Spring Block 3

Fractions

Small steps

Step 1	Understand the whole
Step 2	Count beyond 1
Step 3	Partition a mixed number
Step 4	Number lines with mixed numbers
Step 5	Compare and order mixed numbers
Step 6	Understand improper fractions
Step 7	Convert mixed numbers to improper fractions
Step 8	Convert improper fractions to mixed numbers

Small steps

Step 9	Equivalent fractions on a number line
Step 10	Equivalent fraction families
Step 11	Add two or more fractions
Step 12	Add fractions and mixed numbers
Step 13	Subtract two fractions
Step 14	Subtract from whole amounts
Step 15	Subtract from mixed numbers

Understand the whole

Notes and guidance

Children begin this block by understanding the whole. They covered this in Year 3, but may need to recap the part-whole relationship of fractions.

Children use diagrams to identify how many equal parts a shape has been split into and move on to thinking about how many more parts are needed to make the whole. They use the denominator to identify how many equal parts a whole has been divided into. For example, for the fraction $\frac{3}{7}$, the whole has been split into 7 equal parts because the denominator is 7. Children explain whether a fraction is a small (for example, $\frac{1}{10}$) or large (for example, $\frac{9}{10}$) part of the whole.

The learning from this step will be built upon when looking at fractions greater than 1 and also decimals later in the year.

Things to look out for

- Children may not be able to identify or explain whether a fraction is a large or small part of the whole.
- When trying to identify how many equal parts the whole has been divided into, some children may be reliant on diagrams rather than using the denominator.

Key questions

- Has the whole been divided into equal parts? How do you know?
- In this diagram, how many equal parts has the whole been divided into?
- How many equal parts has the whole been divided into for $\frac{1}{5}$?
- Is this a large or small part of the whole? How do you know?
- How many more parts are needed to make the whole? What fraction would this be?

Possible sentence stems

- The whole has been divided into ______ equal parts.
- ______ has been shaded.

  To make 1 whole, I need to shade ______ equal parts.

  This is ______

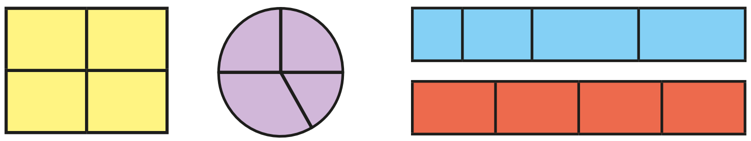
National Curriculum links

- Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators (Y3)

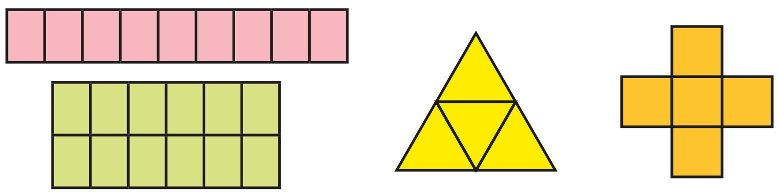
Understand the whole

Key learning

- Which shapes have been split into equal parts?



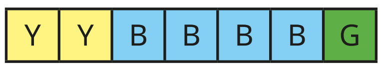
- Complete the sentences for each shape.



The whole is divided into ______ equal parts.

Each part is worth $\frac{1}{\square}$

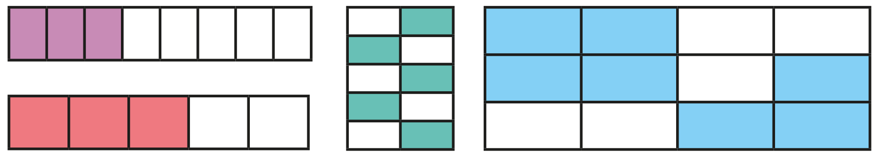
- What fraction of each diagram is shaded in each colour?

▶ 

▶ 

What fraction of each diagram represents the whole?

- Shade the shapes to make one whole.



Complete the sentences for each diagram.

To make 1 whole, I shaded ______ equal parts.

The fraction I shaded was ______

- Complete the additions.

▶ $\frac{3}{4} + \frac{\square}{\square} = 1$ ▶ $\frac{3}{7} + \frac{\square}{\square} = 1$ ▶ $1 = \frac{\square}{\square} + \frac{3}{10}$

- Use the information in the table to draw each whole.

1 part	Number of parts in the whole
	5
	4
	3

Is there more than one answer?

Understand the whole

Reasoning and problem solving

Sort the fractions into the table.

$\frac{3}{100}$ $\frac{3}{4}$ $\frac{3}{5}$

$\frac{3}{50}$ $\frac{17}{20}$ $\frac{7}{20}$

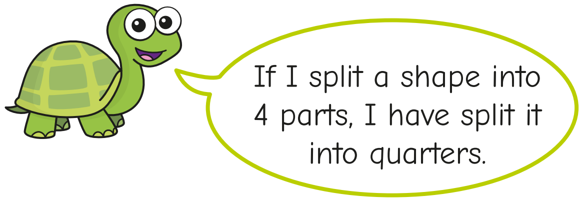
Fractions that are a small part of the whole	Fractions that are a large part of the whole

Explain your choices.

What do you notice about the fractions?

small: $\frac{3}{100}$, $\frac{3}{50}$, $\frac{7}{20}$

large: $\frac{3}{4}$, $\frac{3}{5}$, $\frac{17}{20}$



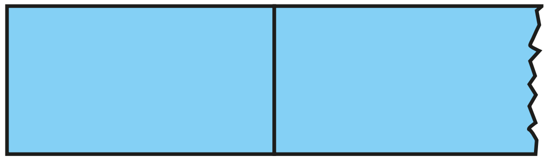
Is Tiny's statement always true, sometimes true or never true?

How do you know?

sometimes true

Filip splits a piece of ribbon into equal parts.

Here is part of his ribbon.



What fraction of the ribbon could the other part be?

multiple possible answers, with the denominator 2 greater than the numerator, e.g. $\frac{2}{4}$, $\frac{5}{7}$, $\frac{98}{100}$

Count beyond 1

Notes and guidance

In this small step, children build on their knowledge of the whole to explore fractions greater than 1

In Year 3, children counted forwards and backwards in fractions within 1 and this is now extended to fractions greater than 1. Number lines are a useful representation, particularly alongside other pictorial representations such as bar models, to support children in counting in fractions. Children first count in unit fractions, using their knowledge that a fraction with the same numerator and denominator can be written as 1. Once comfortable counting forwards and backwards in unit fractions across whole number boundaries, they count in non-unit fractions.

In this step, children count in mixed numbers only, as improper fractions are covered later in the block. It is vital, therefore, that children are secure with the fact that when the numerator is equal to the denominator then the fraction is equivalent to 1

Things to look out for

- Children may think that fractions must be less than 1
- When crossing a whole number, particularly when counting in non-unit fractions, children may miscount, either stopping at the whole number or ignoring it, for example $\frac{4}{6}$, $\frac{5}{6}$, $1\frac{1}{6}$

Key questions

- What fraction comes next after $\frac{4}{7}$, $\frac{5}{7}$, $\frac{6}{7}$? How do you know?
- What fraction comes before ______? How do you know?
- What do you know about a fraction with the same numerator and denominator?
- What is 1 whole plus another $\frac{1}{3}$? How could you draw that as a bar model?
- What is 3 and $\frac{5}{5}$ the same as?
- What is the sequence counting forwards/backwards in?

Possible sentence stems

- There are ______ ______s in 1
- The sequence is counting forwards/backwards in ______s.

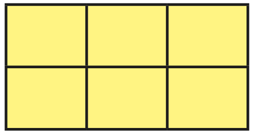
National Curriculum links

- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

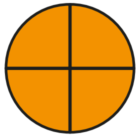
Count beyond 1

Key learning

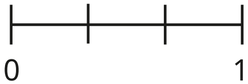
- Fill in the missing numbers.



$\frac{6}{6}$ = ______

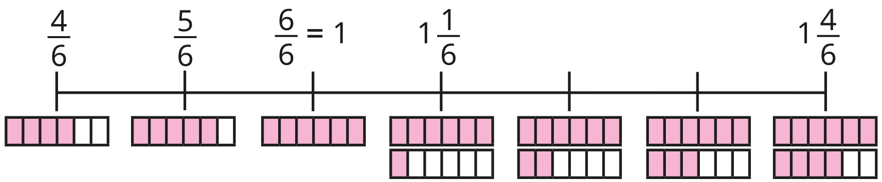


$\frac{\square}{4} = 1$

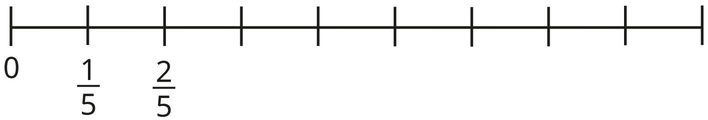


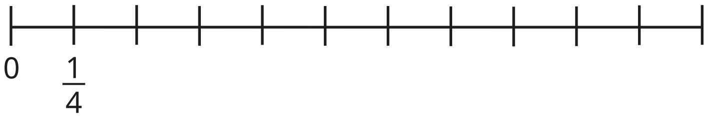
$\frac{3}{\square} = 1$

- Complete the number line, counting in sixths.

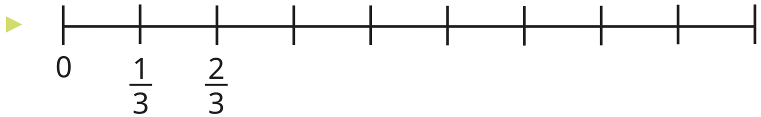


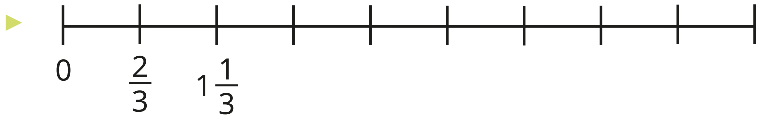
- Complete the number lines.





Complete the number lines.





What is the same about the number lines?

What is different?

- Complete the number tracks.

$\frac{5}{7}$	$\frac{6}{7}$			$1\frac{2}{7}$

$6\frac{1}{2}$	6			

$1\frac{3}{5}$	$1\frac{2}{5}$			

$2\frac{1}{9}$	$2\frac{4}{9}$			

$2\frac{2}{4}$	$2\frac{3}{4}$			

$1\frac{3}{5}$	$1\frac{1}{5}$			

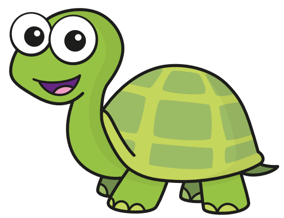
Count beyond 1

Reasoning and problem solving

Tiny is counting in fifths.

$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{5}{5}$

I cannot count any further, because fractions are always less than 1

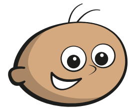


Do you agree with Tiny?

Explain your answer.

No

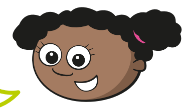
Tommy, Whitney and Dexter are counting forwards and backwards.



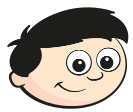
Tommy

I am counting forwards in $\frac{3}{7}$s, starting at 0

I am counting forwards in $\frac{4}{7}$s, starting at 3



Whitney



Dexter

I am counting backwards in $\frac{2}{7}$s, starting at 5

What number will all three children say?

$4\frac{5}{7}$

Partition a mixed number

Notes and guidance

In this small step, children further develop their understanding of mixed numbers.

Children explore partitioning mixed numbers in different ways – a skill that will be vital for later steps in this block. The key focus is to ensure that children can confidently partition a mixed number into its whole and fractional parts. Part-whole models and bar models are key representations that allow children to see how a mixed number is being partitioned. Once confident with this form of partitioning, children partition a mixed number into a whole number and a mixed number (for example, $3\frac{1}{4} = 2 + 1\frac{1}{4}$) or a mixed number and a fraction (for example, $2\frac{3}{4} = 2\frac{1}{4} + \frac{2}{4}$).

