented in a different way can feel more difficult, for example children may find it easier to identify the missing number in 26 + _____ = 30 than in _____ + 26 = 30 or 30 = _____ + 26

Key questions

- What numbers do you need to add together?
- How many tens are there in _____?
- What is the multiple of 10 after _____?
- How many ones are there in _____?
- What is the bond to 10 for _____?
- How many more do you need to add to get to _____?
- What is _____ plus _____?

Possible sentence stems

- _____ has _____ tens and _____ ones.
- The next 10 is _____
  The bond to 10 for _____ is _____
  I need to add _____ to _____ to get to the next 10

National Curriculum links

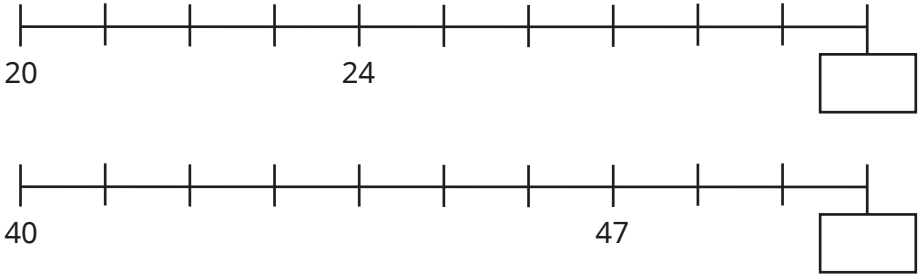
- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add to the next 10

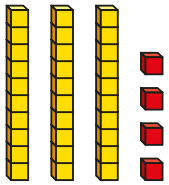
Key learning

- Work out the missing numbers.
  - 4 + _____ = 10
  - 7 + _____ = 10
  - _____ + 2 = 10
  - 10 = 1 + _____
  - 10 = _____ + 5
  - _____ + 3 = 10

- What are the missing numbers?



- The base 10 shows 34



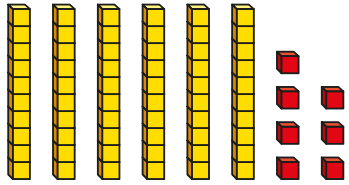
How many tens are there in 34?

What is the multiple of 10 after 34?

How many ones are there in 34?

How many ones do you need to add to get to the next 10?

- The base 10 shows 67



Work out the missing number.

67 + _____ = 70

- Work out the missing numbers.
  - 24 + _____ = 30
  - _____ + 12 = 20
  - 47 + _____ = 50
  - 70 = _____ + 65
  - 40 = 31 + _____
  - _____ + 83 = 90

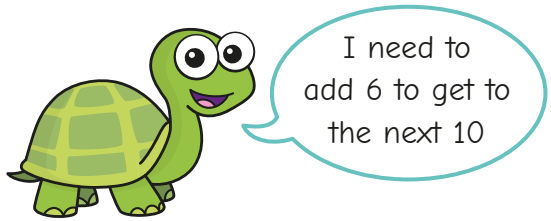
- Work out the missing numbers.
  - 3 + _____ = 10
  - 20 = 13 + _____
  - 73 + _____ = 80
  - _____ + 53 = 60
  - 23 + _____ = 30
  - 100 = _____ + 93

What do you notice?

Add to the next 10

Reasoning and problem solving

Tiny uses base 10 to make 46



Is Tiny correct?

How do you know?

No

Fill in the missing numbers.

24 + _____ = 30

25 + _____ = 30

26 + _____ = 30

27 + _____ = 30

What do you notice?

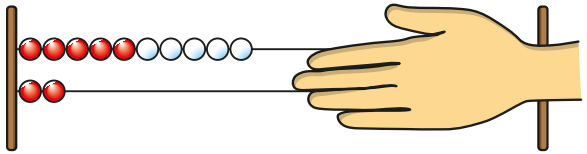
6

5

4

3

How many beads are covered?



How do you know?

8

Work out the missing number.

73 + 7 = ☐ + 71

How did you do it?

9

Add across a 10

Notes and guidance

Now that children can add to the next 10, in this small step they perform additions that cross a 10

The calculations within this step all require children to add a 1-digit number to a 2-digit number, and knowledge of place value, in particular the fact that 10 ones make up 1 ten, is essential prerequisite knowledge and should be reinforced throughout. Links can be made to the learning from an earlier step where children partitioned a 1-digit number to make 10, and this idea can be applied to support working with greater numbers.

Base 10, Rekenreks and number lines can continue to be used and a part-whole model can support children in partitioning the 1-digit number in the calculation. Children are not required to set their calculations up using the formal written method, but they should be encouraged to set concrete resources out in a methodical way.

Things to look out for

- If children are not confident in their number bonds to 10, it can make this step more challenging.
- Children may think calculations such as 3 + 19 are harder than 19 + 3, but should be encouraged to recognise that these are the same.

Key questions

- What numbers do you need to add together?
- How many tens are there in _____?
- What do you need to add to get to the next 10?
- What can you partition _____ into?
- How many more do you need to add?
- What is _____ plus _____?

Possible sentence stems

- The multiple of 10 after _____ is _____

  I need to add _____ to get to the next 10

  _____ + _____ = _____

  I need to add _____ more.

  So _____ + _____ = _____

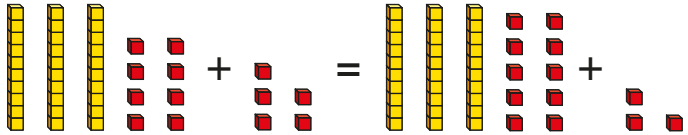
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add across a 10

Key learning

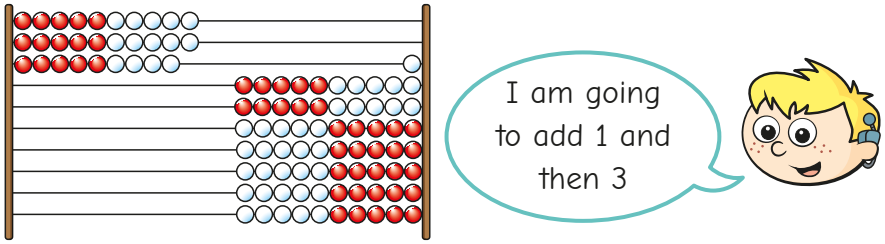
- The base 10 shows that 38 + 5 = 40 + 3



Use base 10 to work out the missing numbers.

- 29 + 5 = 30 + _____
- 18 + 4 = 20 + _____
- 45 + 7 = 50 + _____
- 67 + 9 = 70 + _____

- Max is using a Rekenrek to work out 29 + 4



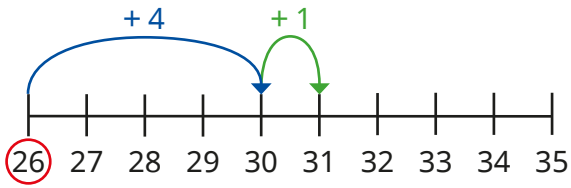
Why does Max do this?

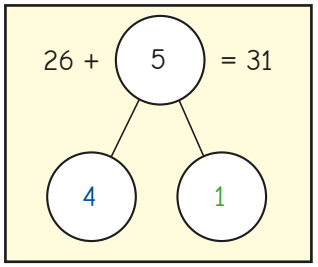
What is 29 + 4?

Use a Rekenrek to work out the additions.

18 + 6	67 + 5	75 + 6	33 + 9

- Here is Ben's method for working out 26 + 5





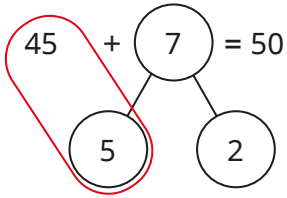
Use Ben's method to work out the additions.

44 + 8	2 + 19	37 + 6	9 + 59

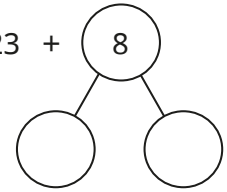
- Use bonds to 10 to complete the additions.

The first one has been started for you.

- 45 + 7 = 50 + _____ = _____



- 23 + 8

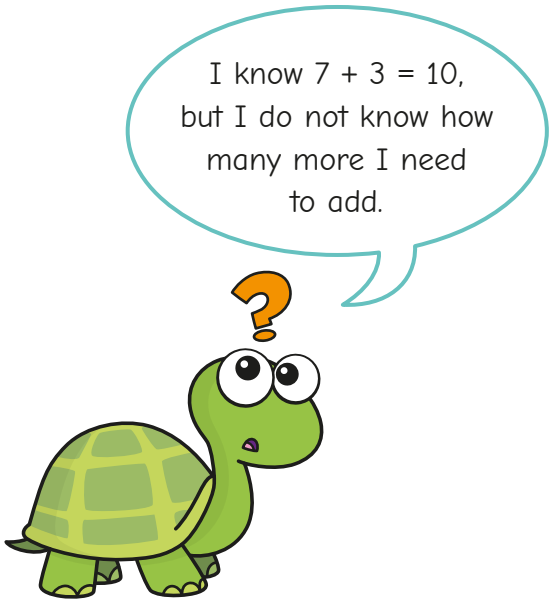


- 17 + 9
- 57 + 6

Add across a 10

Reasoning and problem solving

Tiny is working out 7 + 48



What can Tiny do to simplify the addition?

What is 7 + 48?

55

Work out the additions.

43 + 8	48 + 3
18 + 3	13 + 8
8 + 23	3 + 28
53 + 8	3 + 58

What do you notice?

Write a similar addition that has an answer of 71

51, 51

21, 21

31, 31

61, 61

63 + 8 or 68 + 3

Subtract across 10

Notes and guidance

So far in this block, children have added and subtracted 1s without crossing a 10 and have added across 10 or a multiple of 10. In this small step, children subtract from 2-digit numbers less than 20 where they are required to cross 10. They use strategies similar to those that they used for addition, partitioning the 1-digit number in order to get to 10 and then subtracting whatever is remaining.

The use of concrete resources such as ten frames and counters, base 10 and Rekenreks can support children in choosing the most efficient way to partition the 1-digit number they are subtracting and can also aid their understanding. Other representations, such as number lines for representing calculations and part-whole models for partitioning, are also useful throughout. All of these will support children as they start to move towards a mental strategy for subtracting across a 10

Things to look out for

- Children may find the difference between the ones rather than correctly performing the subtraction, for example 15 – 7 = 12 because 7 – 5 = 2
- If children incorrectly partition a number, this will lead to an incorrect answer.

Key questions

- How many do you start with?
- How many do you need to take away?
- What can you partition _____ into?
- How many do you need to subtract to get 10?
- How many more do you need to subtract?
- What is _____ less than _____?

Possible sentence stems

- I need to subtract _____ to get to 10

  I can partition _____ into _____ and _____

  I need to subtract _____ more.

  _____ less than _____ is _____

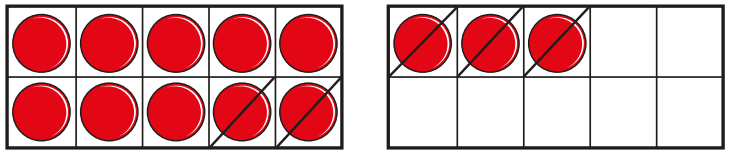
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Subtract across 10

Key learning

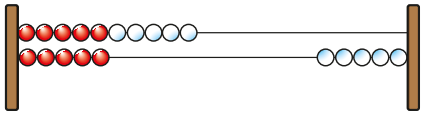
- The counters show that 13 – 5 = 10 – 2

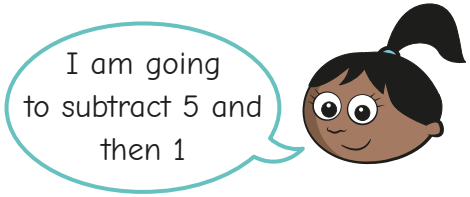


Use counters and ten frames to work out the missing numbers.

- 14 – 5 = 10 – _____
- 18 – 9 = 10 – _____
- 13 – 7 = 10 – _____
- 12 – 8 = 10 – _____

- Sam is using a Rekenrek to work out 15 – 6





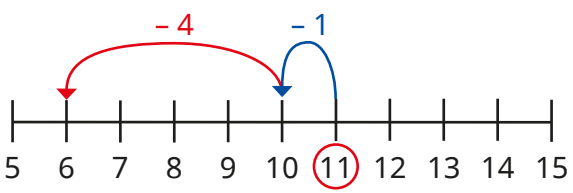
Why does Sam do this?

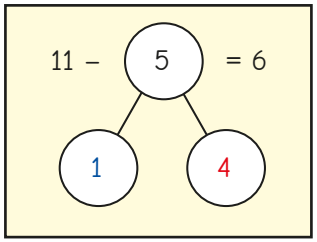
What is 15 – 6?

Use a Rekenrek to work out the subtractions.

16 – 8	15 – 9	14 – 7	13 – 9

- Here is Tom's method for working out 11 – 5



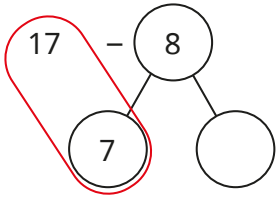


Use Tom's method to work out the subtractions.

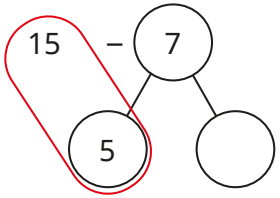
14 – 8	12 – 9	11 – 4	12 – 5

- Use bonds to 10 to complete the subtractions.

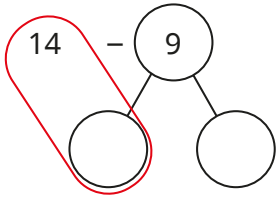
The first one has been started for you.



10 – ___ = ___



___ – ___ = ___

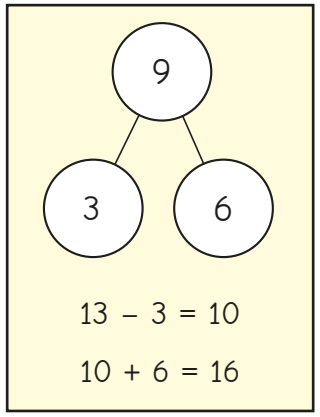


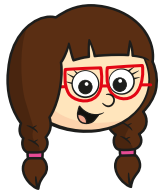
___ – ___ = ___

Subtract across 10

Reasoning and problem solving

Here are Jo's workings for 13 – 9





The answer is 16

How do you know Jo has made a mistake?

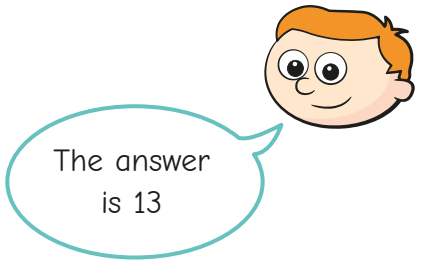
Explain the mistake.

What is 13 – 9?

Jo's answer is greater than the number she started with.

4

Ron is working out 15 – 8



Is Ron correct?

How do you know?

No

Ann has 14 stickers.

She gives some stickers to Ben.

Now she has 6 stickers.

How many stickers does she give to Ben?

How do you know?

8

Subtract from a 10

Notes and guidance

In this small step, children subtract a 1-digit number from any multiple of 10 within 100. Their knowledge of fact families for number bonds is particularly helpful here. For example, if they are calculating 50 – 6, they can use the fact that 6 + 4 = 10, so 10 – 6 = 4, and so 50 – 6 = 44

Rekenreks and number lines can be used to support children. Base 10 could be used, but might be less helpful for some children since they cannot physically break up the 10 rod. Counters and ten frames are less useful, because of the size of the numbers children are working with.

While children might initially count back using the chosen representations as support, it is essential that they do not rely too heavily on counting the individual ones, as they need to move towards a mental strategy.

Children are often more confident working out the missing number in 24 + _____ = 30 than they are calculating 30 – 6, so links to fact families and number bonds can provide support.

Things to look out for

- Children may not reduce the number of tens by 1, instead just using bonds to 10, for example 50 – 4 = 56

Key questions

- How many do you start with?
- How many do you need to take away?
- What is the bond to 10 for _____?
- What is _____ less than 10? So what is _____ less than _____?
- If you know that 4 + 6 = 10, what is 50 – 6?
- What do you notice about the tens? What do you notice about the ones?

Possible sentence stems

- When subtracting, the answer will be _____ than the number I start with.
- _____ + _____ = 10, so 10 – _____ = _____
- If 10 – _____ = _____, then _____ – _____ = _____

National Curriculum links

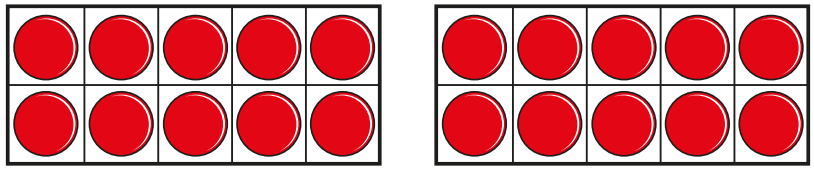
- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Subtract from a 10

Key learning

- Fill in the missing numbers.
  - 10 – 4 = _____
  - 10 – 7 = _____
  - 10 – 2 = _____
  - 10 – 1 = _____
  - 10 – _____ = 5
  - _____ = 10 – 3

- The ten frames show 20



Use the ten frames to work out the subtractions.

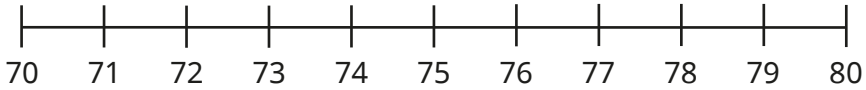
20 – 4	20 – 7	20 – 2
20 – 1	20 – 5	20 – 3

What do you notice?