Things to look out for

- Children may mistake mixed numbers for improper fractions, particularly if their presentation is not clear, for example mistaking $2\frac{3}{4}$ for $\frac{23}{4}$
- Children need to be secure in the fact that all whole numbers can be made up of fractions, for example 1 whole = $\frac{3}{3}$
- Children may be less confident with non-standard partitions, for example $2\frac{3}{4} = 2\frac{1}{4} + \frac{2}{4}$

Key questions

- What is a mixed number?
- What does each part of a mixed number represent?
- How many wholes are there in the mixed number ______?
- What is the fractional part of ______?
- How can you partition the mixed number into wholes and a fraction?
- How many other ways could you partition the mixed number?

Possible sentence stems

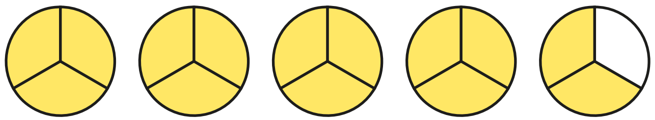
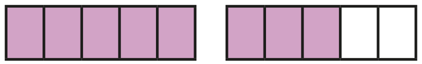
- There are ______ wholes.
- There are $\frac{\square}{\square}$
- The mixed number is ______ $\frac{\square}{\square}$
- ______ can be partitioned into ______ wholes and $\frac{\square}{\square}$

National Curriculum links

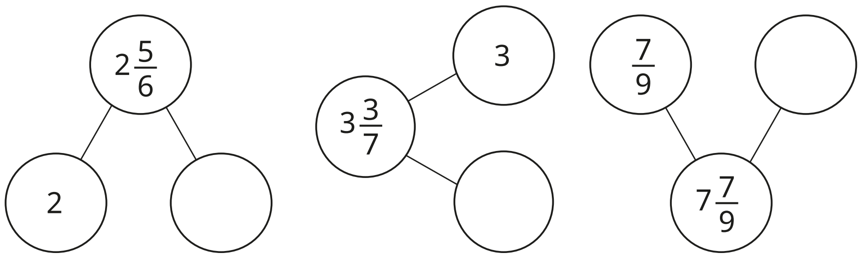
- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

Partition a mixed number

Key learning

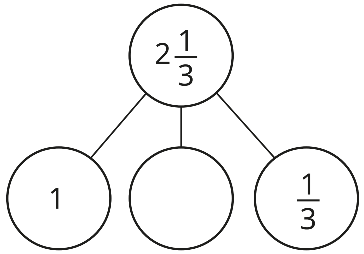
- What mixed number is shown in each diagram?
  - 
  - 
  - 

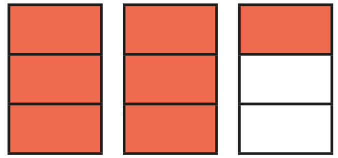
- Complete the part-whole models to show the wholes and fractions in the mixed numbers.



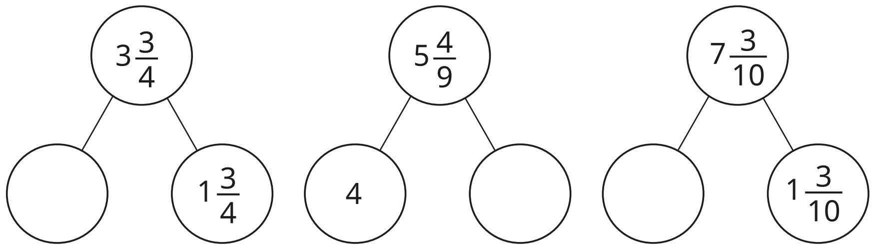
- Fill in the missing wholes and fractions.
  - $4\frac{4}{5} = 4 + \frac{\square}{\square}$
  - $9\frac{5}{6} = \_\_\_\_\_ + \frac{5}{6}$
  - $6\frac{3}{10} = \_\_\_\_\_ + \frac{\square}{\square}$

- Use the diagram to help you complete the part-whole model.





- Complete the part-whole models.



- Fill in the missing numbers.
  - $4\frac{4}{5} = 4\frac{1}{5} + \frac{\square}{\square}$ $4\frac{4}{5} = 4\frac{2}{5} + \frac{\square}{\square}$ $4\frac{4}{5} = 4\frac{\square}{5} + \frac{1}{5}$
  - $2\frac{6}{7} = 2\frac{1}{7} + \frac{\square}{\square}$ $2\frac{6}{7} = 2\frac{3}{7} + \frac{\square}{\square}$ $2\frac{6}{7} = \_\_\_\_\_\frac{4}{7} + \frac{\square}{\square}$

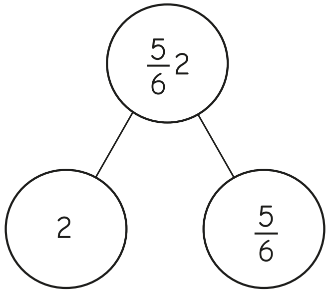
- Partition $3\frac{2}{3}$ in as many different ways as you can.

Partition a mixed number

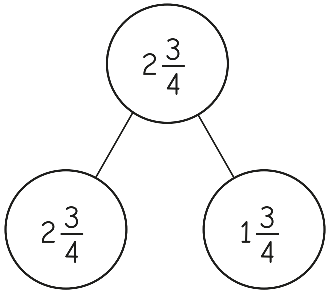
Reasoning and problem solving

Tiny has drawn some part-whole models of mixed numbers.

A



B



What mistakes has Tiny made?

Correct the mistakes.

A: $2\frac{5}{6}$ in whole

B: either

2 and $\frac{3}{4}$

or

1 and $1\frac{3}{4}$

in the parts

Use the digit cards to complete the statements.

You can use each card once only.

1	2	3	4
5	6	7	8

A $6\frac{7}{9} = \square + \square\frac{\square}{9}$

B $6\frac{7}{9} = \square\frac{\square}{9} + \frac{\square}{9}$

Find all the possible solutions.

four possible solutions for each:

A: 1, 5 and 7

5, 1 and 7

4, 2 and 7

2, 4 and 7

B: 6, 3 and 4

6, 4 and 3

6, 5 and 2

6, 2 and 5

Number lines with mixed numbers

Notes and guidance

In this small step, children build on their learning from Step 2 in this block, developing a deeper understanding of how mixed numbers are represented on a number line.

Children label the fractions on any given number line by identifying the number of intervals between each of the whole numbers. A common mistake is counting the number of divisions between consecutive integers. For example, a number line split into quarters has three dividing lines between each integer, so children may conclude that the number line is counting in thirds.

Children estimate the positions of mixed numbers on blank number lines. To support this, it is important that children understand which integer a mixed number is closer to, and the mixed number's relationship to the point halfway between the two wholes either side of it.

Things to look out for

- Children may incorrectly count the number of intervals when working out what fraction the number line is counting in.
- Children may struggle to estimate on a number line if they are not secure in their knowledge of which whole a fraction is closer to.

Key questions

- On the number line, how many intervals are there between these two consecutive whole numbers, ______ and ______?
- What is each interval worth on the number line?
- Is it more efficient to count on from the previous whole number or back from the next whole number when labelling ______?
- What is the whole number before and after ______?
- Is ______ closer to the previous or the next whole number? How do you know?

Possible sentence stems

- The difference between the start and end of the number line is ______

  There are ______ intervals.

  Each interval is worth ______
- ______ $\frac{\square}{\square}$ is closer to ______ than ______

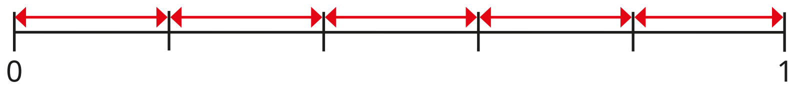
National Curriculum links

- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

Number lines with mixed numbers

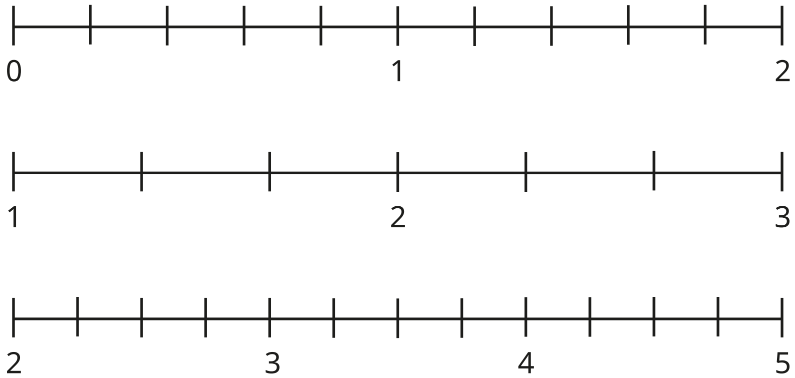
Key learning

- What is the number line counting up in?

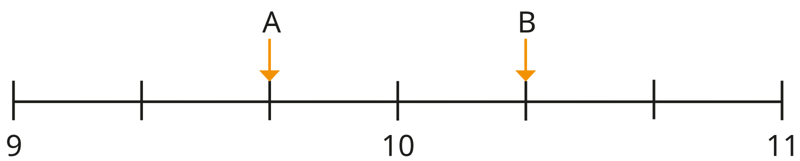


How do you know?

- Complete the number lines.

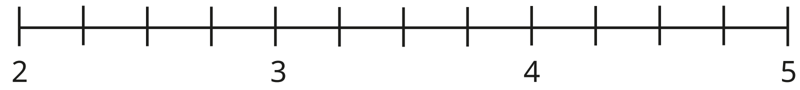


- What number is each arrow pointing to?

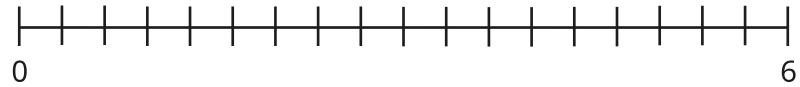


- Label the numbers on the number lines.

$2\frac{3}{4}$ $3\frac{1}{4}$ $4\frac{2}{4}$ $1\frac{4}{4}$

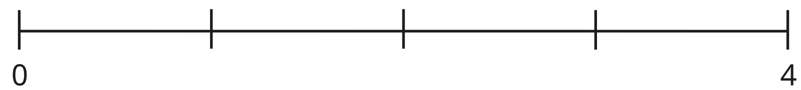


4 $1\frac{1}{3}$ $1\frac{3}{3}$ $5\frac{2}{3}$ $3\frac{1}{3}$



- Draw arrows to estimate the positions of the numbers on the number line.

$2\frac{1}{2}$ $1\frac{3}{4}$ $3\frac{9}{10}$ $\frac{1}{4}$ $3\frac{2}{5}$

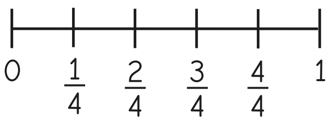


Number lines with mixed numbers

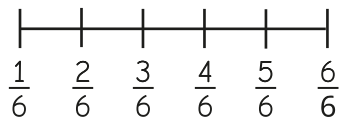
Reasoning and problem solving

Four children are labelling a blank number line that starts at zero.

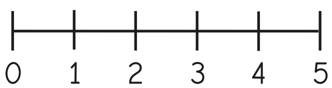
Aisha



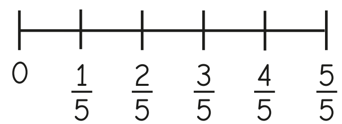
Scott



Tom



Esther



Who could be correct?

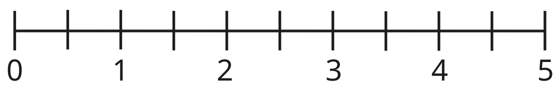
Who **cannot** be correct?

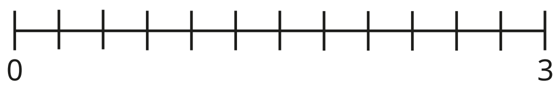
Talk about it with a partner.