- Complete the subtractions.

20 – 8	30 – 8	30 – 5	30 – 9

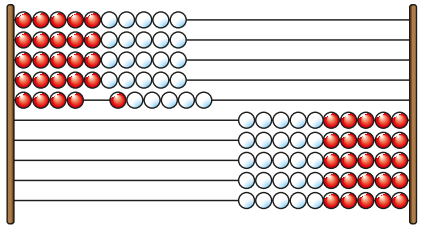
- Here is a number line.



Use the number line to work out the subtractions.

80 – 4	80 – 7	80 – 2
80 – 1	80 – 5	80 – 3

- Dan is using a Rekenrek to work out 50 – 6



What is 50 – 6?

Use a Rekenrek to work out the subtractions.

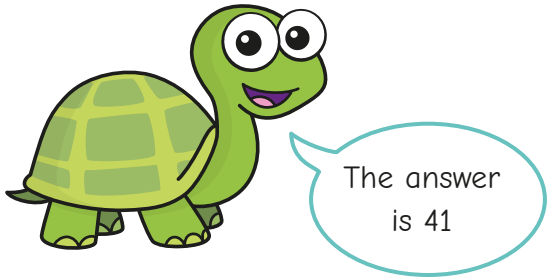
50 – 7	90 – 9	70 – 8	60 – 3

Subtract from a 10

Reasoning and problem solving

Tiny is working out 40 – 9

9 + 1 = 10



How do you know Tiny has made a mistake?

Explain the mistake.

What is 40 – 9?

31

Work out the subtractions.

10 – 4	6
20 – 4	16
30 – 4	26
40 – 4	36
50 – 4	46
60 – 4	56
70 – 4	66
80 – 4	76
90 – 4	86
100 – 4	96

What do you notice?

Subtract a 1-digit number from a 2-digit number (across a 10)

Notes and guidance

Now that children can subtract from a multiple of 10, in this small step they perform subtractions that cross a 10

All the calculations within this step require children to subtract a 1-digit number from a 2-digit number and, as with addition, knowledge of place value, in particular the fact that 10 ones make up 1 ten, is essential prerequisite knowledge and should be reinforced throughout. Links can be made to the learning from Step 10, where children partitioned a 1-digit number to make 10, and this idea can be applied here to support working with greater numbers. Base 10, Rekenreks and number lines can continue to be used and a part-whole model can support children in partitioning the 1-digit number.

Children are not required to set out their calculations using the formal written method.

Things to look out for

- Children may find the difference between the ones digits, for example 34 – 7 = 33 because 7 – 4 = 3
- When counting back, children may get to, for example, 50 and then go to 59, rather than recognising that they have crossed a 10 and should be at 49

Key questions

- How many do you start with?
- How many do you need to take away?
- What is the multiple of 10 before _____?
- What can you partition _____ into?
- How many do you need to subtract to get to the previous 10?
- How many more do you need to subtract?
- So what is _____ less than _____?

Possible sentence stems

- The previous multiple of 10 is _____
- _____ = _____ + _____, so
  _____ – _____ = _____ – _____ – _____
- I need to subtract _____ and then subtract another _____

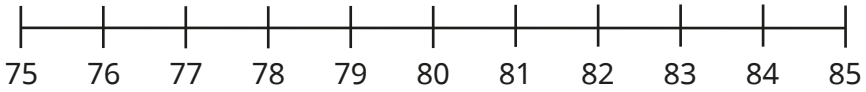
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and three 1-digit numbers

Subtract a 1-digit number from a 2-digit number (across a 10)

Key learning

- Here is a number line.

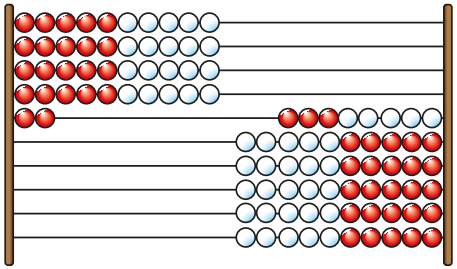


Use the number line to work out the subtractions.

83 – 1	83 – 3	83 – 5
83 – 2	83 – 4	83 – 6

What do you notice?

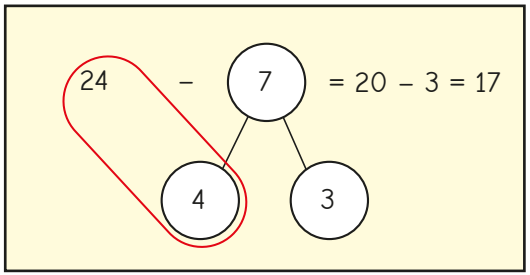
- The Rekenrek shows 42



Use the Rekenrek to work out 42 – 6

Use a Rekenrek to work out 75 – 9

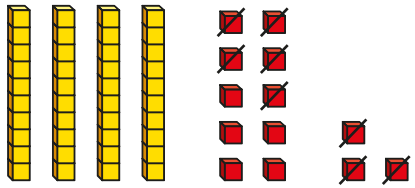
- Kay works out 24 – 7



Use Kay's method to work out the subtractions.

34 – 7	42 – 6	23 – 5	61 – 9

- Max is using base 10 to work out 53 – 8



Why did Max make 53 like this?

Use base 10 to work out the subtractions.

42 – 7	25 – 9	31 – 8	42 – 5

Subtract a 1-digit number from a 2-digit number (across a 10)

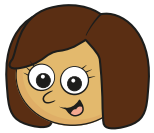
Reasoning and problem solving

Mo and Kim use different methods to work out 53 – 9

Mo

I am going to start at 53 and count back 9

I am going to subtract 3 and then subtract another 6



Kim

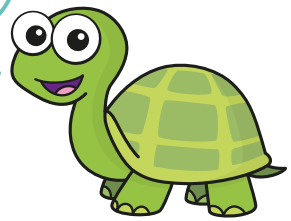
Choose a method to work out 53 – 9

Did you choose the same method as your partner?

44

Tiny is working out 61 – 8

8 – 1 = 7
so 61 – 8 = 67



Is Tiny correct?

How do you know?

No

Work out the missing number.

$32 - \square = 30 - 7$

9

10 more, 10 less

Notes and guidance

Earlier in this block, children added and subtracted 1-digit numbers, both with and without crossing a 10. In this small step, they focus on finding 10 more and 10 less than a given number within 100, in preparation for calculating with two 2-digit numbers that are not multiples of 10

Children should already be able to count in 10s from earlier learning, and this will help when finding 10 more or 10 less than a multiple of 10. The use of concrete manipulatives such as base 10 and Rekenreks can support children's understanding. Other representations such as hundred squares and number tracks can also be helpful.

Children need to pay close attention to the digits in the number before and after finding 10 more/less to recognise that the tens digit increases/decreases by 1, while the ones digit remains unchanged.

Things to look out for

- Children may add or subtract 1 from the ones digit rather than from the tens digit.
- Children may jump straight to the next/previous multiple of 10 rather than finding 10 more/less than the given number.

Key questions

- What number are you starting with?
- When you count on 10, what do you get?
- When you count back 10, what do you get?
- What is 10 more/less than _____?
- What do you notice about the number of tens?
- What do you notice about the number of ones?
- What do you notice about the positions of the numbers on the hundred square?

Possible sentence stems

- _____ has _____ tens and _____ ones.
- 10 more than _____ is _____
- 10 less than _____ is _____

National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

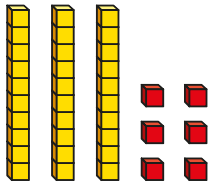
10 more, 10 less

Key learning

- Complete the number tracks.

10	20	30						
			35	45	55			

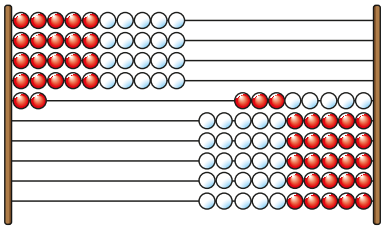
- The base 10 shows 36



What is 10 more than 36?

What is 10 less than 36?

- The Rekenrek shows 42



What is 10 more than 42?

What is 10 less than 42?

- 73 is circled on the hundred square.

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

Circle the number that is 10 more than 73

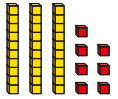
Circle the number that is 10 less than 73

Choose two more numbers to circle.

Circle 10 more and 10 less than each number.

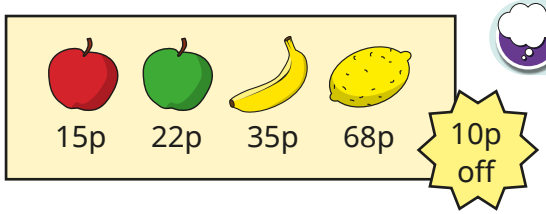
What do you notice?

- Draw base 10 and write numerals to complete the table.

10 less	Number	10 more
		
2	12	
		
	37	

10 more, 10 less

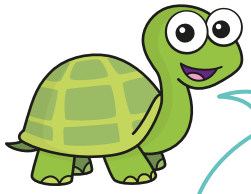
Reasoning and problem solving



Each piece of fruit is now 10p cheaper.

What are the new prices?

5p, 12p, 25p, 58p



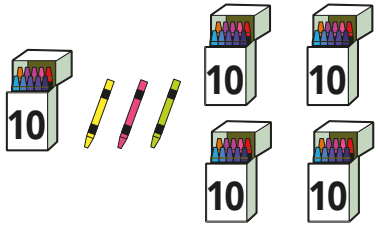
I know that 10 more than 72 is 82, because I only need to look at the tens digit.

Is Tiny correct?

How do you know?

Yes

Class 2 have these crayons.



They give 10 crayons away.

How many crayons do they have left?

How do you know?

43

Jo is counting backwards in 10s.

Forty-nine, thirty-nine, twenty-nine ...

What number comes next? Give your answer in words.

How did you work this out?

nineteen

Add and subtract 10s

Notes and guidance

In this small step, children add and subtract multiples of 10 from a given number, working within 100

Children can use their learning from the previous step where they recognised the effect that finding 10 more/less has on the tens digit. By unitising the tens in the number, they can also make connections to their earlier learning on adding ones and apply that here. For example, when calculating 43 + 20, they should recognise that they are adding 2 tens, so they can find 10 more and then 10 more again.

Base 10, Rekenreks and hundred squares can continue to be used to support children's understanding.

In the next step, children will add two 2-digit numbers, so secure understanding of this step is essential before moving on.

Things to look out for

- Children may add or subtract from the ones digit rather than from the tens digit.
- Children may jump straight to the next/previous multiple of 10 and then keep counting in 10s.

Key questions

- What number are you starting with?
- Count on/back 10. What do you get?
  Count on/back another 10. What do you get?
- 30 has _____ tens, so I need to add/subtract 10 _____ times.
- What is _____ more/less than _____?
- What do you notice about the number of tens?
- What do you notice about the number of ones?
- What do you notice about the positions of the numbers on the hundred square?

Possible sentence stems

- _____ has _____ tens.
- To add/subtract _____, I need to add/subtract 10 _____ times.

National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add and subtract 10s

Key learning

- Ben has these sweets.

He buys 2 more packets of sweets.

How many sweets does he have now?

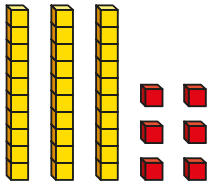
- Count in 20s to fill in the number track.

0	20			

- The base 10 shows 36

What is 20 more than 36?

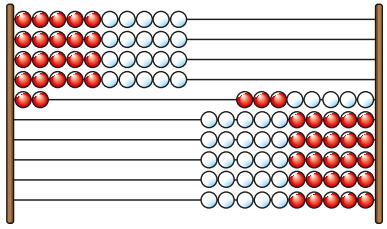
What is 20 less than 36?



- The Rekenrek shows 42

What is 42 + 30?

What is 42 – 30?



- 53 is circled on the hundred square.

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

Circle the answer to 53 + 40

Circle the answer to 53 – 40

Choose two more numbers between 40 and 60

Circle 40 more and 40 less than each number.

What do you notice?

- Work out the calculations.

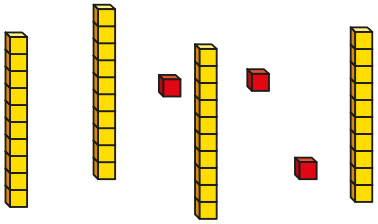
▶ 80 – 10	▶ 23 + 10	▶ 76 – 10
80 – 20	23 + 20	76 – 20
80 – 30	23 + 30	76 – 30
80 – 40	23 + 40	76 – 40

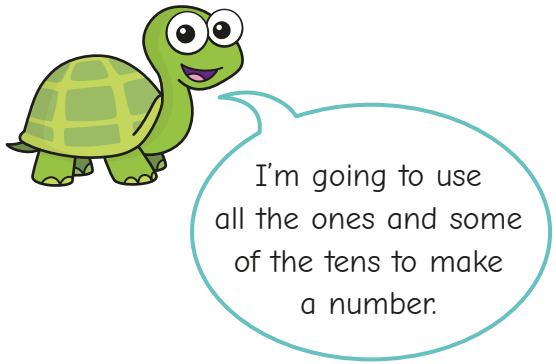
What do you notice?

Add and subtract 10s

Reasoning and problem solving

Tiny is making numbers with these pieces of base 10





What numbers can Tiny make?

Talk about your answer with a partner.

13, 23, 33

43 would require Tiny to use all of the tens.

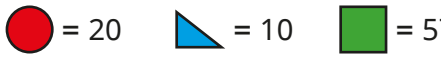
Class 2 has 26 crayons.

They are given 10 more crayons every day for 5 days.

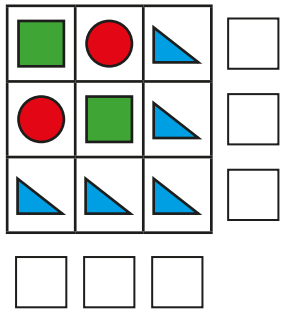
How many crayons do they have after 5 days?

How did you work this out?

76



What is the total of each row and column?



rows
(top to bottom):
87, 87, 30

columns
(left to right):
87, 87, 30

Add two 2-digit numbers (not across a 10)

Notes and guidance

This small step brings together all the learning on addition from earlier in the block, with children adding two 2-digit numbers composed of both tens and ones. The calculations in this step do not require children to make an exchange, as this will be covered explicitly at a later point.

Base 10 is a useful manipulative to support children with the learning in this step. Encourage them to set their numbers out in an organised way, for example one above the other with the tens together and the ones together. Setting them out in this way will support children later when they look at the column method for addition. While it will be tempting for children to consider the tens first, as they are used to working from left to right, encourage them to first consider how many ones they have altogether before looking at the tens. This will help to prevent misconceptions later in the block, when performing exchanges.

Things to look out for

- If children do not set out their concrete resources in an organised way, they may make numerical errors.
- Children may add the tens first, then the ones. While this will work for these questions, it will hold them back in later steps.

Key questions

- What numbers are you adding together?
- How many ones are there in each number?
- How many ones are there altogether?
- How many tens are there in each number?
- How many tens are there altogether?

Possible sentence stems

- _____ ones + _____ ones = _____ ones
  _____ tens + _____ tens = _____ tens
- There are _____ ones altogether.
  There are _____ tens altogether.
  _____ tens and _____ ones is _____

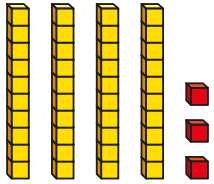
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add two 2-digit numbers (not across a 10)

Key learning

- Ann uses base 10 to make a number.

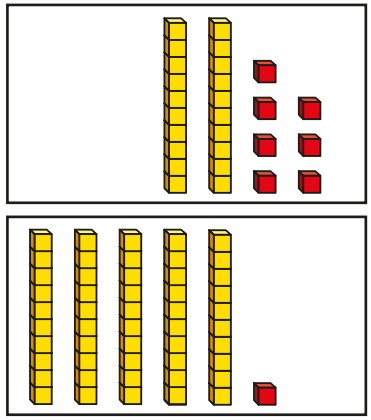


  - What is Ann's number?
  - Ann adds 4 more ones.

    What number does she have now?
  - Ann then adds 1 more ten.

    What number does she have now?
  - What has Ann added altogether?

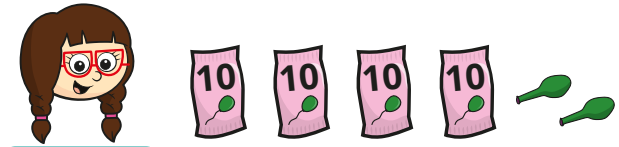
- Here are two numbers in base 10
  - How many ones are there altogether?
  - How many tens are there altogether?
  - What is the total of the two numbers?



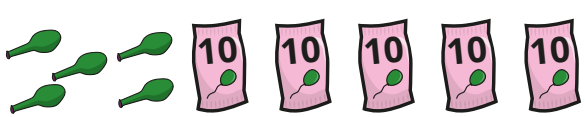
- Use base 10 to work out the additions.

52 + 14	23 + 31	37 + 22
78 + 11	42 + 27	63 + 35

- Jo and Ron each have some balloons.



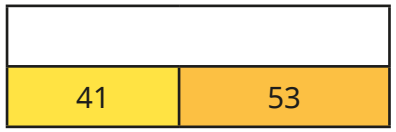
Jo

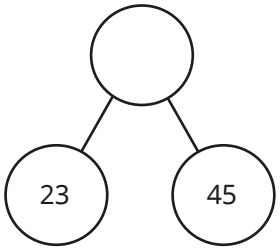


Ron

How many balloons do they have in total?

- Work out the wholes.