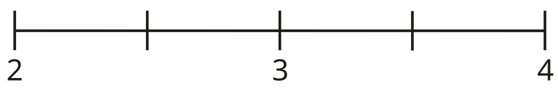
Tom and Esther could be correct.

Aisha and Scott cannot be correct.

Draw arrows to estimate the position of $2\frac{5}{6}$ on each number line.







Which number line did you find easiest/hardest to estimate on?

Why?

arrow in the correct place on each number line

Compare and order mixed numbers

Notes and guidance

In this small step, children compare and order mixed numbers.

Before comparing mixed numbers, it may be appropriate to compare proper fractions to revise the understanding that, when the denominators are the same, the greater the numerator, the greater the fraction. Diagrams, bar models and number lines are effective tools when comparing fractions and mixed numbers.

Children compare mixed numbers where the whole number is different, recognising that the greater the whole number, the greater the mixed number. They then compare mixed numbers where the whole number is the same.

Once children are secure in comparing mixed numbers, they can move on to putting them in order.

Things to look out for

- Children may not be secure in their understanding of how to compare proper fractions.
- Some children may compare the fraction first rather than the whole number, for example $2\frac{4}{5} > 3\frac{1}{5}$ because $\frac{4}{5} > \frac{1}{5}$
- If children are not confident in counting in fractions on a number line, they may find it difficult to place and compare fractions using this representation.

Key questions

- How is comparing mixed numbers similar to comparing proper fractions? How is it different?
- Are the whole numbers the same?
- Which is the greater whole number?
- If the whole numbers are the same, what do you need to compare?
- Which is the greater fraction? How do you know?
- How do you know the mixed numbers are in order?

Possible sentence stems

- First, I will compare the ______
  If they are the same, I will compare the ______
- If the denominator is the same, the ______ the numerator, the ______ the fraction.

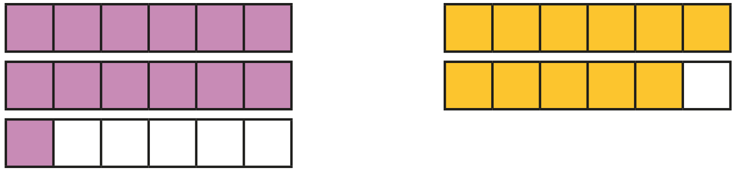
National Curriculum links

- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

Compare and order mixed numbers

Key learning

- Which fraction is greater, $2\frac{1}{6}$ or $1\frac{5}{6}$?

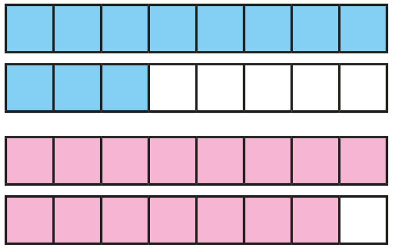


  How do you know?

- Draw bar models to help you compare the mixed numbers.

  $1\frac{3}{4}$ ◯ $2\frac{1}{4}$　　$4\frac{1}{2}$ ◯ $2\frac{1}{2}$　　$3\frac{3}{8}$ ◯ $1\frac{7}{9}$

- Write < or > to compare the mixed numbers.



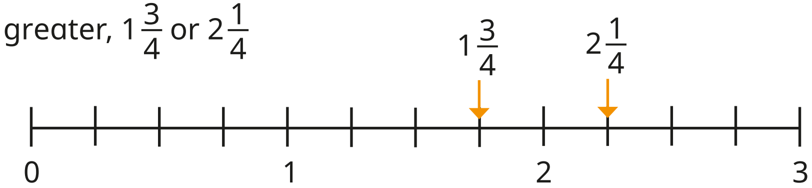
  $1\frac{3}{8}$ ◯ $1\frac{7}{8}$

- Write < or > to compare the mixed numbers.

  You can draw bar models to help you.

  $2\frac{1}{3}$ ◯ $2\frac{2}{3}$　　$2\frac{7}{10}$ ◯ $2\frac{1}{10}$

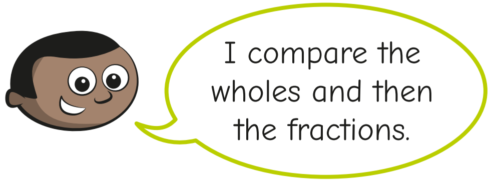
- Use the number line to decide which mixed number is greater, $1\frac{3}{4}$ or $2\frac{1}{4}$



- Draw a number line to help compare the mixed numbers.

  $2\frac{2}{5}$ ◯ $2\frac{4}{5}$　　$1\frac{5}{7}$ ◯ $1\frac{2}{7}$

- Mo is comparing mixed numbers.



  $1 = 1$

  $\frac{3}{8} < \frac{5}{8}$

  So $1\frac{3}{8} < 1\frac{5}{8}$

  Use Mo's method to compare the mixed numbers.

  $2\frac{3}{5}$ ◯ $2\frac{4}{5}$　　$1\frac{3}{5}$ ◯ $2\frac{3}{5}$　　$5\frac{7}{10}$ ◯ $5\frac{1}{10}$

- Put the mixed numbers in order, starting with the smallest.

  $1\frac{3}{4}$, $2\frac{3}{4}$, $1\frac{1}{4}$, $3\frac{3}{4}$, $2\frac{1}{4}$

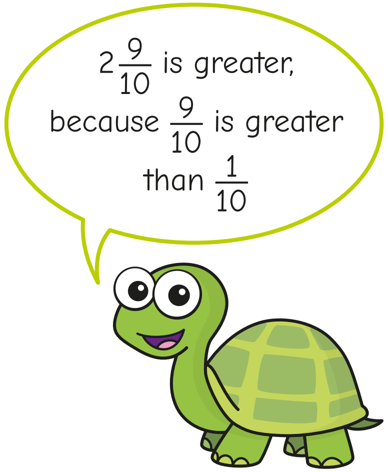
  $15\frac{4}{7}$, $15\frac{6}{7}$, $15\frac{3}{7}$, $16\frac{1}{7}$, $15\frac{1}{7}$

Compare and order mixed numbers

Reasoning and problem solving

Tiny is comparing mixed numbers.

$$3\frac{1}{10} < 2\frac{9}{10}$$



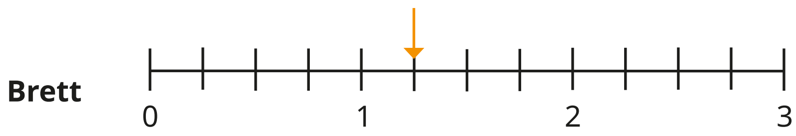
Do you agree with Tiny?

Explain your answer.

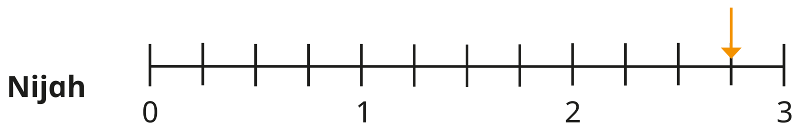
No

Brett and Nijah are counting in fractions on a number line.

Brett starts at the arrow and counts forwards in quarters four times.



Nijah starts at the arrow and counts backwards in quarters four times.



Who finishes on the greater number?

Brett

Understand improper fractions

Notes and guidance

Children should now be confident with the idea that fractions can be greater than 1 and have experienced these as mixed numbers. In this small step, they write them as improper fractions – a fraction where the numerator is greater than or equal to the denominator.

From previous learning, children know that when the numerator is equal to the denominator, the fraction is equal to 1 whole. That knowledge is extended to exploring other integers using knowledge of times-tables. For example, if children know that $\frac{3}{3}$ is equal to 1, they can repeat groups of $\frac{3}{3}$ to see that $\frac{6}{3}$ = 2 and $\frac{9}{3}$ = 3. They then explore the improper fractions that lie between whole numbers. Bar models and number lines support this understanding.

At this point, children do not need to formally convert between improper fractions and mixed numbers, but they may begin to explore the relationships between them by plotting both on a number line.

Things to look out for

- Children may not have seen fractions where the numerator is greater than the denominator before, which may have led to misconceptions about this not being possible.

Key questions

- How many ______ (for example, thirds) are there in 1 whole?
- So how many ______ (for example, thirds) will there be in 2/3/4 wholes?
- What do you think comes next in this count: 3 fifths, 4 fifths, 5 fifths?
- What is the same about mixed numbers and improper fractions? What is different?
- If there are 10 tenths in 1 whole, how many tenths are there in $1\frac{1}{10}$?
- Which of these are improper fractions? How do you know?

Possible sentence stems

- An improper fraction is a fraction where the numerator is ______ the denominator.
- There are ______ ______ in 1 whole, so there are ______ ______ in 2/3/4 wholes.

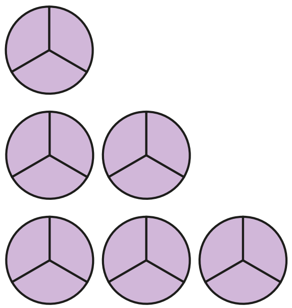
National Curriculum links

- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

Understand improper fractions

Key learning

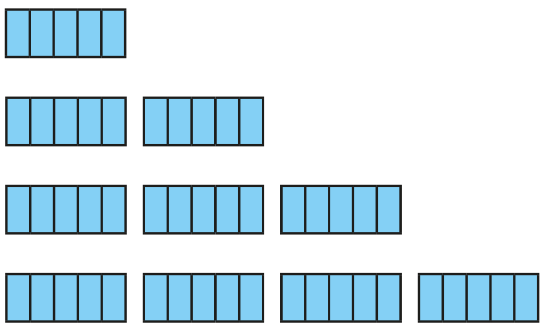
- Fill in the missing numbers.



$\frac{3}{3}$ = ______ whole

$\frac{6}{3}$ = ______ wholes

$\frac{9}{3}$ = ______ wholes

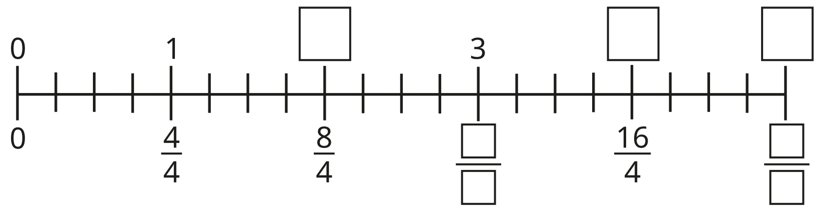


$\frac{5}{5}$ = ______ whole

$\frac{10}{5}$ = ______ wholes

$\frac{\square}{5}$ = 3 wholes

$\frac{\square}{\square}$ = ______ wholes



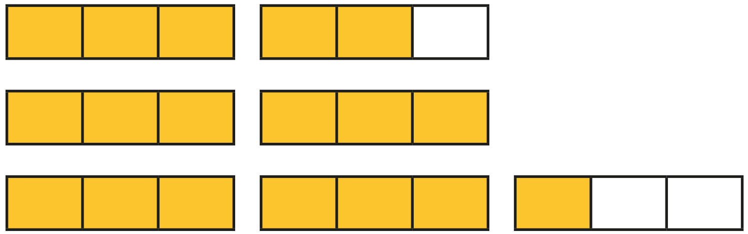
What do you notice?

- Fill in the missing numbers.

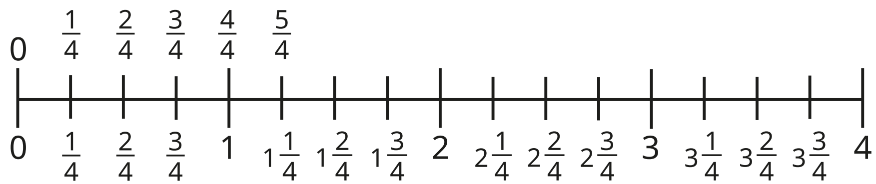
$\frac{4}{2}$ = ______ $\frac{10}{2}$ = ______ $\frac{\square}{2}$ = 10

$\frac{30}{10}$ = ______ $6 = \frac{\square}{10}$ $\frac{110}{10}$ = ______

- What improper fractions are shown in the diagrams?



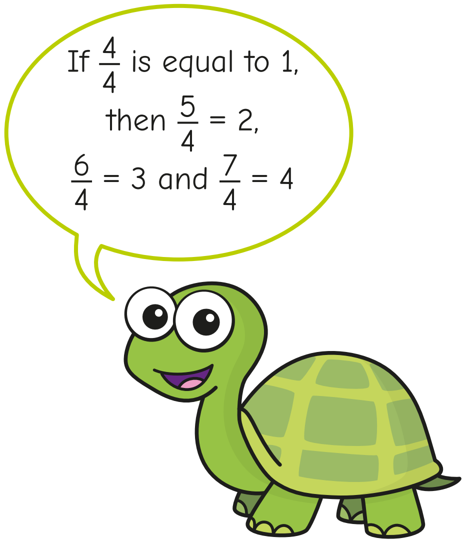
- Complete the number line by counting in improper fractions.



Understand improper fractions

Reasoning and problem solving

Tiny is talking about improper fractions.



Do you agree with Tiny?

Explain your reasons.

No

Use the digit cards to make as many improper fractions as you can.

2	3	4	5	6	7	8

Which of the improper fractions are greater than 1 and less than 2?

Which of the improper fractions are greater than 2 and less than 3?

$\frac{3}{2}, \frac{4}{3}, \frac{5}{3}, \frac{5}{4}, \frac{6}{4}, \frac{7}{4}, \frac{6}{5}, \frac{7}{5}, \frac{8}{5}, \frac{7}{6}, \frac{8}{6}, \frac{8}{7}$

$\frac{5}{2}, \frac{7}{3}, \frac{8}{3}$

Convert mixed numbers to improper fractions

Notes and guidance

Having now been introduced to both mixed numbers and improper fractions, in this small step children convert a mixed number into an improper fraction.

At this stage, children explore this concept predominantly through the use of pictorial representations and concrete manipulatives such as interlocking cubes. Bar models and number lines are useful representations to allow children to see the links between mixed numbers and improper fractions.

Children use their times-tables knowledge to find the improper fraction equivalent to the integer part of a mixed number before adding on any remaining fractional parts.

Things to look out for

- Fluent knowledge of times-tables will greatly support children in this step. Times-table grids could support children who are not yet fluent, allowing them to focus on the key learning of this step.
- Children may forget to add on the fractional part of the mixed number.
- Children may add the integer and the fractional part together, for example $3\frac{4}{5} = \frac{7}{5}$

Key questions

- What is the integer in the mixed number ______?
- What is the fractional part of the mixed number ______?
- How do you know if a fraction is improper?
- How many fifths are there in 2/3/4 wholes? What do you notice?
- If there are 8 quarters in 2, how many more quarters do you need to add for the mixed number $2\frac{3}{4}$?
- What do you notice about the improper fraction equivalences of $2\frac{2}{9}$, $2\frac{3}{9}$, $2\frac{4}{9}$ / $2\frac{2}{9}$, $3\frac{2}{9}$, $4\frac{2}{9}$?

Possible sentence stems

- Each whole is worth ______ ______

  All the wholes are worth ______ ______

  Adding the fractional part means that altogether there are ______ ______

National Curriculum links

- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

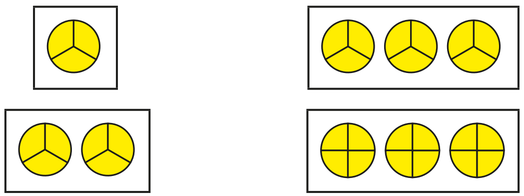
Convert mixed numbers to improper fractions

Key learning

- Each circle represents 1 whole.

  What do the diagrams show?

  Give your answers as an integer and as an improper fraction.



- Complete the sentences for each mixed number.

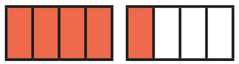
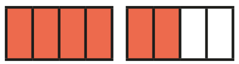
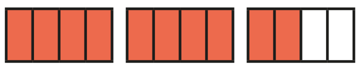
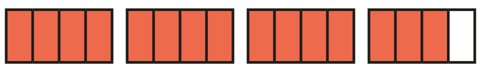
  The integer in the mixed number is ______

  This is equivalent to ______ quarters.

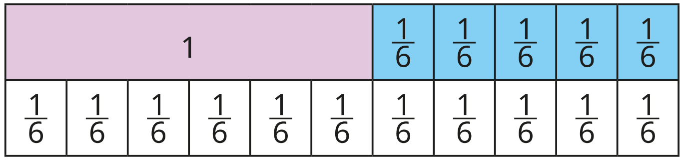
  There are ______ more quarters.

  ______ + ______ = ______

  So the improper fraction is $\frac{\square}{4}$

  - $1\frac{1}{4}$ 
  - $1\frac{2}{4}$ 
  - $2\frac{2}{4}$ 
  - $3\frac{3}{4}$ 

- Use the bar model to convert the mixed number to an improper fraction.

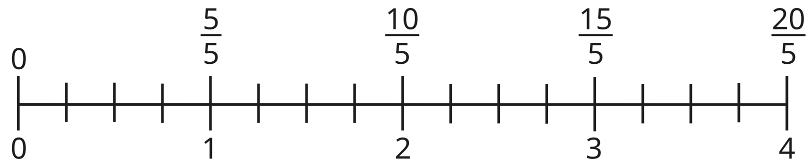


$1\frac{5}{6} = \frac{\square}{6}$

  Draw a bar model to convert $3\frac{2}{3}$ to an improper fraction.

- Use the number line to convert the mixed numbers to improper fractions.

  $1\frac{2}{5}$ $3\frac{1}{5}$ $2\frac{4}{5}$ $3\frac{4}{5}$ $4\frac{1}{5}$



- Convert the mixed numbers to improper fractions.

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

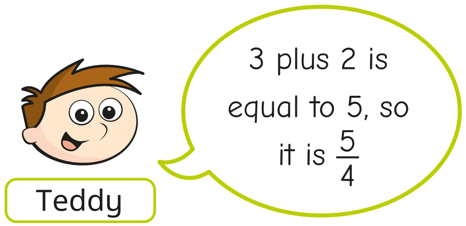
  $1\frac{7}{8}$ $2\frac{7}{8}$ $3\frac{7}{8}$ $5\frac{7}{8}$

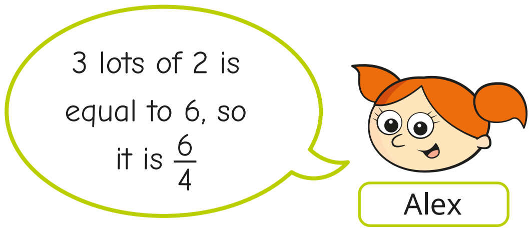
  What do you notice?

Convert mixed numbers to improper fractions

Reasoning and problem solving

Teddy and Alex are converting $3\frac{2}{4}$ into an improper fraction.



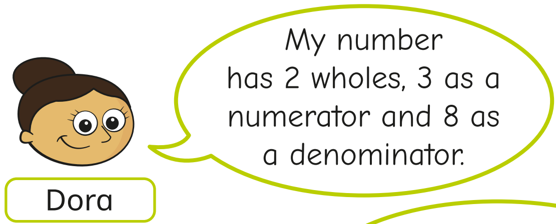


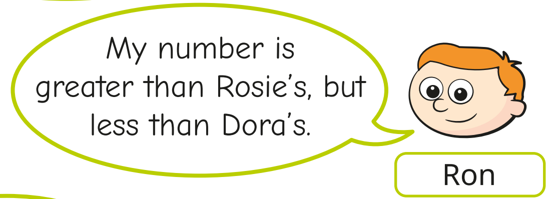
What mistake has each child made?

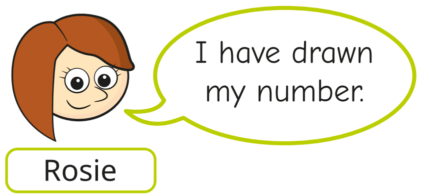
What is the correct answer?

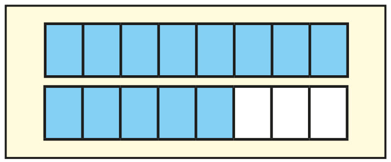
$\frac{14}{4}$

Dora, Ron and Rosie each think of a different number.









What number could Ron be thinking of?

Write each possible answer as both a mixed number and an improper fraction.

multiple possible answers e.g. $1\frac{6}{8}$, $\frac{14}{8}$

Convert improper fractions to mixed numbers

Notes and guidance

In the previous step, children converted mixed numbers to improper fractions. In this small step, they convert the other way, from improper fractions to mixed numbers.

At this stage, children explore this concept predominantly through the use of pictorial representations and concrete manipulatives, for example counters and bar models, linking back to work done on division with remainders in Spring Block 1. Children use their times-tables knowledge to find the integer part of a mixed number, with the remainder as the fractional part.

The learning from this step will be revisited and built on in Year 5.

Things to look out for

- Fluent knowledge of times-tables will greatly support children in this step. Times-table grids could support children who are not yet fluent, allowing them to focus on the key learning of this step.
- Children may partially convert improper fractions, giving an answer as an integer with an improper fraction, for example $\frac{11}{5} = 1\frac{6}{5}$

Key questions

- How do you know ______ is an improper fraction?
- How many quarters are there in $\frac{15}{4}$?
- How many quarters are there in 1/2/3 wholes?
- How many groups of 4 are there in 15? What is the remainder?

  So how many groups of $\frac{4}{4}$ are there in $\frac{15}{4}$? What is the remainder?

  How can you write that as a mixed number?

Possible sentence stems

- There are ______ ______ in 1 whole.

  There are ______ groups of ______ and ______ remaining.

  so $\frac{\square}{\square}$ as a mixed number is ______

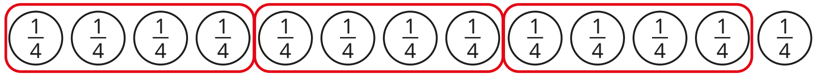
National Curriculum links

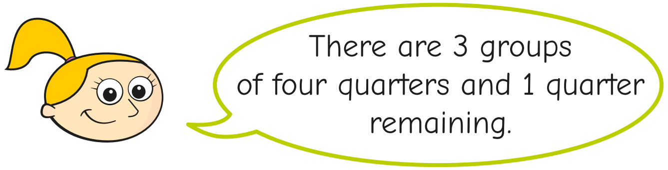
- This small step is not taken from the Year 4 National Curriculum. It is included to take into account the non-statutory DfE Ready to Progress guidance.

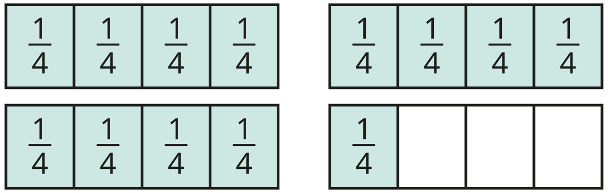
Convert improper fractions to mixed numbers

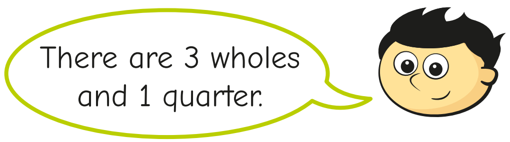
Key learning

- Eva and Jack are converting $\frac{13}{4}$ to a mixed number.









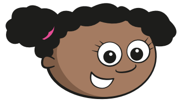
Write $\frac{13}{4}$ as a mixed number.

- Convert the improper fractions to mixed numbers.

$\frac{17}{4}$ $\frac{17}{3}$ $\frac{13}{5}$ $\frac{15}{6}$

- Whitney is converting $\frac{17}{5}$ to a mixed number.

Here are her workings.



$15 \div 5 = 3$
$17 \div 5 = 3$ r2
$\frac{17}{5} = 3\frac{2}{5}$

Use Whitney's method to convert the improper fractions to mixed numbers.