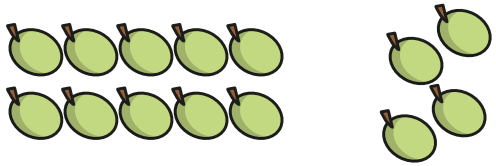




Add two 2-digit numbers (not across a 10)

Reasoning and problem solving

Ron has these grapes.

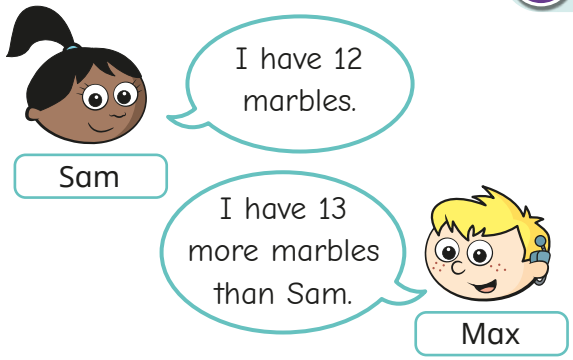


Teddy has 25 more grapes than Ron.

How many grapes does Teddy have?

39

Sam and Max have some marbles.

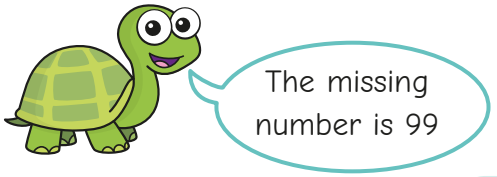


How many marbles do they have altogether?

37

Tiny is working out the missing number.

$57 = 42 + \square$



Explain the mistake Tiny has made.

What is the missing number?

15

What could the missing digits be?

$\_\_2 + \_\_5 = 87$

How many different answers can you find?

multiple possible answers, e.g.

1 and 7

5 and 3

Add two 2-digit numbers (across a 10)

Notes and guidance

In the previous step, children added two 2-digit numbers where there was no exchange. In this small step, they look at additions where they must exchange 10 ones for 1 ten. Their knowledge of place value will be used throughout to support their understanding of exchanges.

Base 10 can continue to be used to support learning. Encourage children to explain why they need to make an exchange when they have more than 10 ones.

As in the previous step, children should first consider how many ones they have before looking at the tens. They could also be encouraged to think about why they need to do it in this order.

Children do not need to set out their calculations using the column method, but should be encouraged to organise their manipulatives in a structured way.

Things to look out for

- Children may say, for example, 25 + 38 = 513 because 5 ones + 8 ones = 13 ones and 2 tens + 3 tens = 5 tens.
- Children may forget to add the extra ten that resulted from an exchange.

Key questions

- How many ones are there in each number?
- How many ones are there altogether?
- Can you make an exchange? Why?
- How many tens are there in each number?
- How many tens are there altogether?
- Did you include the ten from your exchange?

Possible sentence stems

- _____ has _____ tens and _____ ones.
- _____ ones + _____ ones = _____ ones
  _____ ones = _____ ten + _____ ones
- There are _____ ones, so I do/do not need to make an exchange.

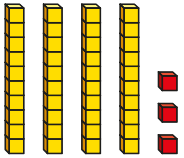
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Add two 2-digit numbers (across a 10)

Key learning

- Mo uses base 10 to make the number 43



  - Mo adds 8 more ones.

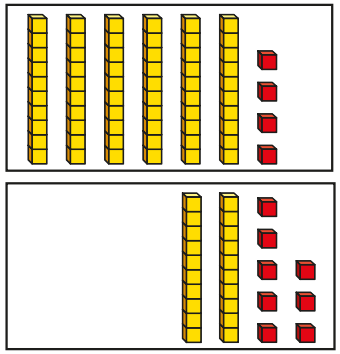
    What number does he have now?

  - Mo then adds 1 more ten.

    What number does he have now?

  - How many has Mo added altogether?

- Complete the sentences to work out 64 + 28



4 ones + 8 ones = _____ ones

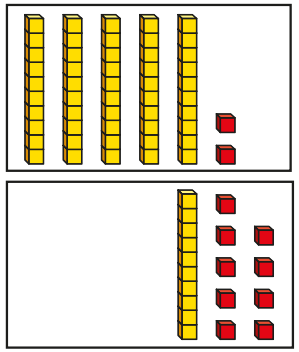
_____ ones = _____ ten + _____ ones

6 tens + 2 tens + _____ ten = _____ tens

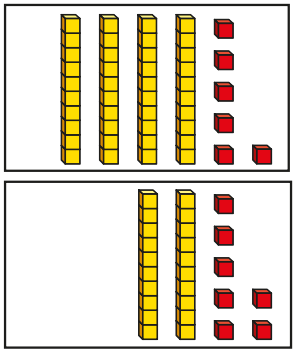
_____ tens + _____ ones = _____

- Use base 10 to work out the additions.

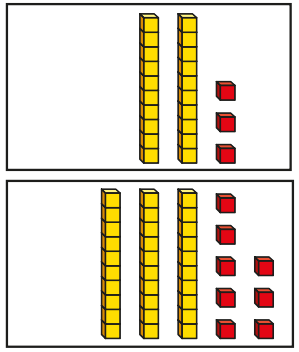
  - 52 + 19



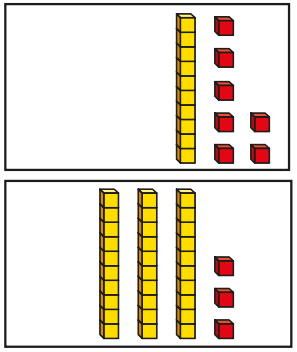
  - 46 + 27



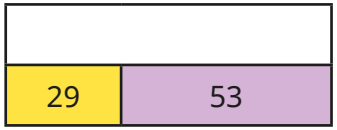
  - 23 + 38

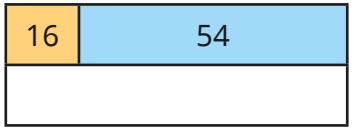


  - 17 + 33



- Work out the wholes.





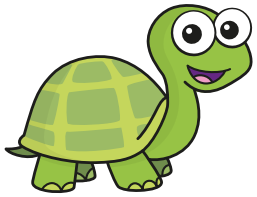
Add two 2-digit numbers (across a 10)

Reasoning and problem solving

Tiny is working out 57 + 26

7 ones + 6 ones = 13 ones

5 tens + 2 tens = 7 tens



The answer is 713

Do you agree with Tiny?

Talk about it with a partner.

No

Jo has 47 stickers.

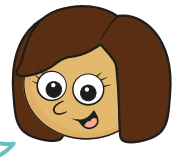
Ben has 16 more stickers than Jo.

How many stickers does Ben have?

63

Kim is working out 28 + 19

I know I need to make an exchange.



How does Kim know this?

What is 28 + 19?

8 + 9 is greater than 10

47

What could the missing digits be?

46 + 2__ = 7__

How many answers can you find?

multiple possible answers, e.g.

5 and 1

9 and 5

Subtract two 2-digit numbers (not across a 10)

Notes and guidance

This small step brings together all the learning on subtraction from earlier in the block, with children subtracting two 2-digit numbers composed of both tens and ones. The calculations in this step do not require children to make an exchange, as this will be covered explicitly once they are confident in completing calculations with no exchange.

Base 10 is a useful manipulative to support children with the learning in this step. Unlike addition, children will only need to make one of the numbers in the calculation: the number they are subtracting from. While it will be tempting for children to consider the tens first, as they are used to working from left to right, encourage them to first consider how many ones they have left before looking at the tens. This will help to prevent misconceptions later in the block when performing exchanges.

Things to look out for

- When adding, children used base 10 to make both numbers. Doing that here may cause confusion. Instead, they need to make the greater of the two numbers and "take away" the smaller one.
- Children may start by considering the tens first, which can cause problems with later learning.

Key questions

- What number are you subtracting from?
- What number are you subtracting?
- How many ones do you need to subtract?
- How many ones are left?
- How many tens do you need to subtract?
- How many tens are left?
- What is the difference between _____ and _____?

Possible sentence stems

- _____ ones – _____ ones = _____ ones

  _____ tens – _____ tens = _____ tens
- The difference between _____ and _____ is _____
- _____ minus _____ is equal to _____

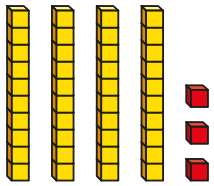
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Subtract two 2-digit numbers (not across a 10)

Key learning

- Ron uses base 10 to make a number.

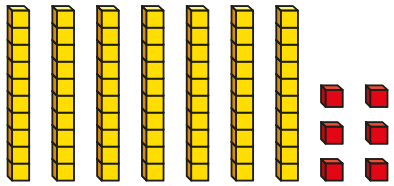


  - What is Ron's number?
  - Ron takes away 2 ones.

    What number does he have now?
  - Ron then takes away 3 tens.

    What number does he have now?
  - What number has Ron taken away altogether?

- The base 10 shows 76

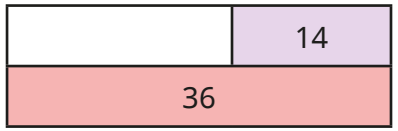


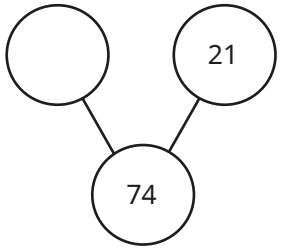
  - Subtract 4 ones.
  - Now subtract 2 tens.
  - What is 76 – 24?

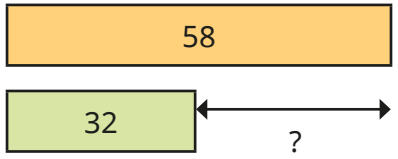
- Use base 10 to work out the subtractions.

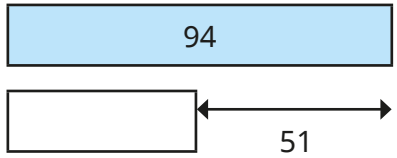
54 – 12	73 – 31	37 – 22
78 – 11	49 – 17	68 – 35

- Work out the missing parts.









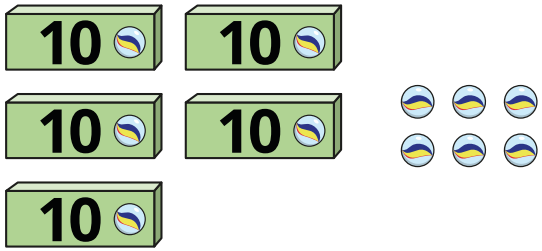
- Work out the difference between the numbers.

56 and 21	39 and 34	97 and 47

Subtract two 2-digit numbers (not across a 10)

Reasoning and problem solving

Kim has these marbles.



Sam has 22 fewer marbles than Kim.

How many marbles does Sam have?

How many marbles do they have altogether?

34

90

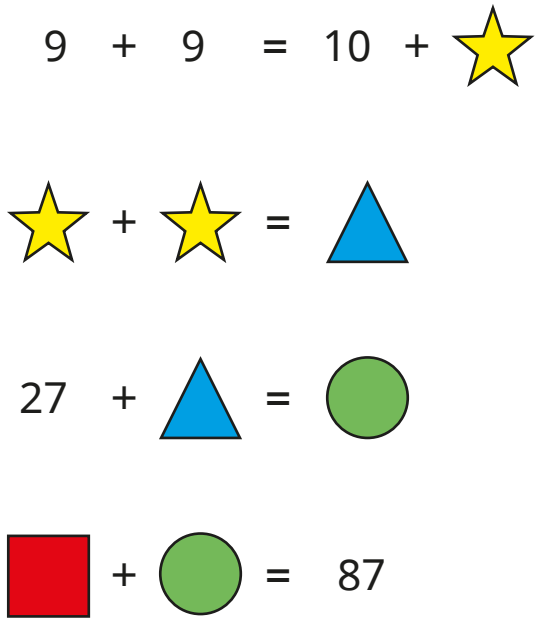
Tom has 47 stickers.

He gives Kay 16 stickers.

How many stickers does Tom have now?

31

Work out the value of 



How did you work this out?

44

Subtract two 2-digit numbers (across a 10)

Notes and guidance

In the previous step, children subtracted two 2-digit numbers where there was no exchange. In this small step, they look at calculations where they must exchange 1 ten for 10 ones in order to complete the subtraction. Their knowledge of place value will be used throughout to support their understanding of exchanges.

Base 10 can continue to be used to support learning, and children should be encouraged to explain why they need to make an exchange when the number that they are subtracting has more ones than the number they are subtracting from.

As in the previous step, children first consider how many ones they have left before looking at the tens. Encourage them to think about why they need to do it in this order.

Children do not need to set out their calculations using the column method, but should be encouraged to organise their manipulatives in a structured way.

Things to look out for

- Children may simply find the difference between the tens digits and the ones digits in order to avoid making an exchange, for example 81 – 25 = 64 because 8 – 2 = 6 and 5 – 1 = 4

Key questions

- What number are you subtracting from?
- How many ones do you need to subtract?
- What do you do if there are not enough ones?
- What can you exchange 1 ten for?
- How many tens do you need to subtract?
- How many tens are left?
- What is the difference between _____ and _____?

Possible sentence stems

- 1 ten is equal to _____ ones.
  I need to exchange _____ for _____
- I know I need to make an exchange because ...
- The difference between _____ and _____ is _____

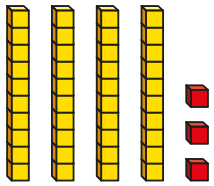
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

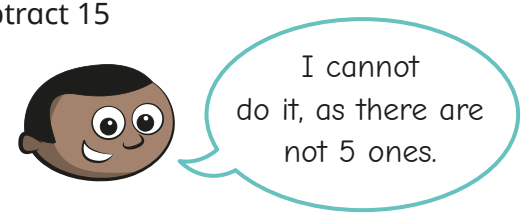
Subtract two 2-digit numbers (across a 10)

Key learning

- Mo uses base 10 to make the number 43

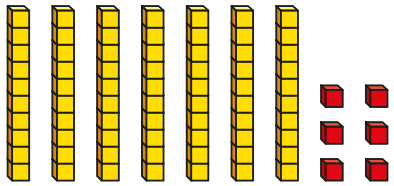


Mo wants to subtract 15



  - What does Mo need to do?
  - What is 43 – 15?

- Ann uses base 10 to make the number 76



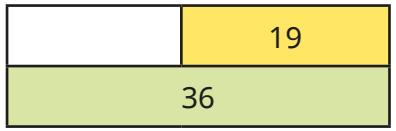
She exchanges 1 ten for 10 ones.

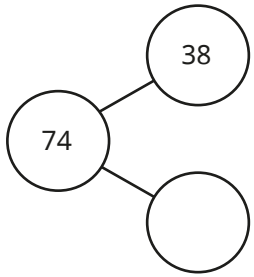
  - Draw the base 10 that Ann has now.
  - Use the base 10 to work out 76 – 19

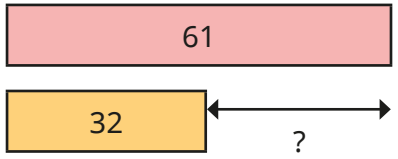
- Use base 10 to work out the subtractions.

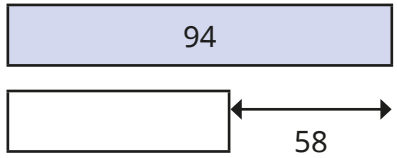
54 – 17	73 – 38	31 – 22
78 – 19	42 – 17	63 – 37

- Work out the missing parts.









- Work out the difference between the numbers.

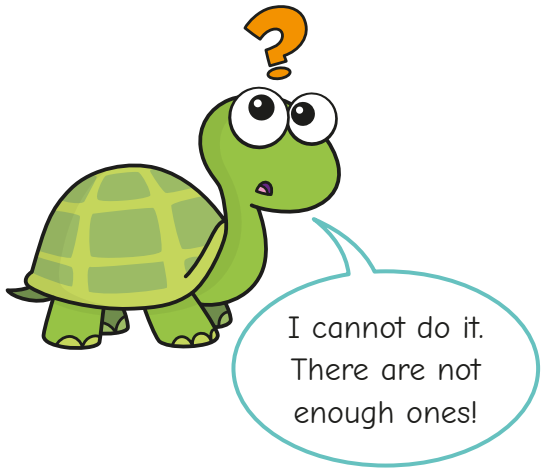
75 and 28	54 and 46	80 and 32

Subtract two 2-digit numbers (across a 10)

Reasoning and problem solving

Tiny is working out 45 – 29

4 tens – 2 tens = 2 tens
5 ones – 9 ones = ?



What mistake has Tiny made?

Work out 45 – 29

16

Ann is trying to work out the difference between 83 and 59

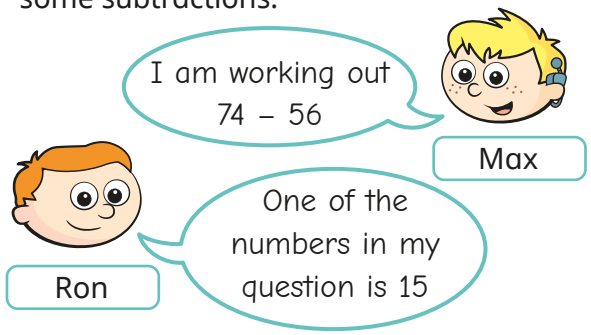
83 – 59 = 36

What mistake has Ann made?

What is the correct answer?

24

Max and Ron are working out some subtractions.



Max's answer is double Ron's answer.

What could Ron's subtraction be?

24 – 15

or

15 – 6

Mixed addition and subtraction

Notes and guidance

So far, children have looked in depth at addition and subtraction separately, and at calculations with and without exchanges separately. Now that they have this knowledge, this small step provides the opportunity for children to consolidate this learning while also requiring them to think about how to tackle each question.

Base 10 can continue to be used to support children, and they will need to think carefully about how they set this out for each question and whether they need to make both numbers or not. Word problems give rise to different structures of subtraction, so encourage children to explain what the numbers in the calculations represent in each case.

Before they begin a question, encourage children to consider whether it will require an exchange, and ask them to explain their decision.

Things to look out for

- If children make both numbers using base 10 to perform a subtraction, this can lead to confusion.
- When performing a subtraction, children may just find the difference between digits in each column, rather than make an exchange.

Key questions

- Is the question an addition or a subtraction? How do you know?
- Do you need to make both numbers using base 10? Why/why not?
- What does the number _____ represent in the calculation?
- Do you need to make an exchange? How do you know?

Possible sentence stems

- I know this is an addition/subtraction because ...
- I know I need to make an exchange because ...
- _____ plus _____ is equal to _____
- _____ subtract _____ is equal to _____

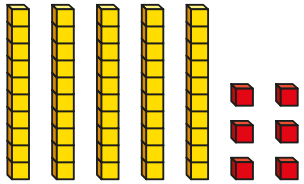
National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Mixed addition and subtraction

Key learning

- The base 10 shows 56



Use base 10 to work out the calculations.

56 + 23	56 + 19
56 – 23	56 – 19

- Fay and Mo are playing a game.

  Fay has 63 points.

  Mo has 18 points more than Fay.

  How many points does Mo have?

- Find the total of 24 and 16

- Find the difference between 95 and 68

- A jumper costs £25

  - A T-shirt costs £17 less than the jumper.

    How much does the T-shirt cost?

  - Mr Trent buys a jumper and a T-shirt.

    How much does he spend?

- Max has 45 stickers.

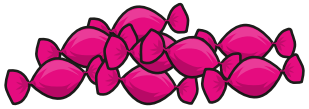
  Sam has 28 stickers.

  - How many more stickers does Max have than Sam?
  - How many stickers do they have altogether?

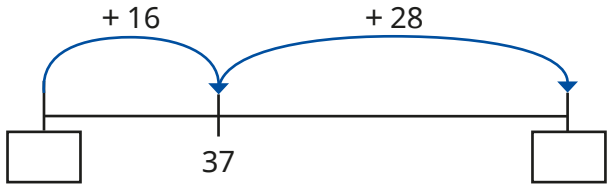
- Dan has 21 sweets.

  He gives 7 sweets to Ben.

  How many sweets does Dan have left?



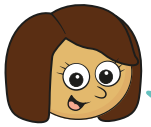
- Work out the missing numbers on the number line.



Mixed addition and subtraction

Reasoning and problem solving

Kim, Jo and Mo are each thinking of a number.



My number is 7 less than 63

Kim

Kim's number is 29 more than my number.

Jo

My number is the sum of Kim's and Jo's numbers.

Mo

What number is Mo thinking of?

How did you work this out?
Talk about it with a partner.

83

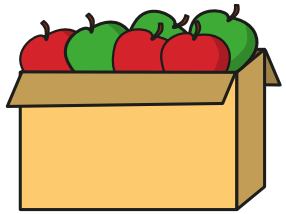
There are 52 apples in a box.

35 of the apples are red.

The rest of the apples are green.

23 green apples are added to the box.

How many green apples are there in the box?



40

The difference between two 2-digit numbers is 42

What could the numbers be?

Compare answers with a partner.

multiple possible answers, e.g.

53 and 11

49 and 91

Compare number sentences

Notes and guidance

Children should already be familiar with the inequality symbols and in this small step they use them to compare number sentences. Encourage children to use correct mathematical language to say their answer in words, for example 4 + 7 > 4 + 5 should be said as "4 plus 7 is greater than 4 plus 5".

The focus of this small step is not just on working out the values of the calculations, but rather comparing the numbers within them. For example, when comparing 32 + 24 and 32 + 27, children do not need to work out both totals; instead, they should recognise that 32 is the same in each, and since 27 is greater than 24, this means that 32 + 27 is greater than 32 + 24

Children need to consider carefully when comparing subtractions, as even though 27 is greater than 24, 32 – 27 is not greater than 32 – 24, because they are subtracting more.

Things to look out for

- Children may need reminding of the meaning of the inequality symbols.
- When comparing calculations, children may automatically find the value of each number sentence rather than considering the numbers that they are made up of.

Key questions

- What do the symbols >, < and = mean?
- Do you need to work out the answer to each calculation? Why/why not?
- When you add a greater number, is the answer greater or smaller?
- When you subtract a greater number, is the answer greater or smaller?

Possible sentence stems

- _____ is greater/less than _____
- _____ is greater than _____, so _____ + _____ is greater than _____ + _____
- _____ is less than _____, so _____ – _____ is greater than _____ – _____

National Curriculum links

- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers
- Compare and order numbers from 0 up to 100; use <, > and = signs

Compare number sentences

Key learning

- Complete the calculations.

35 + 12	27 + 25	41 – 18

Choose the correct phrase to compare the calculations.

greater than	less than	equal to

- 35 + 12 is _____ 27 + 25
- 35 + 12 is _____ 41 – 18
- 27 + 25 is _____ 35 + 12
- 27 + 25 is _____ 41 – 18
- 41 – 18 is _____ 35 + 12
- 41 – 18 is _____ 27 + 25

Write <, > or = to compare the calculations.

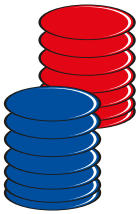
- 35 + 12 ◯ 27 + 25
- 35 + 12 ◯ 41 – 18
- 27 + 25 ◯ 35 + 12
- 27 + 25 ◯ 41 – 18
- 41 – 18 ◯ 35 + 12
- 41 – 18 ◯ 27 + 25

- Ben has 15 blue counters and 12 red counters.

  Kay has 15 blue counters and 17 red counters.

  Who has more counters?

  How do you know?



- Sam and Ron each have 50 stickers.

  Sam gives 32 stickers away.

  Ron gives 17 stickers away.

  Who has more stickers left?

  How do you know?

- Write <, > or = to compare the calculations.

  - 53 + 19 ◯ 53 + 25
  - 53 – 19 ◯ 53 – 25
  - 27 + 31 ◯ 42 + 27
  - 71 – 43 ◯ 71 – 39
  - 56 – 43 ◯ 56 – 43
  - 60 – 15 ◯ 58 – 15

Compare number sentences

Reasoning and problem solving

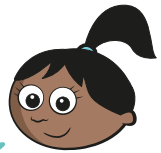
Jo and Sam are comparing the additions.

42 + 19 ◯ 23 + 42

I am going to start by working out the answers.

Jo

I do not need to do that. I already know the answer.



Sam

How does Sam already know the answer?

What is the missing symbol?

<

Work out the missing digit.

27 + 39 = 17 + __ 9

4

Max is working out the missing symbol.

14 – 5 ◯ 14 + 5

The missing symbol must be =, because the numbers are the same in both calculations.

Do you agree with Max?

Explain your answer.

No

Missing number problems

Notes and guidance

In this small step, children use their knowledge of place value and addition and subtraction in order to find missing numbers in calculations.

The types of questions that they will see in this small step are, for example, 10 + 6 = 13 + _____. They could partition the 6 into 3 and 3 to find the missing number, or they could consider that 13 is 3 more than 10, so the missing number must be 3 less than 6 in order for the two calculations to be equal. Correct mathematical language can support children's understanding. For example, if the example above is read as "10 plus 6 is equal to 13 plus something", this can support children in understanding what they need to do, whereas if the = symbol was read as something else, such as "makes", this understanding is likely to be hindered.

Things to look out for

- When finding the missing number in 10 + 6 = 13 + _____, children may think that because 13 is 3 more than 10, then the missing number must be 3 more than 6
- Children may try to complete a series of calculations to find the missing number, rather than think about the connections between the numbers in the question.

Key questions

- What can you partition _____ into?
- How does that help you to work out the missing number?
- If one number increases by _____ ones, what must happen to the other number if the answer is the same?
- Do you need to work out the answer to each calculation?
- How can you check your answer?
- What do you notice about the numbers?

Possible sentence stems

- _____ can be partitioned into _____ and _____

  _____ + _____ = _____ + _____ + _____

  _____ is _____ more than _____, so the missing number must be _____

National Curriculum links

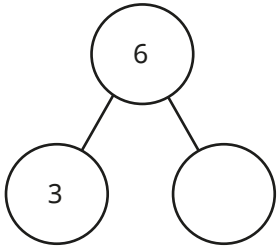
- Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: a 2-digit number and 1s, a 2-digit number and 10s, two 2-digit numbers and adding three 1-digit numbers

Missing number problems

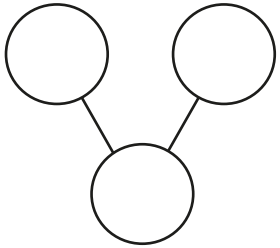
Key learning

- Complete the part-whole models and number sentences.

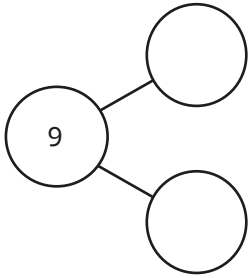
10 + 6 = 13 + _____



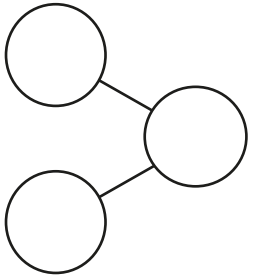
50 + 8 = _____ + 52



20 + 9 = 25 + _____



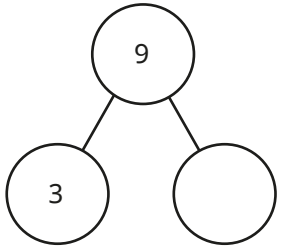
_____ + 31 = 40 + 2



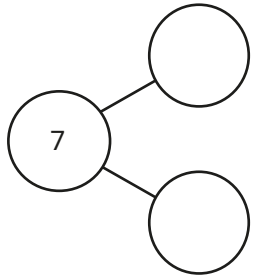
- Work out the missing numbers.
  - 45 + 8 = 50 + _____
  - 45 + 8 = 51 + _____
  - 45 + 8 = 49 + _____
  - 45 + 8 = _____ + 47

- Complete the part-whole models and number sentences.

53 – 9 = 50 – _____



64 – 7 = 60 – _____



- Work out the missing numbers.
  - 22 – 7 = 20 – _____
  - 22 – 7 = 23 – _____
  - 22 – 7 = 19 – _____
  - 22 – 7 = _____ – 6

- Work out the missing numbers.
  - 23 + 35 = 24 + _____
  - 50 – 16 = 49 – _____
  - 42 + _____ = 32 + 18
  - 75 – 21 = _____ – 31

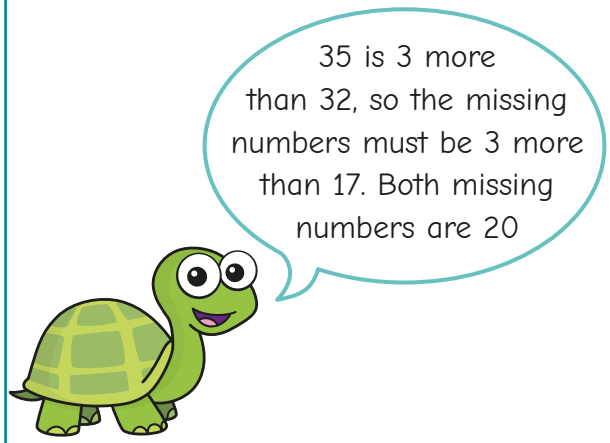
Missing number problems

Reasoning and problem solving

Tiny is working out the missing numbers.

$32 + 17 = 35 + \square$

$32 - 17 = 35 - \square$



Do you agree with Tiny?

Explain your answer.

No

Kim and Jo each have some money.

Kim has £40

She buys a coat.

Jo buys a dress.

They both have the same amount of money left.

How much money did Jo have at the start?

How did you work this out? Talk about it with a partner.

£38

Autumn Block 3

Shape

Small steps

Step 1	Recognise 2-D and 3-D shapes
Step 2	Count sides on 2-D shapes
Step 3	Count vertices on 2-D shapes
Step 4	Draw 2-D shapes
Step 5	Lines of symmetry on shapes
Step 6	Use lines of symmetry to complete shapes
Step 7	Sort 2-D shapes
Step 8	Count faces on 3-D shapes

Small steps

Step 9	Count edges on 3-D shapes
Step 10	Count vertices on 3-D shapes
Step 11	Sort 3-D shapes
Step 12	Make patterns with 2-D and 3-D shapes

Recognise 2-D and 3-D shapes

Notes and guidance

Children begin this block by recapping their understanding of shape from Year 1

Before learning about the properties of shapes, children need to recognise and name both 2-D and 3-D shapes and differentiate between them.

It is important that children have the chance to see and feel the shapes. They should begin to understand that 2-D shapes are flat and that the manipulatives they handle in class are representations of the shapes.

Children should be able to recognise both standard and non-standard representations of 2-D and 3-D shapes. For example, they should notice that there is no such thing as an 'upside down triangle'; instead, it is just a triangle in a different orientation.

Things to look out for

- Children may not recall the names of all 2-D and 3-D shapes.
- Children may call 3-D shapes by the names of the faces, for example calling a cube a square.
- Children may not be able to differentiate between 2-D and 3-D shapes, particularly when looking at an image.

Key questions

- What is the difference between a 2-D and a 3-D shape?
- What is the name of this shape? How do you know?
- Does a _____ always look the same? Can you think of some examples?
- What 2-D shapes can you see on this 3-D shape?
- How do you know that this shape is a _____?
- Which shape is the odd one out? How do you know?

Possible sentence stems

- This shape is a _____ because ...
- A _____ is a 2-D shape.
- A _____ is a 3-D shape.

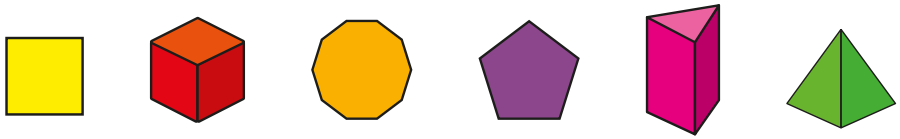
National Curriculum links

- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

Recognise 2-D and 3-D shapes

Key learning

- Here are some shapes.

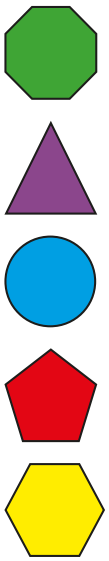


Which of the shapes are 2-D?

Which of the shapes are 3-D?

Can you find any other 2-D and 3-D shapes in your classroom?

- Match the 2-D shapes to the names.

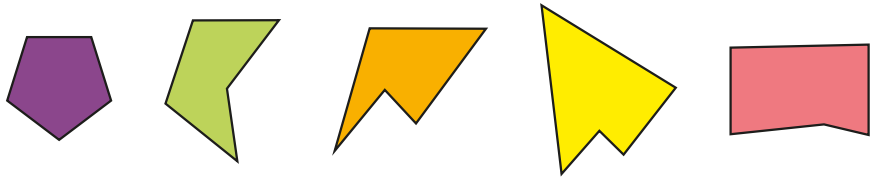


circle
octagon
hexagon
triangle
pentagon

- Match the 3-D shapes to the names.

cuboid	pyramid	sphere	cube	cone

- Which of the shapes are pentagons?



Send children on a shape hunt.

Ask them to draw the shapes they see.

Questions that could be asked after this activity are:

"How many pentagons did you see?"

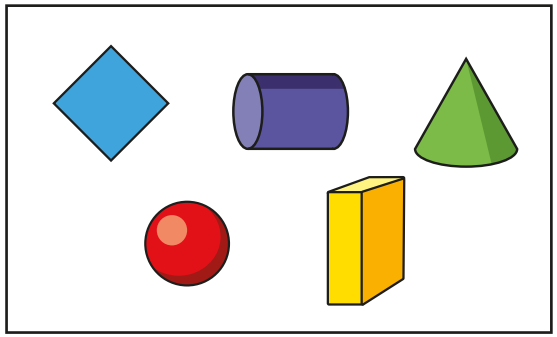
"How many hexagons did you see?"

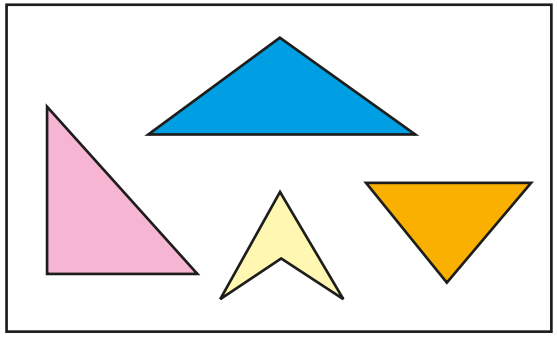
"What shape did you see the most?"

Recognise 2-D and 3-D shapes

Reasoning and problem solving

Which shape is the odd one out in each set?

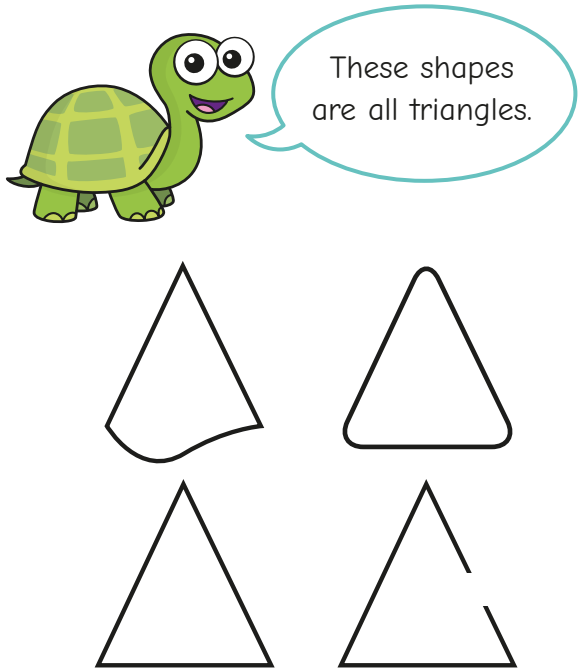




How do you know?

square

arrow shape



Do you agree with Tiny?