$\frac{19}{6}$ $\frac{23}{4}$ $\frac{39}{9}$

- Which of these improper fractions are equivalent to an integer?

$\frac{20}{5}$ $\frac{17}{4}$ $\frac{13}{6}$ $\frac{20}{8}$ $\frac{40}{8}$ $\frac{210}{2}$

How do you know?

Convert the other improper fractions to mixed numbers.

- Convert the improper fractions to mixed numbers.

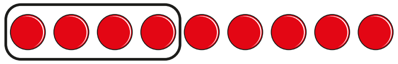
$\frac{12}{3}$ $\frac{13}{3}$ $\frac{14}{3}$ $\frac{15}{3}$ $\frac{16}{3}$ $\frac{17}{3}$

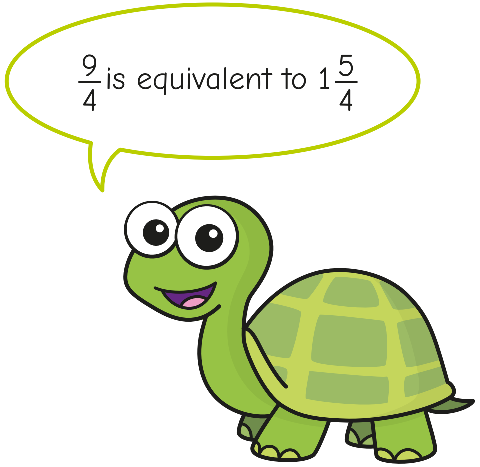
What do you notice?

Convert improper fractions to mixed numbers

Reasoning and problem solving

Tiny is converting $\frac{9}{4}$ to a mixed number.





What mistake has Tiny made?

What is the correct answer?

$2\frac{1}{4}$

$\frac{1617}{7}$ is equivalent to 231

Use this fact to convert $231\frac{1}{7}$ to an improper fraction.

What improper fraction is equivalent to 232?

How do you know?

$\frac{1618}{7}$ | $\frac{1624}{7}$

Use the digit cards to complete the statement in as many ways as possible.

You may use each digit card only once each time.

0	1	2	3	4
5	6	7	8	9

$2 < \frac{\square\square}{5} < 4\frac{3}{5}$

10 solutions from $\frac{12}{5}$ to $\frac{21}{5}$

Equivalent fractions on a number line

Notes and guidance

In Year 3, children used number lines to find equivalent fractions within 1 and this knowledge is now extended to numbers beyond 1

The focus of this step is on using number lines to find equivalent fractions by looking at fractions that are in line with each other (equal in value), rather than using more abstract methods of multiplicative reasoning. Drawing bars of unequal length or lining them up incorrectly are common mistakes with this method, so it is vital to highlight that integer values should always be in line with each other. Children look at multiple number lines, double number lines and splitting up existing number lines into smaller parts. They may explore equivalence of both mixed numbers and improper fractions.

Things to look out for

- If number lines are not drawn to the same length or lined up correctly, then equivalent fractions will not be easy to see.
- Children may need support drawing and labelling number lines accurately.
- Children may use incorrect "rules" for finding equivalent fractions that can lead to incorrect equivalences such as $2\frac{1}{3} = 4\frac{2}{6}$

Key questions

- What are equivalent fractions?
- What unit fraction is the number line counting in?
- How do you know that ______ is equivalent to ______?
- Why do the integers have to be in line with each other?
- How do you know that $2\frac{1}{3}$ cannot be equivalent to $4\frac{2}{6}$?
- What is ______ as a mixed number/improper fraction?

Possible sentence stems

- There are ______ equal intervals between consecutive integers, so the number line is counting in ______s.
- I know that ______ is equivalent to ______ because ...
- To split the number line into ______, I need to split each interval into ______ equal sections.

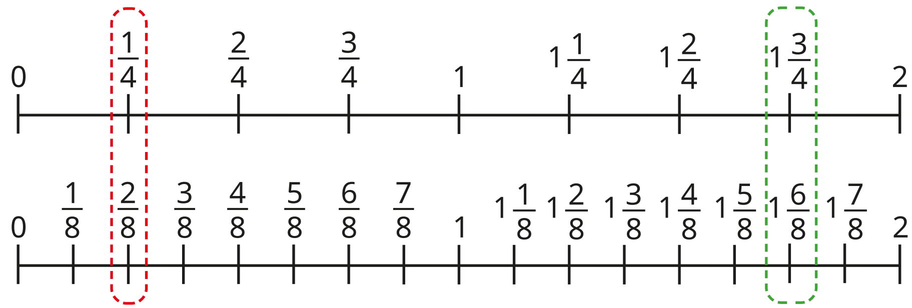
National Curriculum links

- Recognise and show, using diagrams, families of common equivalent fractions

Equivalent fractions on a number line

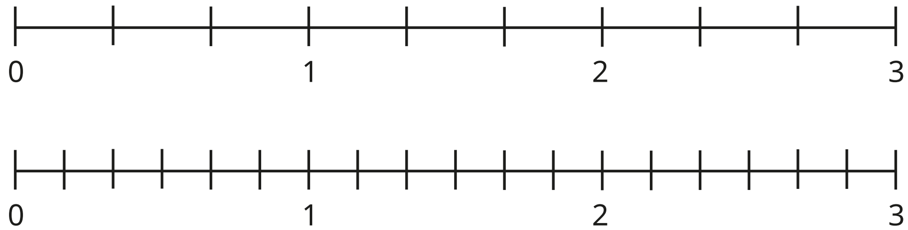
Key learning

- The number lines show two pairs of equivalent fractions.



Use the number lines to find two other pairs of equivalent fractions.

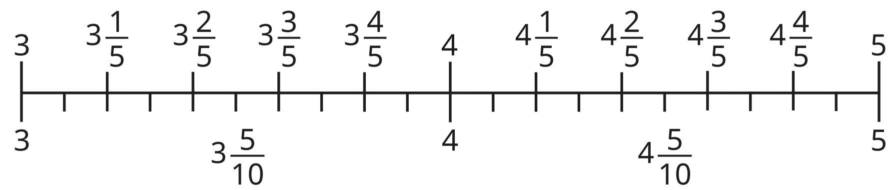
- Label the number lines.



Use the number lines to complete the equivalent fractions.

▶ $\frac{\square}{3} = \frac{2}{6}$ ▶ $1\frac{1}{3}$ = ______ $\frac{\square}{6}$ ▶ $1\frac{4}{6}$ = ______ $\frac{\square}{\square}$

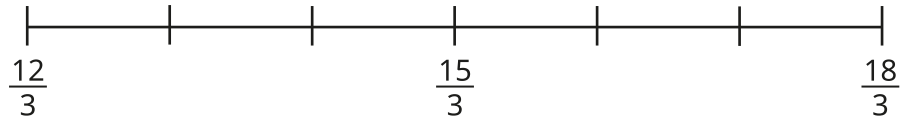
- Use the double number line to complete the equivalent fractions.



▶ $3\frac{4}{5}$ = ______ ▶ $4\frac{4}{10}$ = ______ ▶ $5\frac{1}{5}$ = ______

Write the equivalent mixed numbers as improper fractions.

- Split each section of the number line into 4 equal parts.



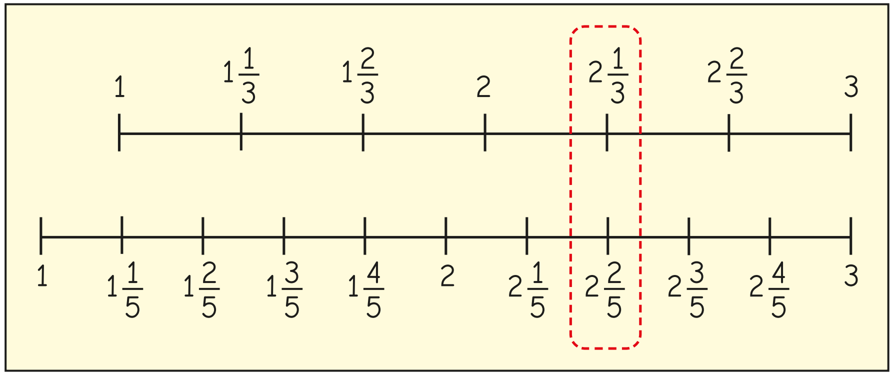
Use the number line to find two pairs of equivalent improper fractions.

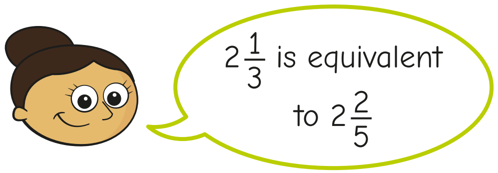
Write each pair of improper fractions as mixed numbers.

Equivalent fractions on a number line

Reasoning and problem solving

Dora is drawing number lines to find equivalent fractions.

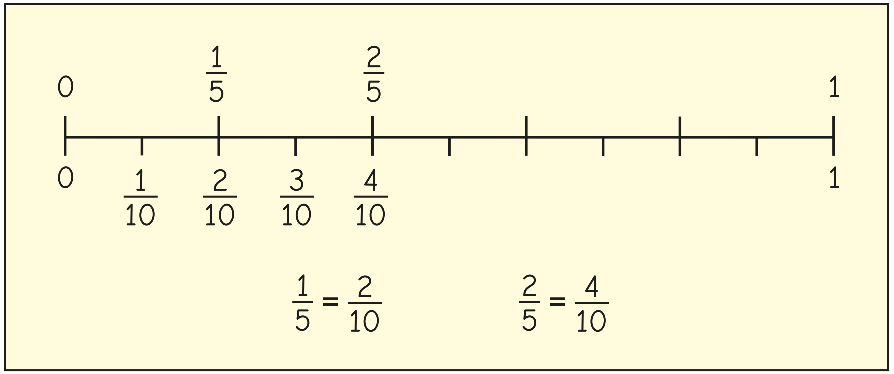


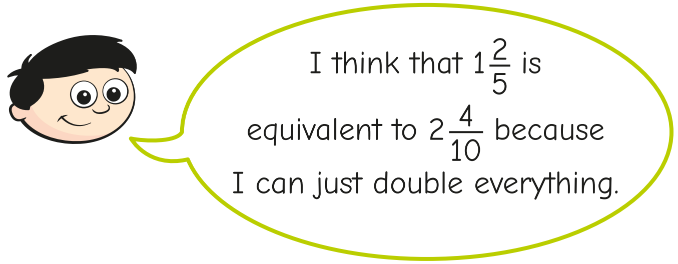


Do you agree with Dora?

Explain your answer.

No





Do you agree with Dexter?

Explain your answer.

No

Equivalent fraction families

Notes and guidance

In this small step, children develop their understanding of equivalent fractions, both within 1 and greater than 1, mainly through exploring bar models.

Building on learning from Year 3, children begin by finding equivalent fractions by splitting up models into smaller parts in a range of different ways. The key learning point is that as long as each of the existing parts are split equally into the same number of smaller parts, then the fractions will be equivalent. A common misconception is that children believe they can only split up existing parts into two equal sections, which limits the number of equivalent fractions that they will find. Children begin to use fraction walls to help create equivalent fraction families.

Although not the key focus, once children are comfortable finding equivalent fractions within 1, they may begin to find equivalent fractions greater than 1

Things to look out for

- Children may not draw accurate diagrams, so their equivalent fractions will be incorrect.
- Children may only split existing parts into two smaller sections.

Key questions

- How can you split each section into 2/3/4 equal smaller parts? How many other ways could you split each part?
- If you split each part into ______ equal smaller parts, what fraction does each part now represent?
- Why do you need to split all of the existing parts? Why do they need to be equal in size?
- Are there any fractions on the fraction wall that do not have any equivalent fractions shown? Does this mean they do not have any equivalent fractions?