Why?

No

Count sides on 2-D shapes

Notes and guidance

In the next few small steps, children explore in more detail the properties of 2-D shapes, starting by counting the number of sides.

Children need to know that the sides of a shape are the straight lines that form its outline. They should have experience of feeling models of the shapes and running their fingers along each side as they count. They may not be accurate when counting the sides, so encourage them to develop strategies such as marking sides as they count them.

Children need to know that they can use the number of sides to identify the shape. They may have a standard mental image of, for example, a triangle, but should be aware that any shape with three straight sides is a triangle.

Things to look out for

- Children may miscount the sides of shapes, either not counting all the sides or counting a side more than once.
- Children may identify a shape using a mental image, rather than counting its sides.
- Children may believe that all 4-sided shapes look the same.

Key questions

- What is a side?
- How can you count the sides of a shape accurately?
- How many sides does a _____ have?
- Does a shape with _____ sides always look the same? Can you think of some examples?
- What is the name of a shape with _____ sides?
- How many triangles/squares/pentagons can you make with 15 lolly sticks?

Possible sentence stems

- A triangle has _____ straight sides.
- A _____ has _____ straight sides.
- I know I have counted all the sides because ...
- I know this shape is a _____ because ...

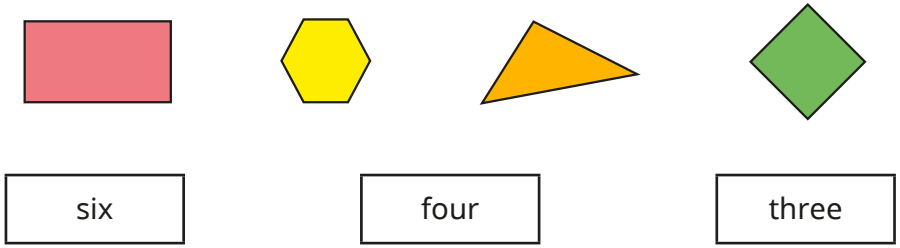
National Curriculum links

- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

Count sides on 2-D shapes

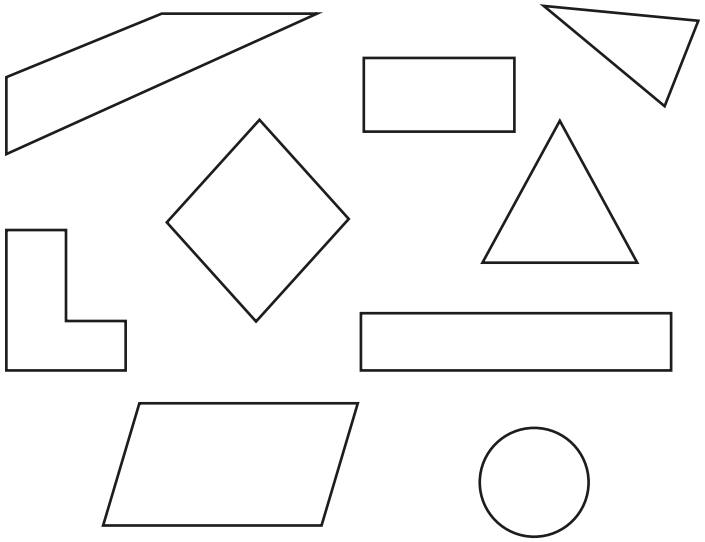
Key learning

- Match the shapes to the number of sides.



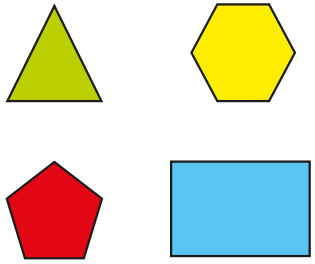
six | four | three

- Colour the shapes with four sides.



What do you notice?

- Complete the sentences.



The triangle has _____ sides.

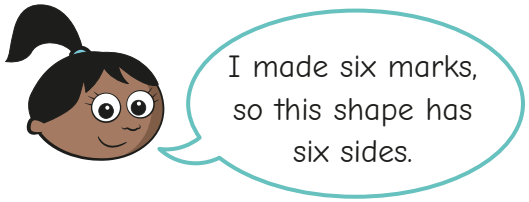
The rectangle has _____ sides.

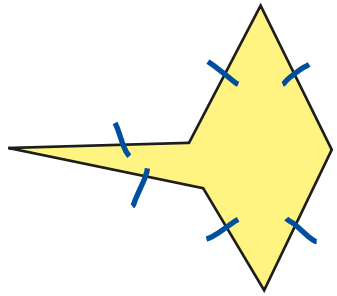
The pentagon has _____ sides.

The _____ has _____ sides.

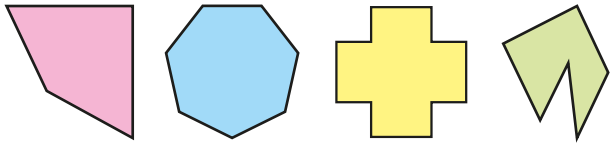
- Sam is counting the sides on 2-D shapes.

She marks each side as she counts it.





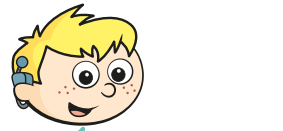
How many sides does each shape have?

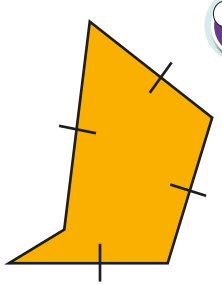


Do all shapes with the same number of sides look the same?

Count sides on 2-D shapes

Reasoning and problem solving



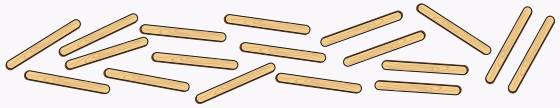


Is Max correct?

How do you know?

No

Give children 18 lolly sticks.

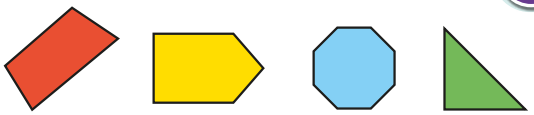


Ask children how many hexagons they can make. How many octagons can they make?

Get them to explore other shapes they can make with the lolly sticks.

various answers

Here are some shapes.



Which shape has the fewest sides?

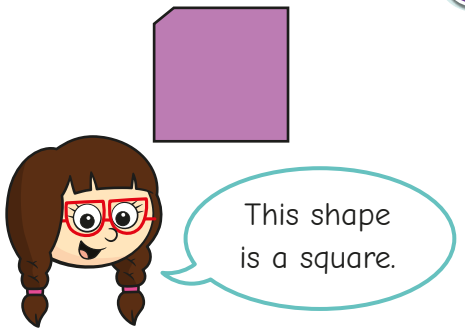
Which shape has the most sides?

How do you know?

triangle

octagon

Jo is looking at this shape.



Do you agree with Jo?

Why?

No

Count vertices on 2-D shapes

Notes and guidance

Building from the previous small step, children count vertices on 2-D shapes. This is the first time that children have encountered the terms "vertex" and "vertices". They should understand that a vertex is formed where two sides meet, and "vertices" is used when referring to more than one vertex. Children may already know these as being a corner or corners, but should be encouraged to use the correct terminology from this point on.

Children should notice that a shape has the same number of sides as it has vertices. As with the previous step, children should be able to feel the shape when counting the vertices and be taught efficient strategies for counting.

Children count vertices of standard and non-standard versions of shapes and use this to identify and name shapes.

Things to look out for

- Children may miscount the number of vertices a shape has, either by not counting all the vertices or counting a vertex more than once.
- Children may not recognise that a shape has the same number of sides and vertices.

Key questions

- What is a vertex?
- How can you count the vertices of a shape accurately?
- How many vertices does a _____ have?
- Does a shape with _____ vertices always look the same? Can you think of some examples?
- What is the name of a shape with _____ vertices?
- How many sides does this shape have? How many vertices does it have?
- What do you notice?

Possible sentence stems

- A square has _____ vertices and _____ sides.
- A _____ has _____ vertices and _____ sides.
- The number of vertices a shape has is _____ to the number of sides.
- I know that I have counted all the vertices because ...

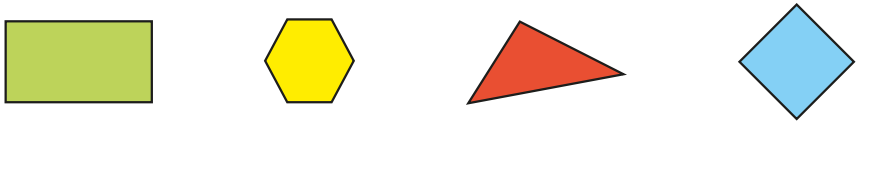
National Curriculum links

- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

Count vertices on 2-D shapes

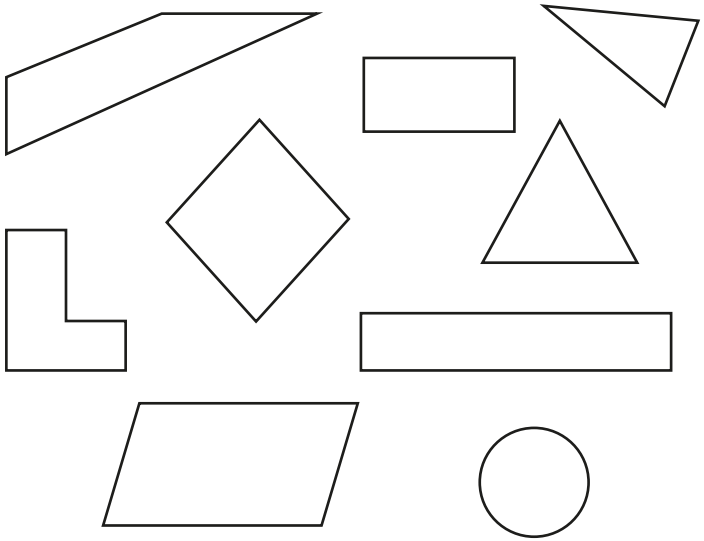
Key learning

- Match the shapes to the number of vertices.



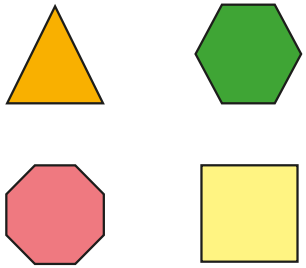
six | four | three

- Colour the shapes with 4 vertices.



What do you notice about the number of vertices and the number of sides?

- Complete the sentences.



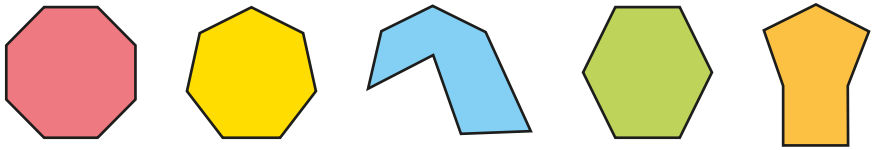
The triangle has _____ vertices.

The hexagon has _____ vertices.

The _____ has _____ vertices.

The _____ has _____ vertices.

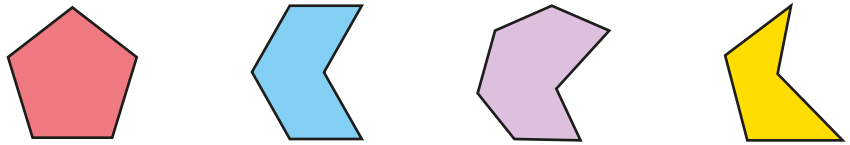
- Which shapes have 7 vertices?



How did you count the vertices?

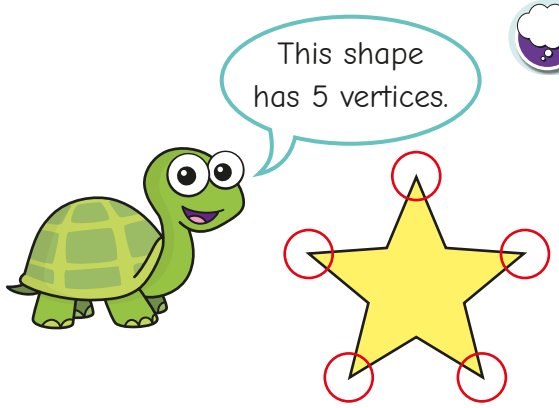
- How many vertices does each shape have?

Mark them as you count so that you do not miss any.



Count vertices on 2-D shapes

Reasoning and problem solving



Do you agree with Tiny?

Why?

No

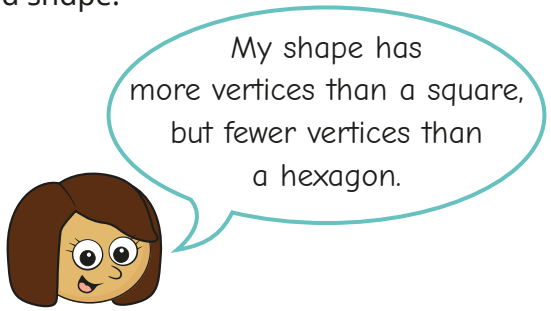
Is the statement always true, sometimes true or never true?

A square has 4 vertices.

Explain your answer.

always true

Kim and Jo are each thinking of a shape.

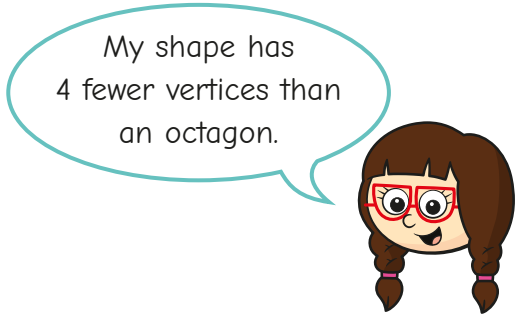


What shape is Kim thinking of?

Draw Kim's shape.

pentagon

any quadrilateral, e.g. square, rectangle



What shape could Jo be thinking of?

Draw 2-D shapes

Notes and guidance

In this small step, children use their knowledge of the properties of shapes to accurately draw 2-D shapes.

Children begin by using straws and modelling clay to explore how to make shapes before using dotted and squared paper to draw them using a pencil and ruler. When making shapes, children should be encouraged to consider what the straws represent (sides) and what the modelling clay represents (vertices). For some children, accurately drawing shapes might be difficult, and drawing a shape using a ruler may need to be modelled. They should use their knowledge of vertices and sides when drawing shapes, to help with accuracy.

Things to look out for

- Children may find it difficult to use a ruler accurately.
- Children may not draw their shapes with straight sides.
- Children may not start lines at a vertex, which could mean that they draw an extra side/vertex.
- Children may believe that there is only one way to draw a shape with a given number of sides.

Key questions

- How can you make the 2-D shape using straws and modelling clay?
- How can you change your shape to a different one?
- How can you accurately draw a _____?
- How do you know you have drawn a _____?
- Is there more than one way to draw a _____?
- Can you draw a polygon without a ruler? Why/why not?

Possible sentence stems

- To make a _____, I need _____ straws and _____ balls of modelling clay.
- To draw a _____, I need to draw _____ sides and _____ vertices.
- I know that I have drawn a _____, because it has _____ sides and _____ vertices.

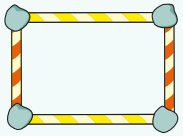
National Curriculum links

- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

Draw 2-D shapes

Key learning

Show children how to make a rectangle using straws and modelling clay.



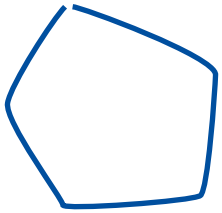
Ask children what the modelling clay represents.

Ask them what the straws represent.

Ask children to make a square and a triangle.

Can they make any other shapes?

- Ron is drawing shapes.



What has Ron done well?

How can Ron improve?

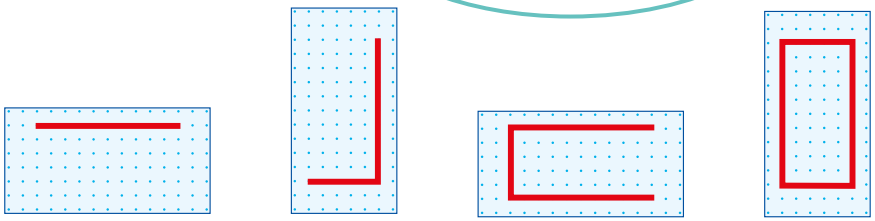
- Draw the shapes on squared paper.
  - three rectangles
  - three squares
  - three triangles

- Draw the shapes on squared paper.
  - three pentagons
  - three hexagons
  - two octagons

Compare answers with a partner.

Do your shapes look the same?

- Jo is drawing a rectangle on dotted paper.



Draw the shapes on dotted paper.

square	triangle	pentagon

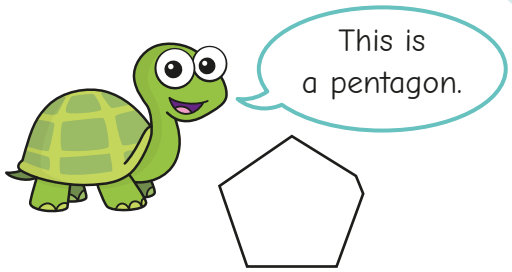
Which shape was the easiest to draw?

Which was the hardest?

Draw 2-D shapes

Reasoning and problem solving

Tiny draws a 2-D shape.



Do you agree with Tiny?

Why?

No

Max draws a 2-D shape.

Draw Max's shape.

Is there more than one way to draw the shape?

any hexagon

Give children a piece of squared or dotted paper, a pencil and a ruler and ask them to follow your instructions.

Ask them to draw a large rectangle.

Now ask them to draw a square inside the rectangle.

Now ask them to draw a triangle below the rectangle.

Finally, ask them to draw a pentagon that is bigger than the square.

Get children to compare their answers.

Do all their drawings look the same?

Can they make up their own instructions for a partner?

multiple possible answers

Lines of symmetry on shapes

Notes and guidance

In this small step, children are introduced to the concept of vertical lines of symmetry.

Show children symmetrical pictures and ask them to think about what "symmetrical" means. They could identify that a shape is symmetrical when both sides are the same. Give them shapes that they can cut out and fold to identify the shapes that have a vertical line of symmetry. After this, they look at shapes with a mirror line drawn to help identify whether a shape has a vertical line of symmetry. They could then draw their own mirror line or use mirrors to identify shapes with a vertical line of symmetry.

Children may point out that there are other lines of symmetry, and this can be explored, although it is not taught in this step.

Things to look out for

- If children do not draw their vertical line accurately, they will be unable to determine whether a shape is/is not symmetrical.
- Children may not use mirrors accurately.
- Children may identify other lines of symmetry that are not vertical.

Key questions

- What does "symmetrical" mean?
- How do you know if a shape is symmetrical?
- How can you use a mirror to help you?
- Is the shape the same on both sides?
- How do you know that this shape does/does not have a vertical line of symmetry?
- How can you be accurate when you are drawing a vertical line of symmetry?

Possible sentence stems

- This shape is symmetrical because ...
- I know that this is a line of symmetry because ...
- A mirror can help me find lines of symmetry because ...

National Curriculum links

- Identify and describe the properties of 2D shapes, including the number of sides, and line symmetry in a vertical line

Lines of symmetry on shapes

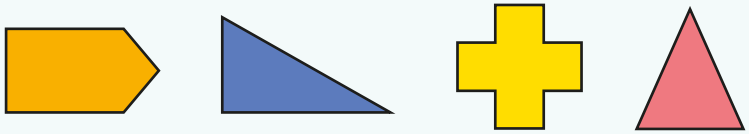
Key learning

Show children pictures of symmetrical butterflies.

Ask them what they notice about the pictures.

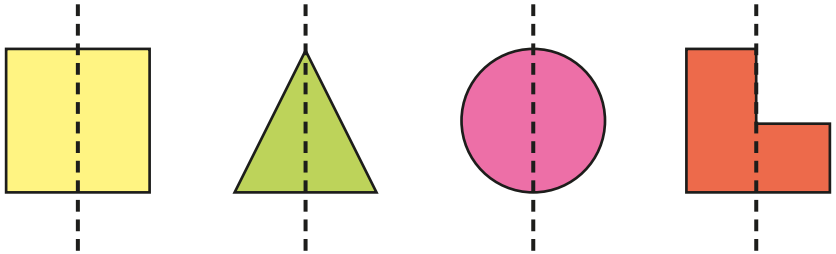
Say that when a picture is the same on both sides of a line, the shape is symmetrical.

Give children shapes that they can cut out.



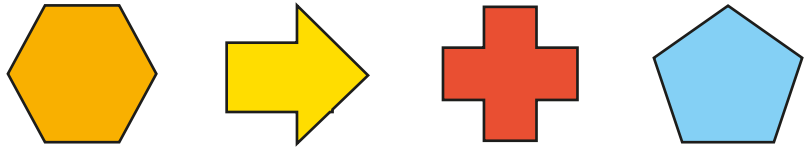
Ask children to fold the shapes to identify if they have a vertical line of symmetry.

- Which shapes have a vertical line of symmetry?



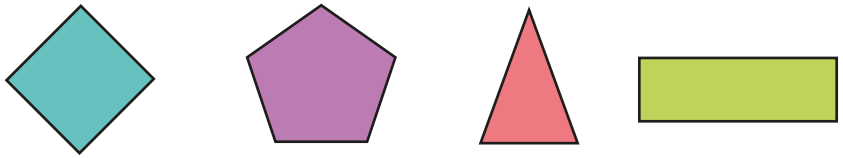
How do you know if a shape has a vertical line of symmetry?

- Which shapes have a vertical line of symmetry?

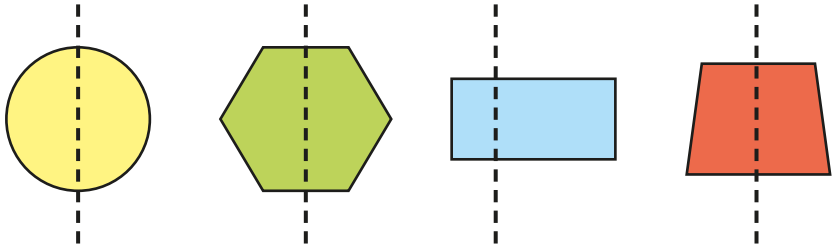


Explain your answers to a partner.

- Draw a vertical line of symmetry on each shape.



- Which lines of symmetry are correct?



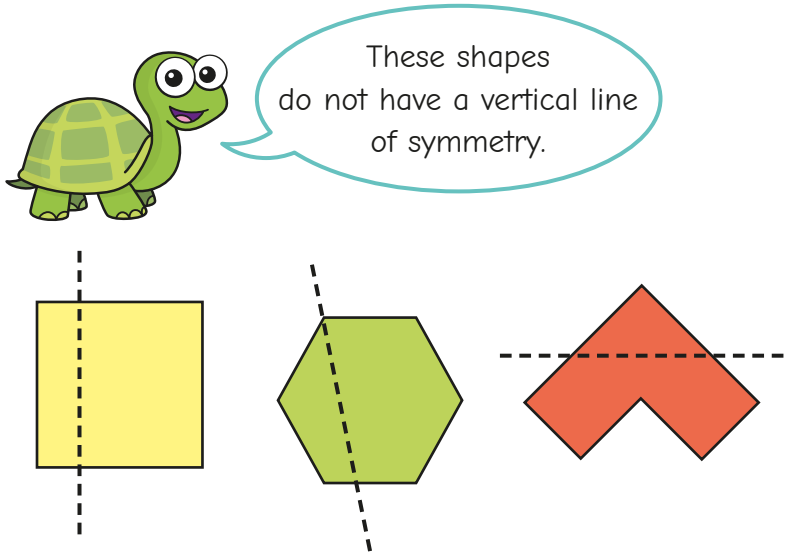
- Draw two shapes with a vertical line of symmetry.

  Draw two shapes with no vertical line of symmetry.

Lines of symmetry on shapes

Reasoning and problem solving

Tiny is finding lines of symmetry.



Do you agree with Tiny?

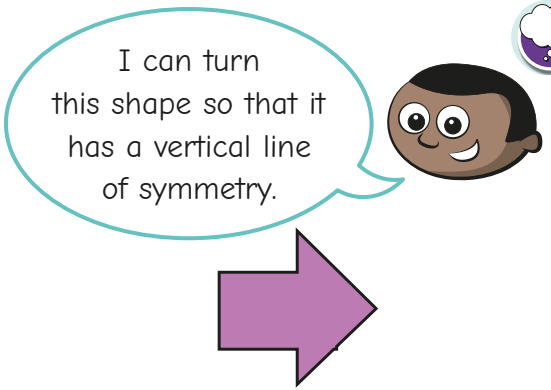
Why?

No

Does the picture have a vertical line of symmetry?

How do you know?

No



Do you agree with Mo?

Why?

Yes

Use lines of symmetry to complete shapes

Notes and guidance

In this small step, children use their knowledge of vertical lines of symmetry to complete shapes.

Children start by completing rectangles. Explore different methods, such as using mirrors and counting squares away from the mirror line. They then move on to more complicated rectilinear shapes, before completing shapes with diagonal lines.

Encourage children to plot the vertices first before joining up the shape. They should be encouraged to check each other's shapes using mirrors to ensure they are symmetrical. Once their understanding is secure, children could reflect complex images and create their own symmetrical pictures.

Things to look out for

- Children need to be able to use a ruler to draw 2-D shapes accurately or their drawings will not be symmetrical.
- Children may not reflect the image, but instead draw the same thing on the other side of the mirror line.
- Children may miscount the squares if they are counting away from the mirror line.
- Drawings may be less accurate when diagonal lines are introduced.

Key questions

- What does "symmetrical" mean?
- How could you complete the shape?
- How do you know if your drawing is symmetrical?
- How can counting the squares away from the mirror line help you?
- Why are shapes with diagonal lines more difficult to complete?
- How could marking the vertices and joining them up help you?
- What mistakes do you think you might make when completing this shape?

Possible sentence stems

- The vertex is _____ squares away from the mirror line.

  I need to count _____ squares away from the mirror line on the opposite side.

National Curriculum links

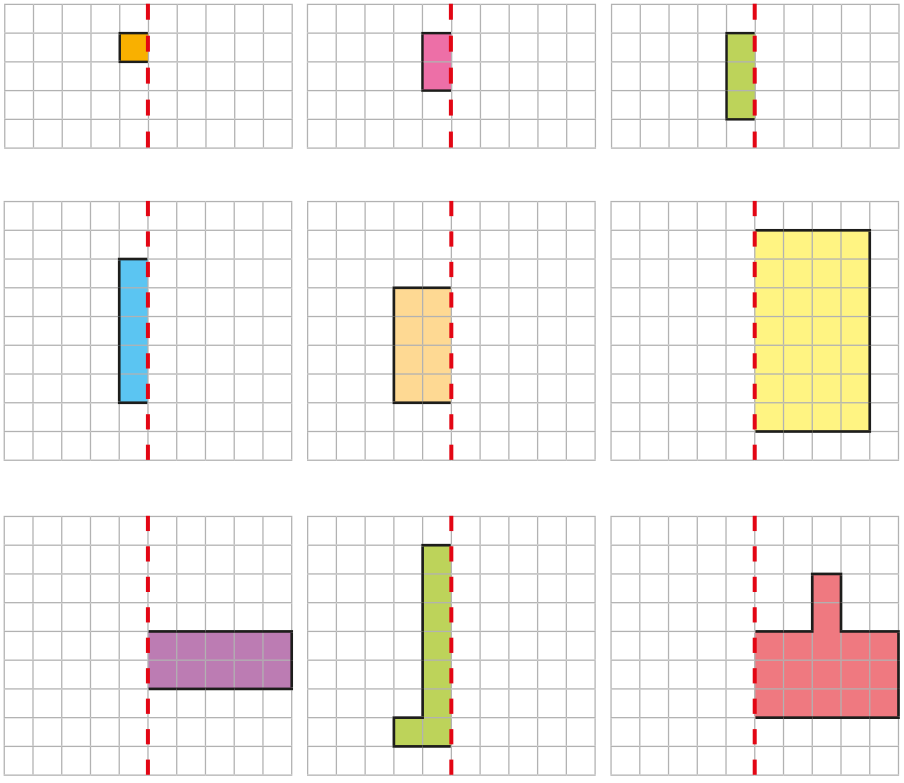
- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

Use lines of symmetry to complete shapes

Key learning

- Each diagram shows half a shape and the line of symmetry.

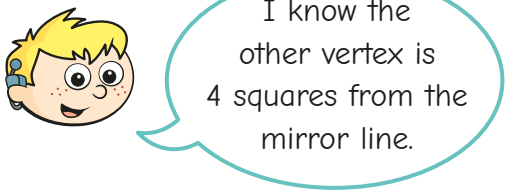
  Complete the shapes.

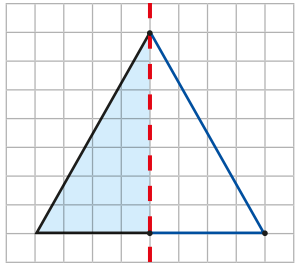


How did you make sure each shape was symmetrical?

Talk about it with a partner.

- Max is completing a triangle.

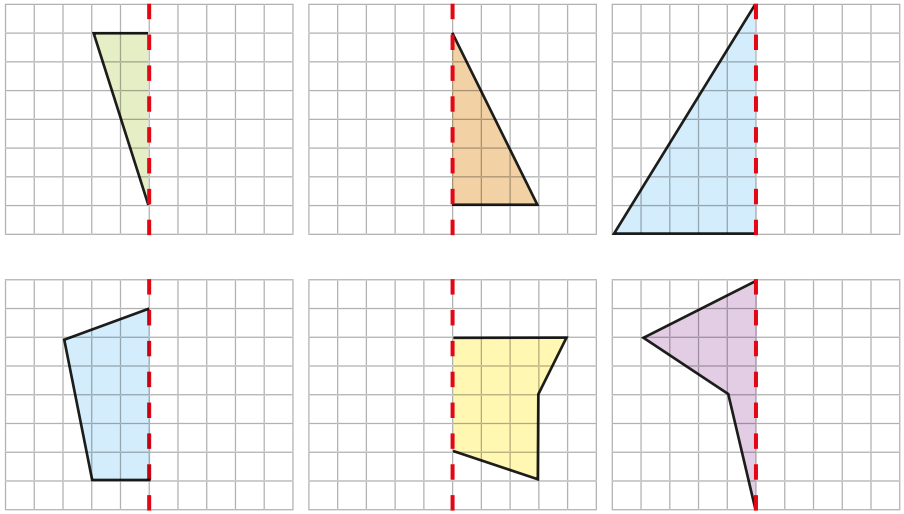




How does Max know this?

- Each diagram shows half a shape and the line of symmetry.

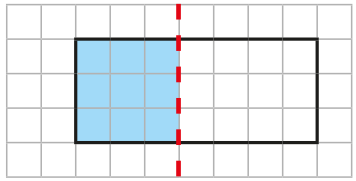
  Complete the shapes.

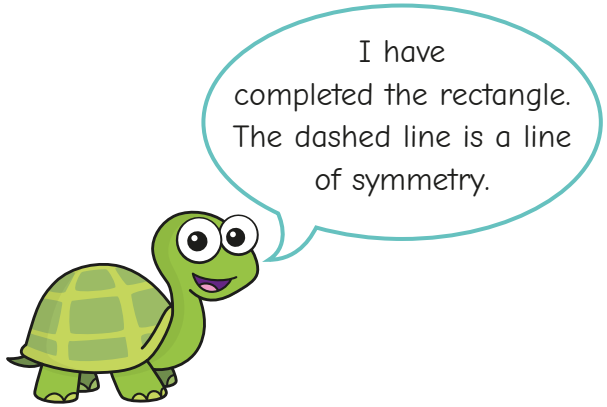


Use lines of symmetry to complete shapes

Reasoning and problem solving

Tiny is completing shapes.



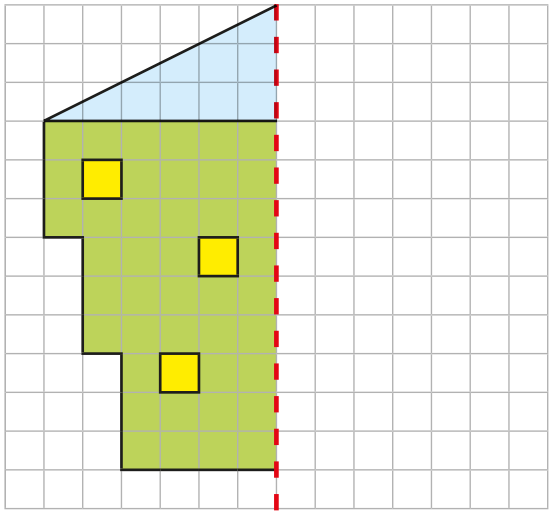


Do you agree with Tiny?

Talk about it with a partner.

No

Use symmetry to complete the picture.



Draw your own picture like this for a partner to complete.

The picture is completed correctly.

Sort 2-D shapes

Notes and guidance

In this small step, children continue to look at 2-D shapes and should be given the opportunity to explore similarities and differences between them as they play, and to sort them according to what they notice. Children may have naturally started to sort 2-D shapes based on what they noticed in the previous small steps. Here, they sort and group 2-D shapes according to simple properties, including size and colour, and more formal properties, such as number of sides and vertices. Children need to sort shapes into groups as well as identify how given groups of shapes have been sorted.

Encourage children to explain in detail what they notice about groups of shapes and consider whether they could have been sorted another way. They should recognise that the orientation of a shape does not affect its properties. Take time to explore the similarities between squares and rectangles so that children see the connection.

Things to look out for

- Children may make errors when presented with irregular or non-standard variations of shapes.
- Children may need to be taught how to use a sorting diagram correctly.

Key questions

- How have you sorted the shapes?
- How do you know this shape is in the correct group?
- How can you use the number of sides/vertices to help you?
- Are there any other ways to sort the shapes?
- Is this the most useful way to sort the shapes? Why/why not?
- Why is using a sorting diagram different from sorting into separate groups?
- What other shape could go in this group?
- What shape could not go in this group?

Possible sentence stems

- I put the _____ in this group because ...
- The shapes could have been sorted into _____ and _____, because ...
- _____ belongs/does not belong in this group because ...

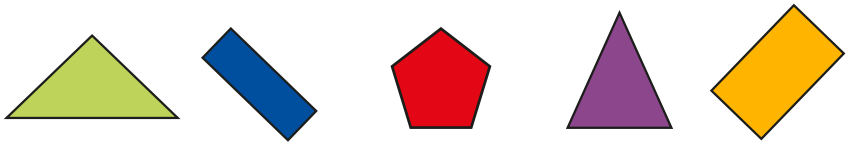
National Curriculum links

- Compare and sort common 2-D and 3-D shapes and everyday objects

Sort 2-D shapes

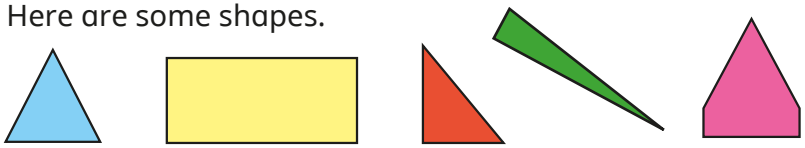
Key learning

- Sort the 2-D shapes into the groups.



rectangle | triangle | pentagon

- Here are some shapes.