Possible sentence stems

- If I divide each part into ______ equal parts, then they will each represent $\frac{\square}{\square}$
- I can divide each part into ______ equal parts to show that ______ is equivalent to ______

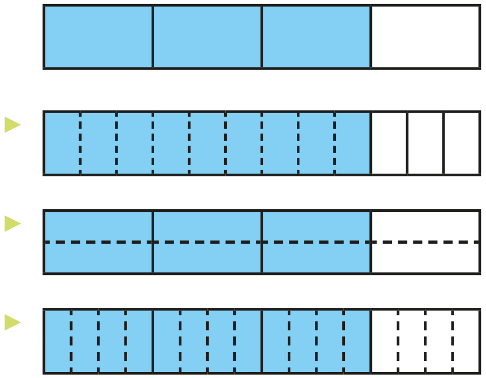
National Curriculum links

- Recognise and show, using diagrams, families of common equivalent fractions

Equivalent fraction families

Key learning

- Use the bar models to find the equivalent fractions.



$\frac{3}{4} = \frac{\square}{\square}$

$\frac{3}{4} = \frac{\square}{\square}$

$\frac{3}{4} = \frac{\square}{\square}$

Which bar model method do you prefer for finding equivalent fractions?

Complete the fraction family.

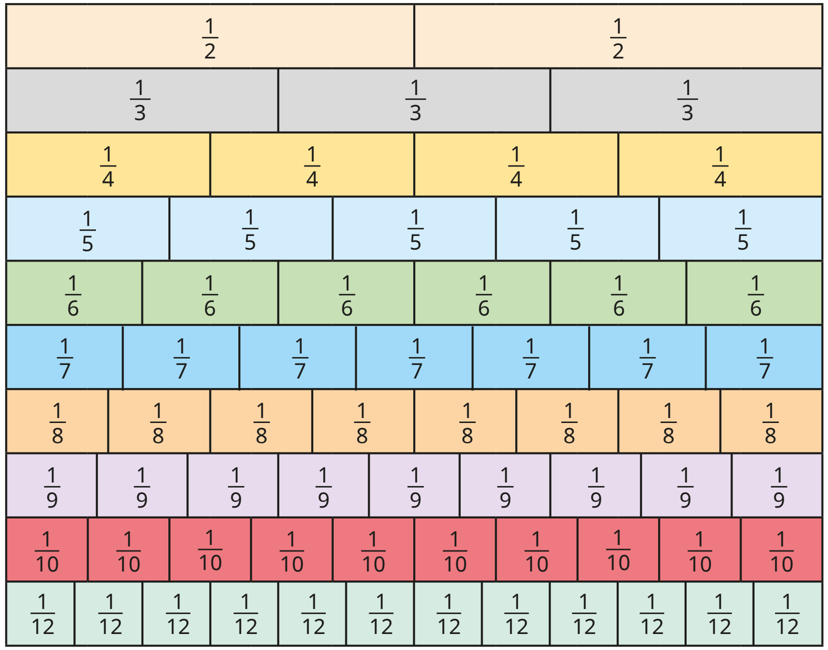
$\frac{3}{4} = \frac{\square}{\square} = \frac{\square}{\square} = \frac{\square}{\square}$

- Draw bar models to help you write a fraction family for each fraction.
  - $\frac{4}{5}$
  - $\frac{2}{3}$
  - $\frac{1}{6}$

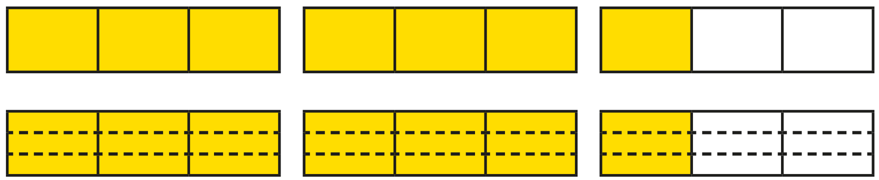
Compare answers with a partner.

Are your fraction families the same?

- Use the fraction wall to create equivalent fraction families.



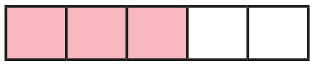
- What equivalent fractions can you see from the bar models?

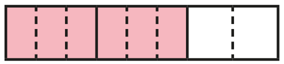


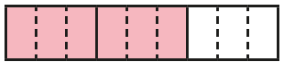
Equivalent fraction families

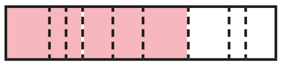
Reasoning and problem solving

Kim is finding equivalent fractions to $\frac{2}{3}$

A  $\frac{2}{3} = \frac{3}{5}$

B  $\frac{2}{3} = \frac{6}{8}$

C  $\frac{2}{3} = \frac{6}{9}$

D  $\frac{2}{3} = \frac{6}{9}$

Which of Kim's bar models is correct?

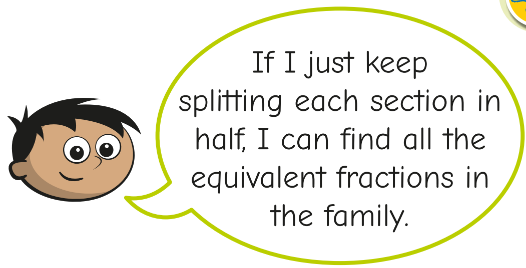
Which of Kim's equivalent fractions are correct?

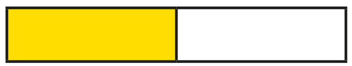
What mistakes has she made?

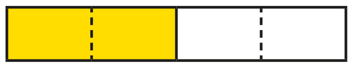
C

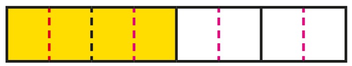
C, D

Amir is finding equivalent fractions.



 $\frac{1}{2}$

 $\frac{2}{4}$

 $\frac{4}{8}$

Do you agree with Amir?

Explain your reasons.

No

Add two or more fractions

Notes and guidance

Building from Year 3, in this small step children add two or more fractions with the same denominator. They add proper fractions in this step and then add fractions and mixed numbers in the next step.

Children start by folding strips of paper and shading the equal parts. They transfer this knowledge to using diagrams and bar models to add two fractions, before progressing to adding more than two fractions. Children also explore adding by using a number line and counting on.

Addition with totals greater than 1 is covered in this step, but first ensure that children are secure in adding fractions within 1. Encourage children to convert improper fractions to mixed numbers, although this is not essential in this step.

Things to look out for

- If using two bar models to add two fractions, children may think the two bar models together make 1 whole and will be unable to find the correct denominator.
- Children may add both the numerators and denominators, for example $\frac{1}{3} + \frac{1}{3} = \frac{2}{6}$

Key questions

- Are the denominators the same? Why is this important?
- How can you show the addition in a diagram/bar model?
- How could a number line help you?
- Is your answer greater or smaller than 1? How do you know?
- How do you convert an improper fraction to a mixed number?
- How is adding three fractions different from adding two fractions?
- How would you explain how to add fractions to someone who does not understand?

Possible sentence stems

- When the denominators are the same, to add the fractions add the ______
- $\frac{\square}{\square}$ is the same as ______ (for example, $\frac{5}{4}$ is the same as $1\frac{1}{4}$)

National Curriculum links

- Add and subtract fractions with the same denominator

Add two or more fractions

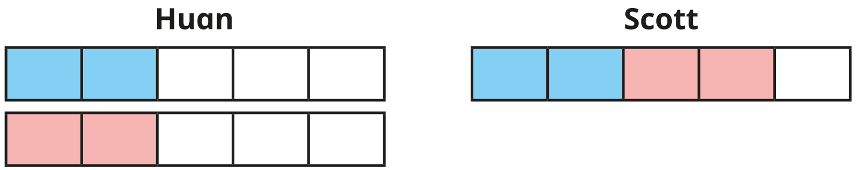
Key learning

- Take two identical strips of paper.

  Fold each strip in half and then in half again to make quarters.

  Use the strips to work out $\frac{1}{4} + \frac{1}{4}$

- Huan and Scott use bar models to represent $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$

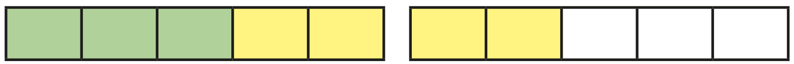


  Are their methods the same or different?

  Use your preferred method to work out the additions.

  $\frac{3}{8} + \frac{1}{8}$ $\frac{2}{7} + \frac{4}{7}$ $\frac{3}{10} + \frac{7}{10}$

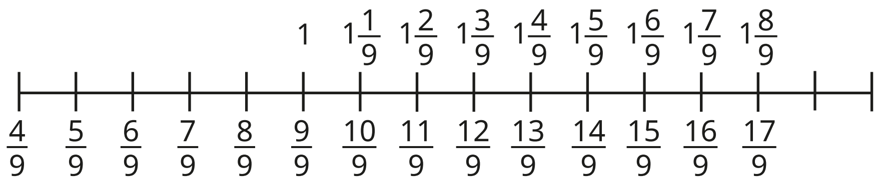
- Dani uses bar models to show that $\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$



  Use Dani's method to work out the additions.

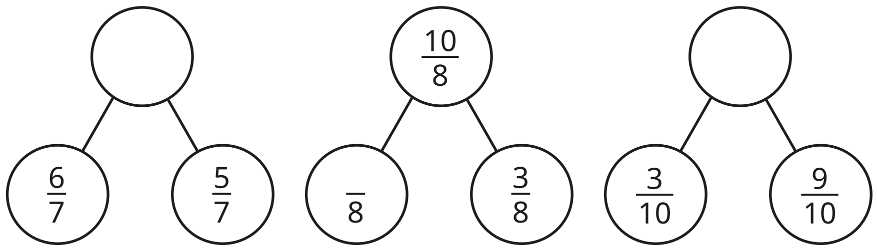
  $\frac{2}{5} + \frac{4}{5}$ $\frac{4}{5} + \frac{4}{5}$ $\frac{3}{10} + \frac{9}{10}$ $\frac{7}{10} + \frac{9}{10}$

- Use the number line to add the fractions.



  $\frac{4}{9} + \frac{8}{9}$ $\frac{5}{9} + \frac{6}{9}$ $\frac{8}{9} + \frac{8}{9}$

- Complete the part-whole models.



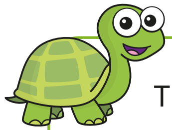
- Filip walks $\frac{7}{10}$ km to school.

  After school, he walks $\frac{9}{10}$ km to Aisha's house.

  How far has Filip walked in total?

Add two or more fractions

Reasoning and problem solving



Tiny is adding fractions.

$$\frac{3}{9} + \frac{2}{9} = \frac{5}{18}$$

Is Tiny correct?

How do you know?

No

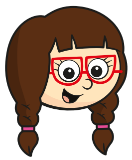
Find as many ways as possible to complete the calculation.

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{11}{9}$$

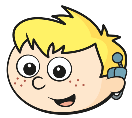
multiple possible answers, e.g. $\frac{3}{9} + \frac{8}{9}$

Jo and Max are working out the addition.

$$\frac{6}{13} + \frac{5}{13} + \frac{7}{13}$$



Jo: The answer is 1 and $\frac{5}{13}$



Max: The answer is $\frac{18}{13}$

Who do you agree with?

Explain your answer.

Both are correct.

Add fractions and mixed numbers

Notes and guidance

In this small step, children combine knowledge of adding two or more fractions with their understanding of mixed numbers to add fractions and mixed numbers.

Children start by adding fractions to whole numbers and, when this is secure, add mixed numbers and fractions. Bar models and number lines are useful tools to illustrate this process. Number lines are especially helpful when crossing a whole. Children look at two methods: partitioning the fraction to add to the next whole number, then adding the remaining fraction to the whole number, and adding the fractions separately, then adding the total to the whole number.

Things to look out for

- Children may add the whole number to the numerator, for example $1\frac{3}{10} + \frac{1}{10} = \frac{4}{10} + \frac{1}{10} = \frac{5}{10}$
- Children should be encouraged to start with the mixed number, especially when using a number line.
- Children may not convert improper fractions to mixed numbers when crossing a whole, for example writing $1\frac{6}{5}$

Key questions

- Are the denominators the same? Why is this important?
- How is adding two fractions different from adding a fraction and a whole number? How is it different from adding a fraction and a mixed number?
- Do you prefer to use a bar model or a number line? Why?
- How could you partition the fraction to help you work out the answer?
- Do you have an improper fraction in your answer? How should you write the mixed number?

Possible sentence stems

- If the denominators are the same, to add the fractions I need to add the ______
- I can partition ______ into ______ and ______

National Curriculum links

- Add and subtract fractions with the same denominator

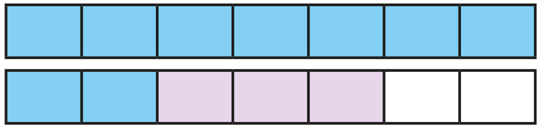
Add fractions and mixed numbers

Key learning

- Draw bar models to show the calculations.

$\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$	$1 + \frac{2}{5} = 1\frac{2}{5}$	$\frac{2}{5} + 2 = 2\frac{2}{5}$

- Tommy uses a bar model to work out this addition.

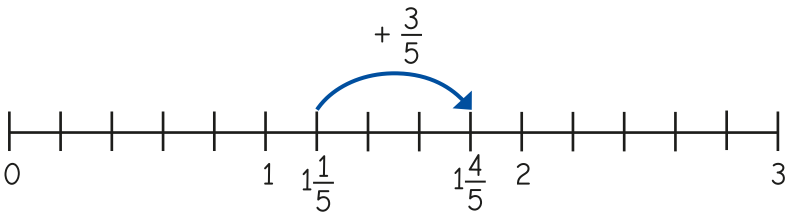


$1\frac{2}{7} + \frac{3}{7} = 1\frac{5}{7}$

Use bar models to work out the additions.

$1\frac{3}{7} + \frac{3}{7}$	$1\frac{1}{5} + \frac{2}{5}$	$2\frac{3}{10} + \frac{6}{10}$	$\frac{7}{10} + 3\frac{1}{10}$

- Amir uses a number line to add fractions.

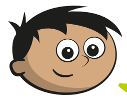


What calculation is Amir working out? What is the answer?

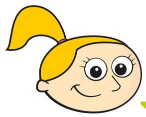
- Use number lines to work out the additions.

$2\frac{2}{5} + \frac{2}{5}$	$2\frac{1}{10} + \frac{6}{10}$	$1\frac{4}{5} + \frac{3}{5}$
$1\frac{1}{5} + \frac{2}{5}$	$2\frac{3}{5} + \frac{2}{5}$	$6\frac{4}{6} + \frac{5}{6}$

- Amir and Eva are working out $1\frac{7}{9} + \frac{5}{9}$



Amir: I will add the fractions first.



Eva: I will partition $\frac{5}{9}$ to make it easier to add.

Amir	Eva
$\frac{7}{9} + \frac{5}{9} = \frac{12}{9} = 1\frac{3}{9}$	$1\frac{7}{9} + \frac{2}{9} = 1\frac{9}{9} = 2$
$1\frac{3}{9} + 1 = 2\frac{3}{9}$	$2 + \frac{3}{9} = 2\frac{3}{9}$

Use your preferred method to work out the additions.

$1\frac{7}{9} + \frac{8}{9}$	$\frac{3}{9} + 1\frac{8}{9}$	$2\frac{4}{5} + \frac{3}{5}$	$\frac{6}{10} + 7\frac{7}{10}$

Add fractions and mixed numbers

Reasoning and problem solving

Tommy works out an addition.

$$4\frac{3}{5} + \frac{2}{5} = 4\frac{5}{5}$$

Do you agree with Tommy?

Explain your answer.

No

Whitney is working out $1\frac{2}{5} + \frac{1}{5}$

$$1\frac{2}{5} + \frac{1}{5} = \frac{4}{5}$$

What mistake has she made?

Work out the correct answer.

$1\frac{3}{5}$

A mixed number and two different fractions have a total of $3\frac{3}{8}$

- The mixed number is greater than 1
- All the denominators are 8
- The sum of the two fractions is $\frac{5}{8}$

Complete the number sentence.

$$\_\_\_\_ \frac{\square}{\square} + \frac{\square}{\square} + \frac{\square}{\square} = 3\frac{3}{8}$$

mixed number: $2\frac{6}{8}$

fractions: $\frac{3}{8} + \frac{2}{8}$ or $\frac{4}{8} + \frac{1}{8}$

What is the missing digit?

$$6\frac{3}{10} + \frac{\square}{10} = 7$$

What would change if the answer to the calculation was 8?

7

Subtract two fractions

Notes and guidance

In this small step, children subtract two fractions with the same denominator. They should link this to adding fractions with the same denominator, realising that when the denominators are the same, they need to subtract the numerators.

Children start by folding paper and then link this to diagrams and bar models. Encourage children to explore all the different structures of subtraction: taking away, partitioning and difference.

The questions in this step only explore subtracting from proper and improper fractions. Subtraction from whole numbers and mixed numbers are covered later in the block.

Things to look out for

- Children may subtract both the numerators and the denominators, for example $\frac{5}{8} - \frac{3}{8} = \frac{2}{0}$
- When comparing methods, children may not be aware of the different structures of subtraction.
- Children do not need to give answers as mixed numbers, but some may not recognise that an improper fraction can be converted to a mixed number.

Key questions

- Are the denominators the same? Why is this important?
- How could you represent the subtraction in a diagram/bar model?
- How would a number line help you?
- Is your answer greater or smaller than 1? How do you know?
- What is the same when you are adding or subtracting fractions with the same denominator? What is different?
- How would you explain how to subtract fractions to someone who does not understand?

Possible sentence stems

- If the denominators are the same, to subtract the fractions I need to subtract the ______
- ______ minus ______ is equal to ______

National Curriculum links

- Add and subtract fractions with the same denominator

Subtract two fractions

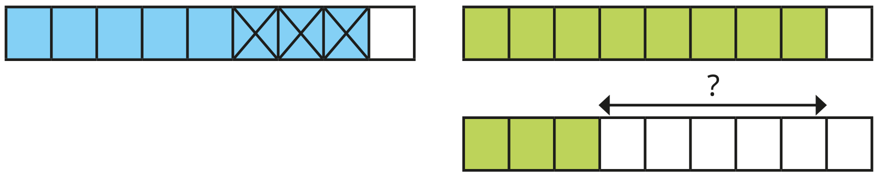
Key learning

- Fold strips of paper into eighths and use them to work out the subtractions.

$\frac{7}{8} - \frac{1}{8}$　　$\frac{7}{8} - \frac{3}{8}$　　$\frac{6}{8} - \frac{3}{8}$　　$\frac{8}{8} - \frac{5}{8}$

- Filip and Kim use bar models to work out $\frac{8}{9} - \frac{3}{9} = \frac{5}{9}$

Filip　　**Kim**



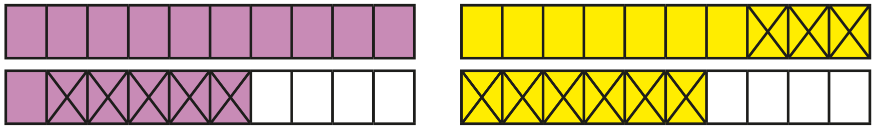
What is the same about their methods? What is different?

- Use bar models to work out the subtractions.

$\frac{7}{9} - \frac{5}{9}$　　$\frac{9}{9} - \frac{7}{9}$　　$\frac{7}{10} - \frac{6}{10}$　　$\frac{9}{10} - \frac{8}{10}$

$\frac{7}{9} - \frac{4}{9}$　　$\frac{5}{6} - \frac{2}{6}$　　$\frac{6}{6} - \frac{5}{6}$　　$\frac{12}{12} - \frac{10}{12}$

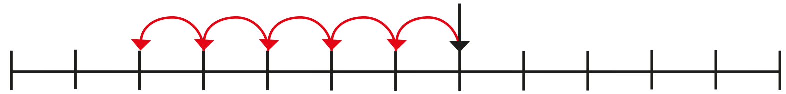
- Use the bar models to complete the calculations.



$\frac{16}{10} - \frac{5}{10}$　　$\frac{16}{10} - \frac{9}{10}$

What is the same? What is different?

- Annie is using a number line to show that $\frac{7}{6} - \frac{5}{6} = \frac{2}{6}$



Use Annie's method to work out the subtractions.

$\frac{7}{6} - \frac{4}{6}$　　$\frac{9}{6} - \frac{5}{6}$　　$\frac{11}{6} - \frac{5}{6}$　　$\frac{11}{6} - \frac{8}{6}$

Subtract two fractions

Reasoning and problem solving

Tiny is subtracting fractions.

$$\frac{7}{10} - \frac{4}{10} = 3$$

Do you agree with Tiny?

Explain your answer.

No

Complete the calculations in as many different ways as you can.

$$\frac{\square}{7} - \frac{3}{7} = \frac{\square}{7} + \frac{\square}{7}$$

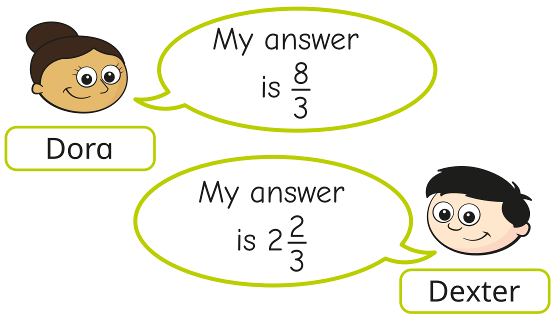
$$\frac{\square}{7} - \frac{3}{7} = \frac{\square}{7} - \frac{\square}{7}$$

multiple possible answers, e.g.

$$\frac{6}{7} - \frac{3}{7} = \frac{1}{7} + \frac{2}{7}$$

$$\frac{7}{7} - \frac{3}{7} = \frac{6}{7} - \frac{2}{7}$$

Dora and Dexter are working out $\frac{13}{3} - \frac{5}{3}$



Who is correct?

How do you know?

Both are correct.

A chocolate bar has been split into 10 equal parts.

Rosie eats $\frac{3}{10}$ of the bar.

Dexter eats $\frac{1}{10}$ of the bar more than Rosie.

What fraction of the chocolate bar is left?

$\frac{3}{10}$

Subtract from whole amounts

Notes and guidance

This small step links the previous step and the next step together, helping children to make links between subtracting fractions and subtracting mixed numbers and fractions.

Children need to know how many equal parts are equivalent to the whole and how this relates to whole numbers greater than 1. They use bar models and explore subtracting from the whole, initially when it is written as a fraction, for example $\frac{9}{9}$, rather than 1. They subtract from whole numbers greater than 1, comparing subtracting the fraction from one of the wholes with using improper fractions.

Number lines are also used in this step, and children explore the difference between taking away and finding the difference.

Things to look out for

- Some children may not be efficient when converting whole numbers into fractions.
- Children may know that $1 = \frac{10}{10}$ but may not be as confident that $3 = \frac{30}{10}$
- Children may subtract the numerator from the whole, for example $4 - \frac{1}{5} = \frac{3}{5}$

Key questions

- How many ______ are equal to 1 whole/2 wholes/5 wholes?
- What is the connection between the numerator in the question and the numerator in the answer when you subtract a fraction from 1?
- How can you show the problem using a bar model/number line?
- How many of the wholes are affected when you subtract a fraction?
- How can you partition the whole number to help with the subtraction?

Possible sentence stems

- $1 - \frac{\square}{\square} = \frac{\square}{\square}$, so $2 - \frac{\square}{\square} = 1\frac{\square}{\square}$
- If the denominators are the same, to subtract the fractions I need to subtract the ______
- 1 whole is equal to $\frac{\square}{\square}$, so wholes are equal to $\frac{\square}{\square}$

National Curriculum links

- Add and subtract fractions with the same denominator

Subtract from whole amounts

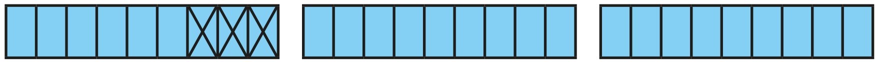
Key learning

- Convert the whole numbers into fractions.