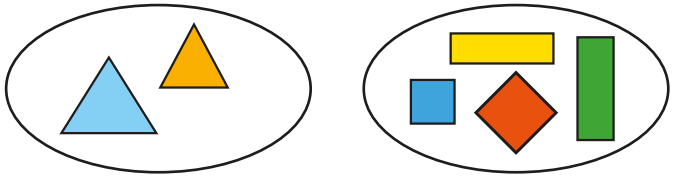
Which of the shapes are triangles?

Which of the shapes are **not** triangles?

Sort them into two groups.

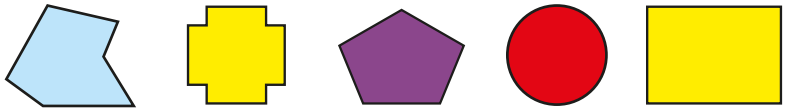
Which shape was the most difficult to sort? Why?

- How are the shapes sorted?



Is there more than one answer?

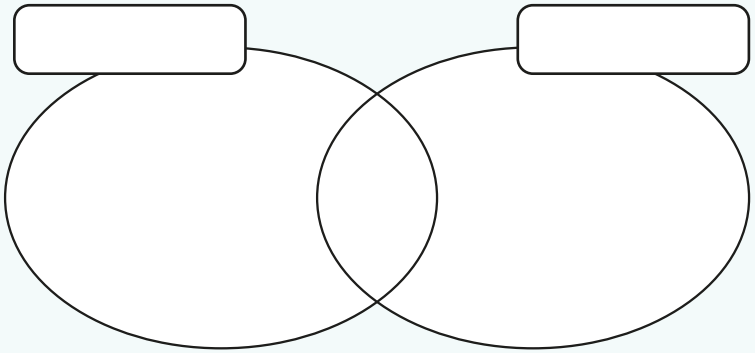
- Sort the shapes into the two groups.



fewer than 7 sides | more than 7 sides

Draw one more shape in each group.

Get children to choose six different shapes and sort them into the diagram.



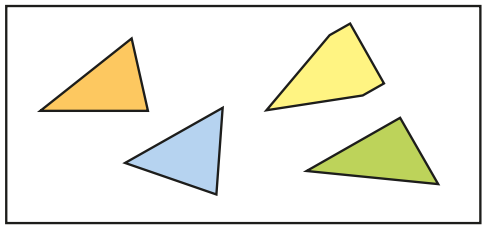
Now ask them to sort the shapes another way.

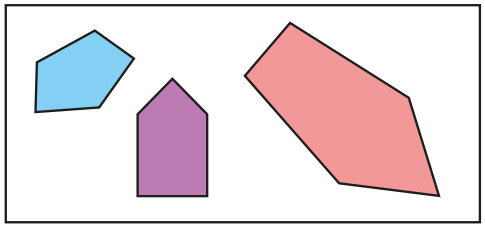
What do they notice?

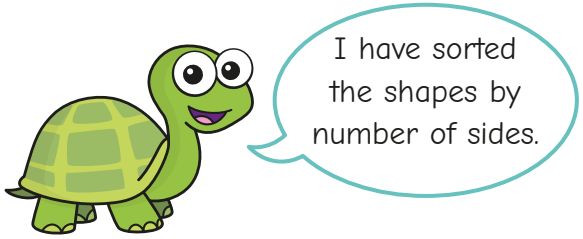
Sort 2-D shapes

Reasoning and problem solving

Tiny is sorting 2-D shapes.





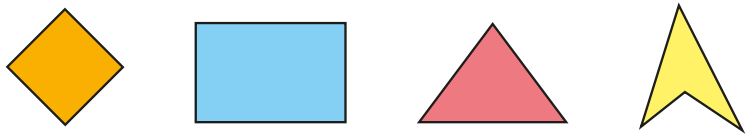


Do you agree with Tiny's sorting?

Why?

No

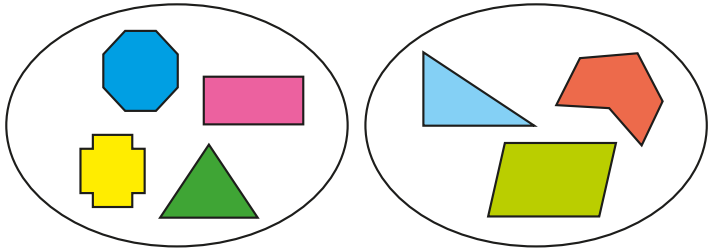
Which shape is the odd one out?



How do you know?

multiple possible answers, e.g. the triangle because it has 3 sides

How are the shapes sorted?



Draw another shape to fit in each group.

shapes with and without a vertical line of symmetry

Count faces on 3-D shapes

Notes and guidance

Children now move on to explore the properties of 3-D shapes. They begin by counting faces on 3-D shapes in this small step.

Children first identify what a face is and develop efficient methods for counting them, for example marking on the shape or using sticky paper. They should be able to identify the 2-D shapes that make up the faces of 3-D shapes, including identifying pyramids according to the shape of their base.

Children explore the difference between a face and a curved surface, describing a cylinder as having two faces and one curved surface. In the next two steps, they explore edges and vertices.

Things to look out for

- When looking at an image, children may only count the visible faces.
- Children may mix up faces and curved surfaces.
- Children may not be able to visualise the 2-D shapes that make up a 3-D shape.
- Children may name 3-D shapes using the names of the 2-D shapes they can see.

Key questions

- What is a face?
- What is a curved surface?
- What is the difference between a face and a curved surface?
- How can you count the faces of a shape efficiently?
- What 2-D shapes can you see on this 3-D shape?
- What 3-D shape do you think these 2-D shapes make?
- How many faces does a _____ have?

Possible sentence stems

- A _____ has _____ faces.
- A _____ has _____ faces and _____ curved surface.
- The 2-D shapes that make up the faces of a _____ are ...

National Curriculum links

- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces
- Identify 2-D shapes on the surface of 3-D shapes

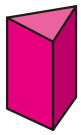
Count faces on 3-D shapes

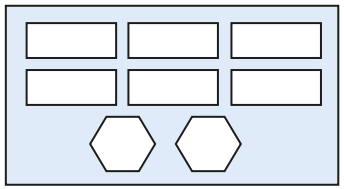
Key learning

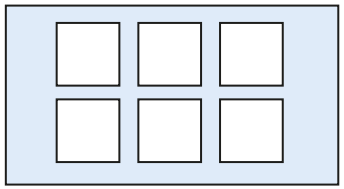
Give children a selection of 3-D shapes.

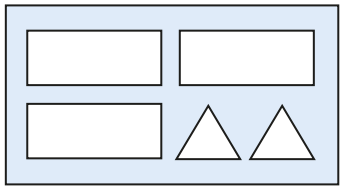
Ask them to identify any 2-D shapes they can see on the surfaces of the shapes.

- Match the shapes to the faces.





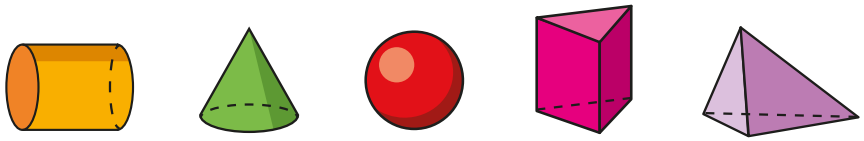




- Here are some 3-D shapes.

  - What is the name of each shape?
  - How many faces does each shape have?
  - Draw the faces of each shape.

- Which shapes have a curved surface?



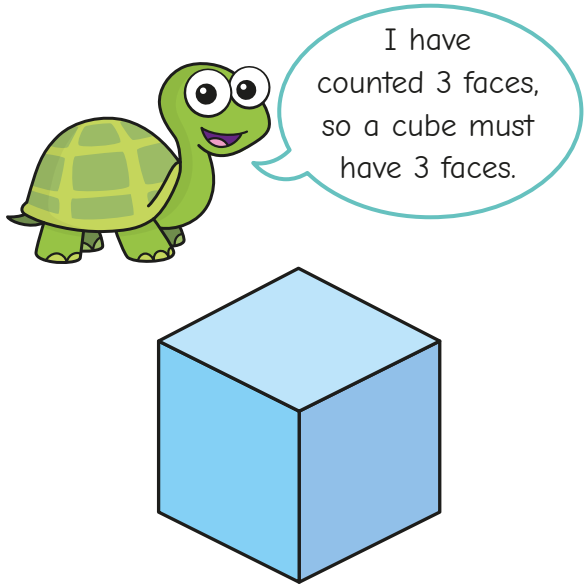
- Match the shapes to the labels.

1 curved surface and 2 circular faces	1 curved surface and 1 circular face	4 rectangular faces and 2 square faces

Count faces on 3-D shapes

Reasoning and problem solving

Tiny is counting faces on 3-D shapes.



Do you agree with Tiny?

Why?

No

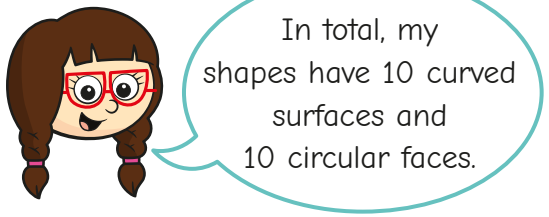
Explain to children that you have a 3-D shape with 2 square faces and 4 rectangular faces.

Can they identify your shape?

Encourage children to play this game with a partner: one child describes the faces and surfaces of a 3-D shape and their partner tries to guess the shape.

cuboid

Jo has ten of the same 3-D shapes.



What shapes does Jo have?

10 cones

Count edges on 3-D shapes

Notes and guidance

In this small step, children explore the edges of 3-D shapes.

It is important that children understand what an edge is and that it is formed where two faces meet. Discuss counting strategies and think about how they may be different from counting the faces of a 3-D shape. Children should first count the edges by holding 3-D shapes before looking at images of 3-D shapes. This is an important step as images can lead to mistakes.

Once children are securely able to count edges, they explore the concept in more detail, such as ordering shapes by the number of edges they have or identifying patterns in the number of edges prisms have.

Things to look out for

- Children may miscount the number of edges a shape has, either by not counting all the edges or counting an edge more than once.
- When looking at an image, children may only count the visible edges.
- When looking at an image, children may mistake the outline for an edge, for example a cylinder having 4 edges.
- Children may mix up faces and edges.

Key questions

- What is an edge?
- How is an edge different from a face?
- How can you count the edges of a shape efficiently?
- How can you make sure that you do not miscount the edges?
- How many edges does a _____ have?
- Do you think a _____ will have more edges than a _____? Why/why not?
- Count the edges of these prisms. What patterns can you see?

Possible sentence stems

- A _____ has _____ edges.
- A _____ has _____ faces and _____ edges.
- A _____ and a _____ have the same number of edges.
- A _____ has fewer/more edges than a _____

National Curriculum links

- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces

Count edges on 3-D shapes

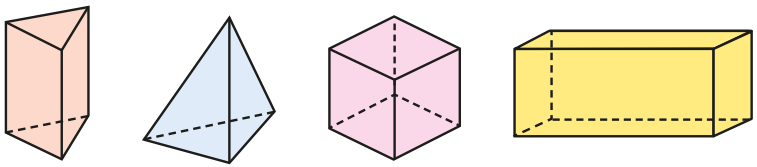
Key learning

Show children a selection of 3-D shapes.

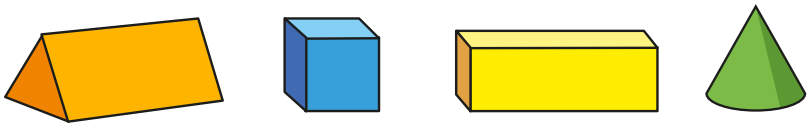
Ask them to count how many edges each shape has.

Discuss how they counted the edges and what they found difficult.

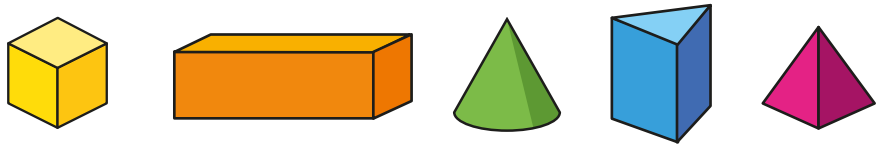
- How many edges does each shape have?



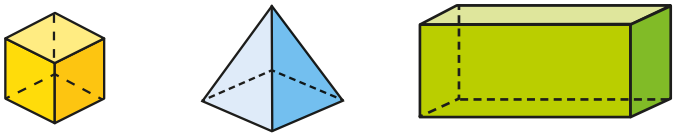
- How many edges does each shape have?



- Which shape has 9 edges?



- Here are some 3-D shapes.

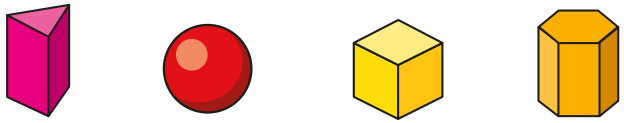


  - What is the name of each shape?
  - How many edges does each shape have?
  - How many faces does each shape have?

  What do you notice?

- How many edges does this shape have?

- How many edges does each shape have?



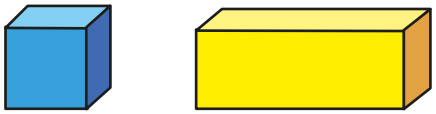
Put the shapes in order of the number of edges.

Start with the smallest number of edges.

Count edges on 3-D shapes

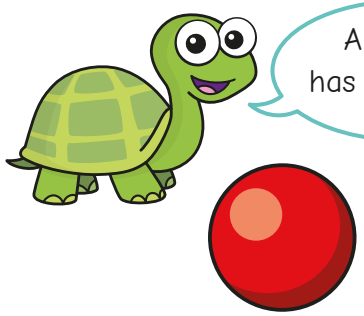
Reasoning and problem solving

Compare the 3-D shapes.



What is the same?
What is different?

multiple possible answers

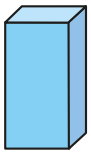


Is Tiny correct?

How do you know?

No

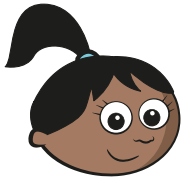
Sam is counting edges on 3-D shapes.



12 edges

15 edges

18 edges



What pattern can Sam see?

The number of edges increases by 3 each time.

Count vertices on 3-D shapes

Notes and guidance

In this small step, children count the vertices on 3-D shapes. They also consider all the properties of 3-D shapes that they have explored so far.

Children have looked at vertices in 2-D shapes earlier in the block, and now begin to understand vertices on 3-D shapes. They should first explore counting strategies by holding 3-D shapes and sharing different methods. When looking at images, it is important to discuss possible mistakes children may make, for example missing out hidden vertices.

As well as counting the vertices of shapes, children continue to count the edges and faces; these are used in the next small step when children use their understanding of the properties of 3-D shapes to sort them in various ways.

Things to look out for

- When looking at an image, children may only count the visible vertices.
- Children may believe that all shapes must have at least one vertex.
- Children may mix up vertices, faces and edges.

Key questions

- What is a vertex? What are vertices?
- How is a vertex different from a face? How is it different from an edge?
- How can you count the vertices of a shape efficiently?
- How can you make sure you do not miscount the vertices?
- How many vertices does a _____ have?
- Do you think a _____ has more vertices than a _____? Why/why not?

Possible sentence stems

- A _____ has _____ vertices.
- A _____ has _____ vertices, _____ faces and _____ edges.
- A _____ has the same number of vertices as a _____
- A _____ has fewer/more vertices than a _____

National Curriculum links

- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces

Count vertices on 3-D shapes

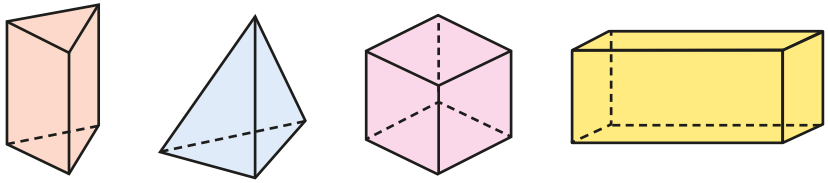
Key learning

Show children a selection of 3-D shapes.

Ask them to count how many vertices each shape has.

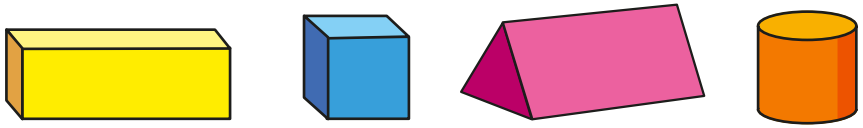
Discuss how they counted the vertices and what they found difficult.

- How many vertices does each shape have?



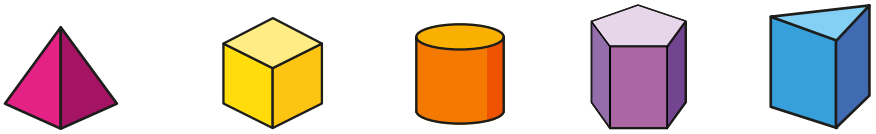
How did you count them?

- How many vertices does each shape have?

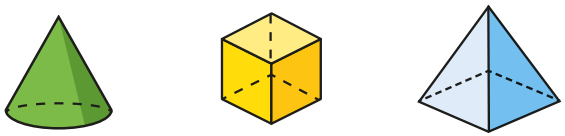


- How many vertices does a sphere have?

- Which shape has 5 vertices?

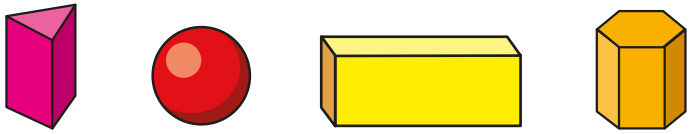


- Here are some 3-D shapes.



  - What is the name of each shape?
  - How many edges does each shape have?
  - How many faces does each shape have?
  - How many vertices does each shape have?

- How many vertices does each shape have?



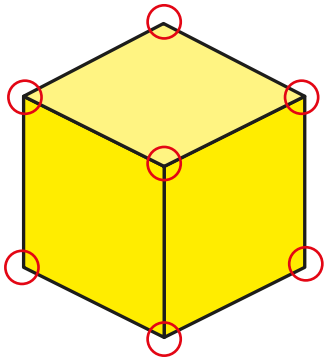
Put the shapes in order of the number of vertices.

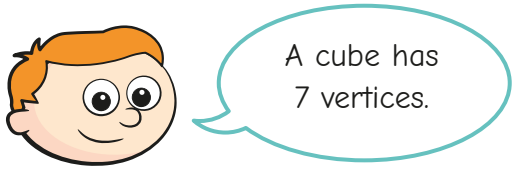
Start with the shape with the most vertices.

Count vertices on 3-D shapes

Reasoning and problem solving

Ron counts the vertices of a cube.



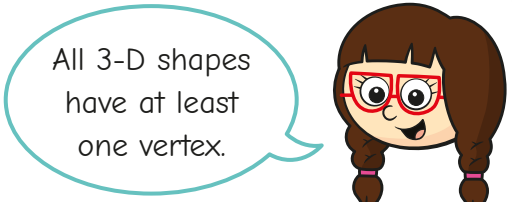


What mistake has Ron made?

How many vertices does a cube have?

Ron has only counted the vertices he can see.

A cube has 8 vertices.



Do you agree with Jo?

Why?

No

Sam has a 3-D shape.

What could Sam's shape be?

What could her shape **not** be?

cube or cuboid

multiple possible answers, e.g. sphere, cone, square-based pyramid

Sort 3-D shapes

Notes and guidance

In this small step, children sort 3-D shapes in a variety of ways, including using the properties they learnt earlier in the block.

Children begin by sorting a range of everyday objects, looking at groups of shapes and identifying the odd one out.

Children explore sorting shapes into a range of different groups and thinking about how some shapes have been sorted. They may notice that some shapes go into similar groups, for example a cube and a cuboid, and could think about the reasons behind this.

This step is an excellent opportunity to develop reasoning skills. Encourage children to explain fully why they have placed a shape in a certain group.

Things to look out for

- Children may not identify how some shapes have been grouped.
- If children miscount faces, edges or vertices, they may sort the shapes into the wrong groups.
- Children may not use correct mathematical vocabulary when explaining how shapes have been sorted.

Key questions

- How can you sort these shapes?
- Which group does a _____ go into?
- How do you know this shape is in the correct group?
- Which shape is the odd one out?
- Why do some shapes go into the same groups?
- Is there another way to sort these shapes?
- Which other shapes can go into this group?

Possible sentence stems

- _____ is the odd one out because ...
- My two groups are _____ and _____

  A _____ belongs in _____
- I have sorted the shapes by ...

National Curriculum links

- Compare and sort common 2-D and 3-D shapes and everyday objects

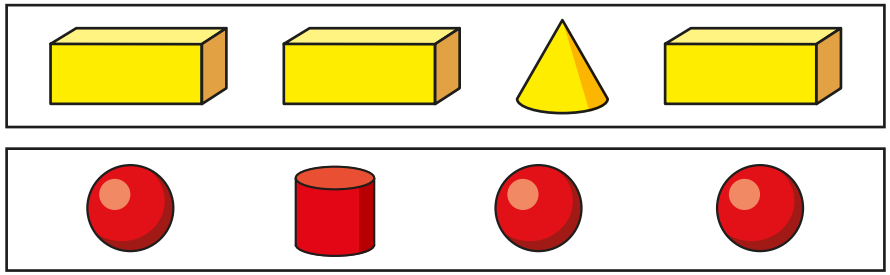
Sort 3-D shapes

Key learning

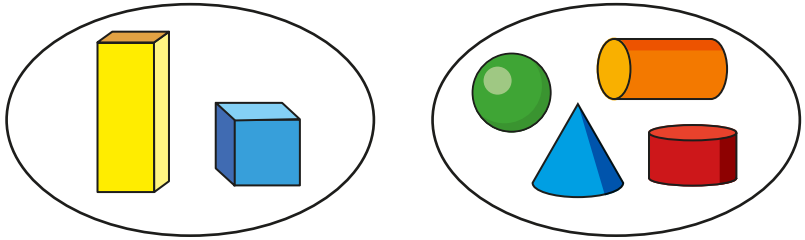
Show children a selection of everyday objects, e.g. tin can, dice, box, football, marble.

Ask children to sort the objects and challenge them to find another object that can be added to each group.

- In each group, what is the name of the shape that is the odd one out?

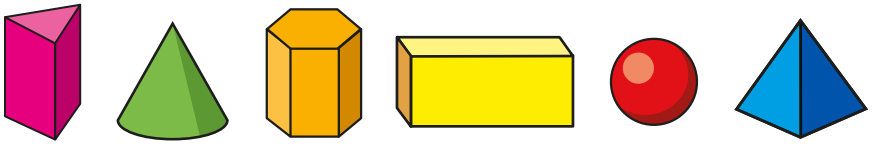


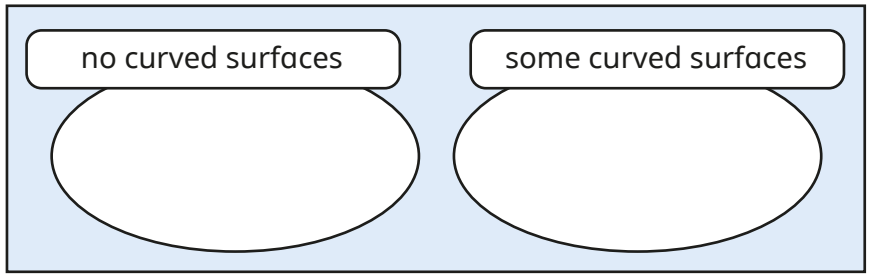
- How are the shapes sorted?

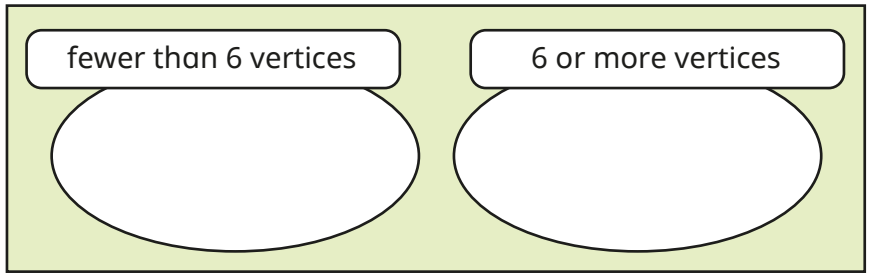


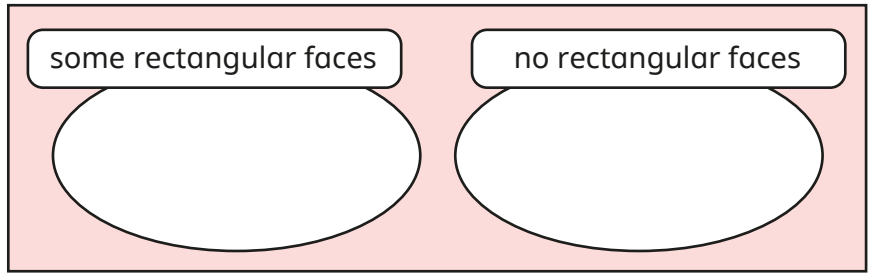
How else can you sort these shapes?

- Sort the shapes into the correct groups.





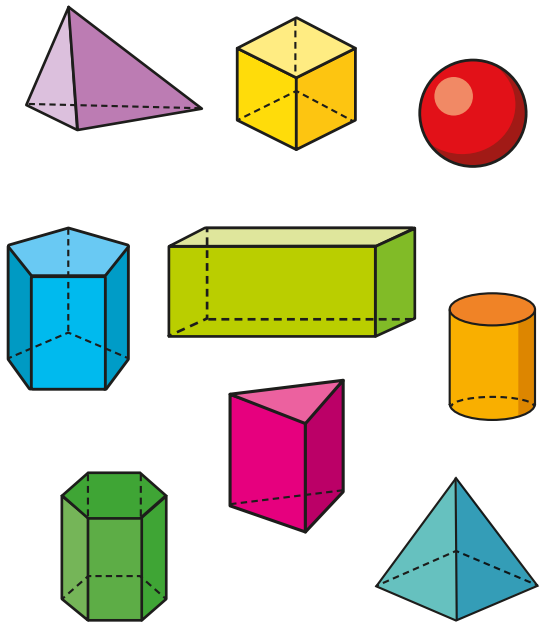




Sort 3-D shapes

Reasoning and problem solving

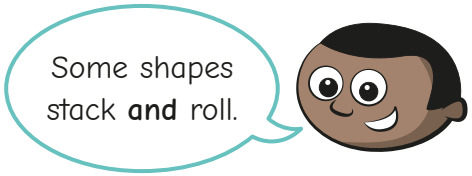
How many different ways can you sort the shapes?



Why are some shapes always put in the same group?

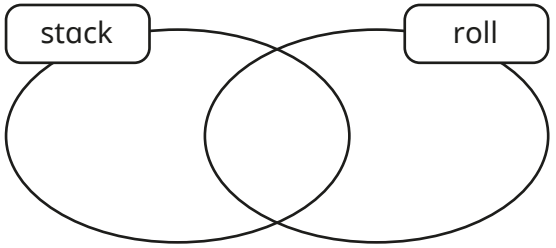
multiple possible answers, e.g.
number of faces
number of vertices
curved surfaces

Mo is investigating which shapes stack and which shapes roll.



Is Mo correct?

Sort some shapes using the sorting diagram.



What do you notice about each group?

Do all your shapes with flat surfaces stack?

Yes

children's shapes sorted

Make patterns with 2-D and 3-D shapes

Notes and guidance

In this small step, children use their understanding of 2-D and 3-D shapes to identify and create patterns.

Children need to be able to identify and name shapes to help them describe the patterns accurately. They look at patterns made up of only 2-D or only 3-D shapes, before looking at patterns that are made up of both.

Encourage children to not only think about the next shape in the pattern but also identify what, for example, the 10th shape would be. Discuss strategies such as drawing out the pattern or spotting connections between the position number and the shape.

Children should be shown both repeating and symmetrical patterns and be able to discuss the differences between these.

Things to look out for

- Children may find it challenging to find the 10th shape in a pattern.
- Children may find symmetrical patterns more difficult to complete.
- When drawing patterns, children may stick to ABAB, rather than more complex patterns.

Key questions

- What shapes can you see in the pattern?
- Which shapes are repeating?
- What would be the next shape in the pattern?
  What would be the shape after that?
  What would the 10th shape be?
- Is the pattern repeating or symmetrical?
- How do you know the next shape is not a _____?

Possible sentence stems

- The next shape will be a _____, because ...
- The shapes that are repeating are _____, _____, ...
- I know that the 10th shape in the pattern will be a _____ because ...

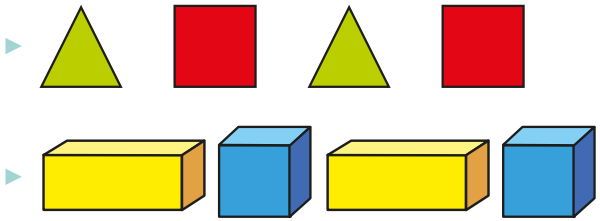
National Curriculum links

- Identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line
- Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces

Make patterns with 2-D and 3-D shapes

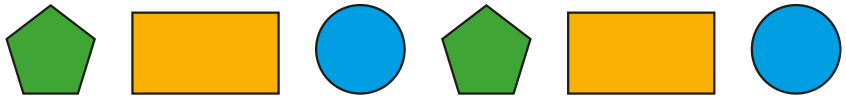
Key learning

- Draw the next two shapes in each pattern.



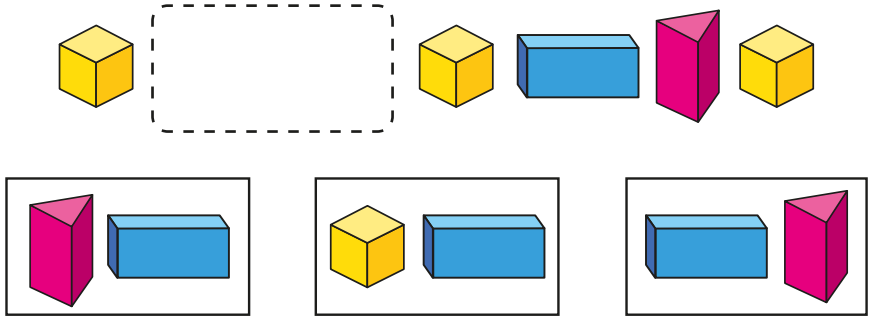
What is the 10th shape in each pattern?

- Continue the pattern.

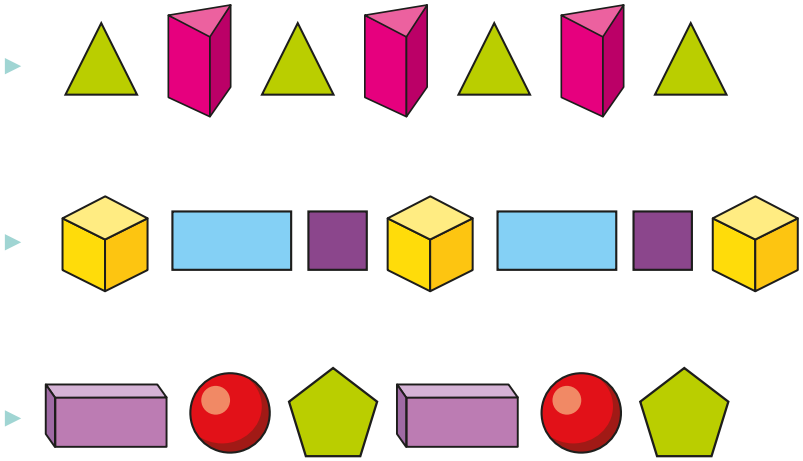


What are the names of the shapes in the pattern?

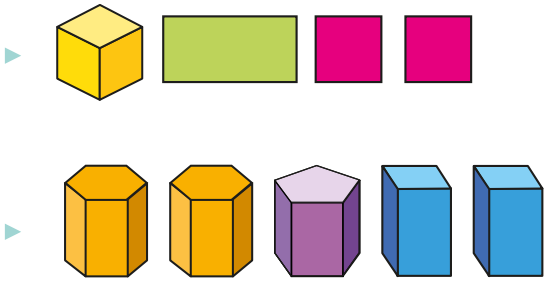
- Which shapes fit the pattern?



- Draw and name the next shape in each pattern.



- Complete the patterns so that they are symmetrical.

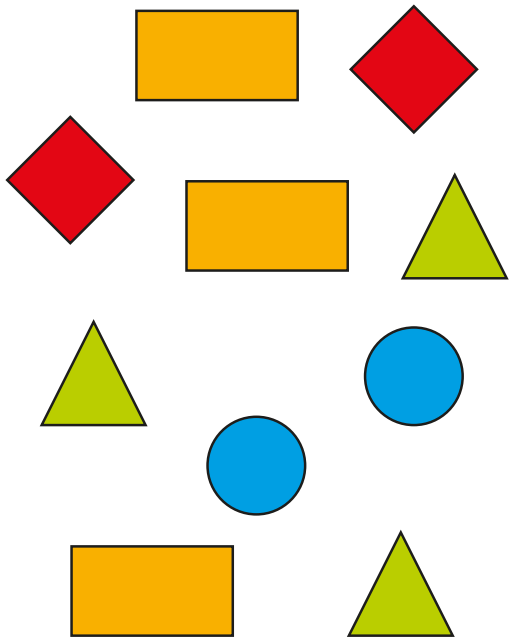


Make patterns with 2-D and 3-D shapes

Reasoning and problem solving

Put the shapes into a repeating pattern.

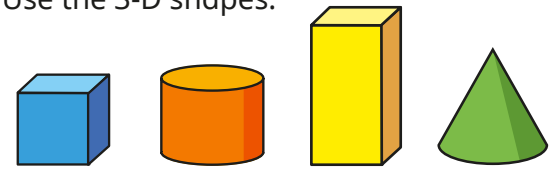
Find as many ways as you can.



multiple possible answers, e.g.

rectangle, triangle, square, circle, rectangle ...

Use the 3-D shapes.

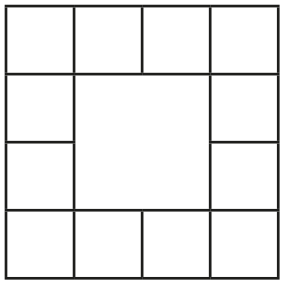


- Make a repeating pattern in which there are more cones than cuboids.
- Make a repeating pattern in which the 3rd shape is always a cylinder.

multiple possible answers, e.g.

- cone, cone, cuboid ...
- cone, cube, cylinder ...

Use the grid to make a repeating pattern of 2-D and 3-D shapes.



multiple possible answers