$1 = \frac{\square}{3}$ $1 = \frac{\square}{5}$ $2 = \frac{\square}{5}$ $2 = \frac{\square}{10}$ $5 = \frac{\square}{10}$

What do you notice?

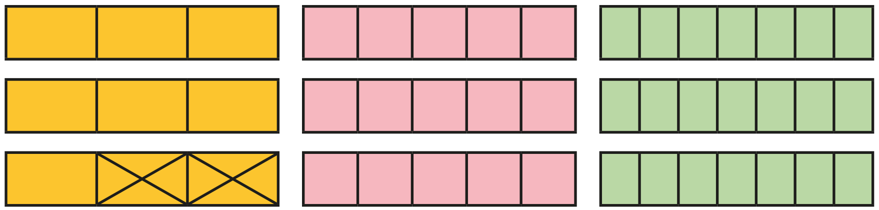
- Use the diagrams to work out the subtractions.



$\frac{9}{9} - \frac{3}{9}$ $\frac{9}{9} - \frac{4}{9}$ $1 - \frac{5}{9}$

What is the same? What is different?

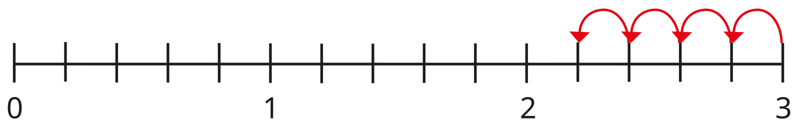
- Use the bar models to work out the subtractions.



$3 - \frac{2}{3}$ $3 - \frac{3}{5}$ $3 - \frac{5}{7}$

Compare answers with a partner.

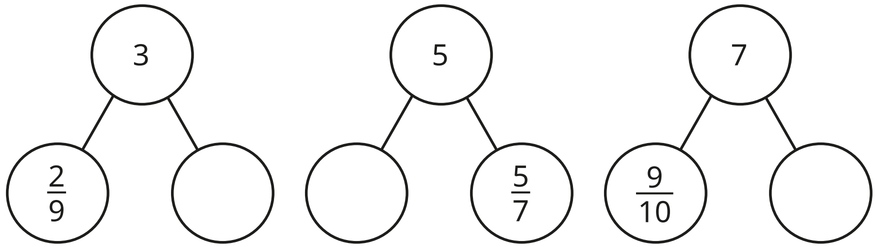
- Jo uses a number line to find $3 - \frac{4}{5} = 2\frac{1}{5}$



Use Jo's method to work out the subtractions.

$3 - \frac{2}{5}$	$2 - \frac{4}{5}$	$3 - \frac{7}{10}$	$5 - \frac{7}{9}$

- Complete the part-whole models.



- Huan has 5 m of ribbon.

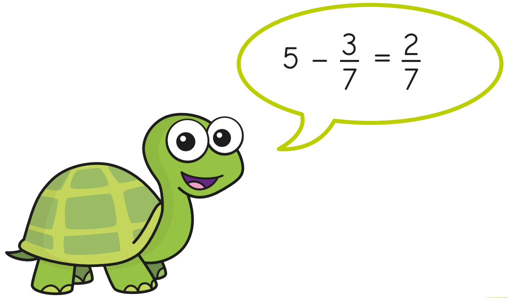
  He cuts off $\frac{3}{5}$ m to give to Dani.

  How much ribbon is left?

Subtract from whole amounts

Reasoning and problem solving

Tiny is subtracting a fraction from a whole number.



What mistake has Tiny made?

What is the correct answer?

$4\frac{4}{7}$

Find as many ways as you can to complete the statement.

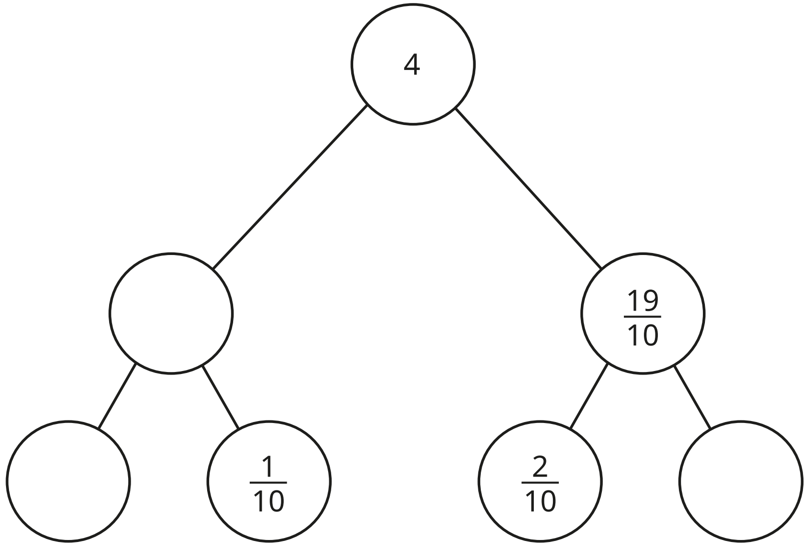
$$2 - \frac{\square}{8} = \frac{5}{8} + \frac{\square}{8}$$

multiple possible answers, e.g.

$2 - \frac{1}{8} = \frac{5}{8} + \frac{10}{8}$

$2 - \frac{7}{8} = \frac{5}{8} + \frac{4}{8}$

Complete the part-whole model.



$\frac{21}{10}$ or $2\frac{1}{10}$

$\frac{20}{10}$ or 2 $\quad$ $\frac{17}{10}$ or $1\frac{7}{10}$

Subtract from mixed numbers

Notes and guidance

In this small step, children subtract from mixed numbers. This step only covers subtracting a whole or a fraction from a mixed number; this will be developed in more detail and extended to subtracting mixed numbers from mixed numbers in Year 5

Children are introduced to these subtractions using bar models and number lines. Firstly, they explore what happens when they subtract a whole number from a mixed number, and then a fraction that does not cross a whole from a mixed number. Once this is secure, children complete subtractions that cross a whole number, exploring different methods.

Things to look out for

- When subtracting a whole number from a mixed number, children may subtract a fraction instead, for example $3\frac{4}{7} - 1 = 3\frac{3}{7}$
- Children may think they cannot complete a subtraction if the fraction they are subtracting is greater than the fractional part of the mixed number, for example $3\frac{1}{3} - \frac{2}{3}$

Key questions

- How is subtracting from a mixed number different from subtracting from wholes or fractions? How is it the same?
- How can you show the subtraction as a bar model? Will you subtract whole bars or parts of bars?
- How can you show the subtraction on a number line?
- How can you partition the mixed number/fraction to help you solve the calculation?
- If you subtracted back to the previous whole number, why would this help?

Possible sentence stems

- If the denominators are the same, to subtract the fractions I need to subtract the ______
- I can partition ______ into ______ and ______
- When I subtract a whole number from a mixed number, the ______ stays the same.

National Curriculum links

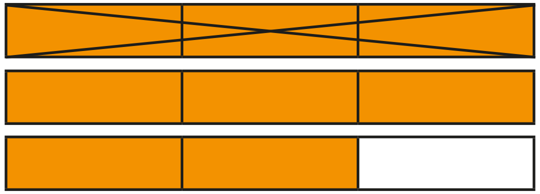
- Add and subtract fractions with the same denominator

Subtract from mixed numbers

Key learning

- Aisha uses a bar model to show that $2\frac{2}{3} - 1 = 1\frac{2}{3}$

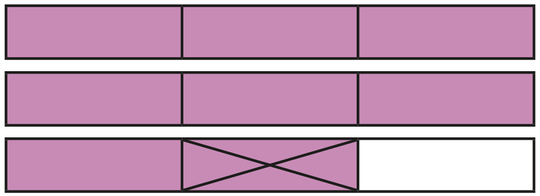
  What do you notice?



Use Aisha's method to work out the subtractions.

$3\frac{2}{3} - 2$	$2\frac{4}{5} - 1$	$5\frac{3}{10} - 3$	$4\frac{6}{7} - 4$

- Ron uses a bar model to show that $2\frac{2}{3} - \frac{1}{3} = 2\frac{1}{3}$

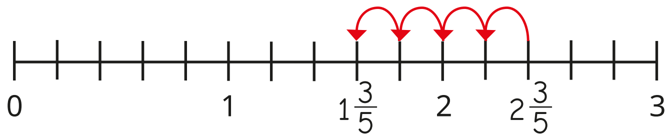


Use Ron's method to work out the subtractions.

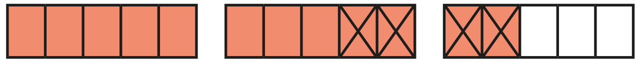
$3\frac{4}{5} - \frac{1}{5}$	$3\frac{4}{5} - \frac{3}{5}$	$2\frac{7}{10} - \frac{3}{10}$	$3\frac{9}{10} - \frac{9}{10}$

- Esther and Brett are working out $2\frac{2}{5} - \frac{4}{5} = 1\frac{3}{5}$

Esther



Brett

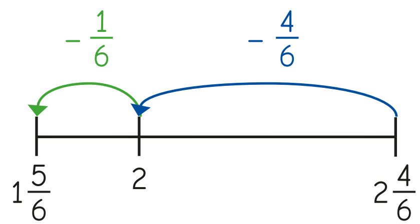


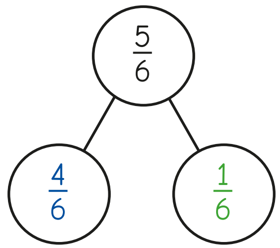
What is the same about the methods? What is different?

Use your preferred method to work out the subtractions.

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

- Jack has partitioned $\frac{5}{6}$ to work out $2\frac{4}{6} - \frac{5}{6}$





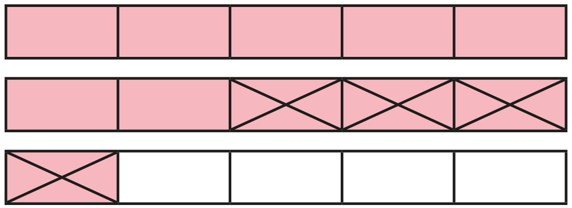
Use Jack's method to work out the subtractions.

$3\frac{2}{7} - \frac{5}{7}$	$2\frac{3}{5} - \frac{4}{5}$	$5\frac{3}{10} - \frac{7}{10}$

Subtract from mixed numbers

Reasoning and problem solving

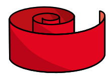
What subtraction does the bar model show?



How do you know?

$2\frac{1}{5} - \frac{4}{5} = 1\frac{2}{5}$

A piece of ribbon is $3\frac{1}{4}$ m long.



Tom and Alex cut off $\frac{3}{4}$ m of ribbon each.

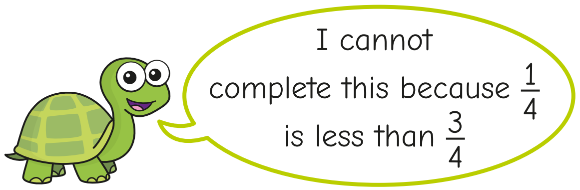
Nijah needs 2 m of ribbon to complete an art project.

Is there enough ribbon left for Nijah?

Explain your answer.

No

Tiny is working out $7\frac{1}{4} - \frac{3}{4}$



Do you agree with Tiny?

Explain your answer.

No

Use the digit cards to complete the calculation.

3 4 5 6 7

You may use each card only once.

$\square\frac{\square}{7} - \frac{\square}{7} = 2\frac{\square}{\square}$

$3\frac{4}{7} - \frac{5}{7} = 2\frac{6}{7}$

Spring Block 4

Decimals A

Small steps

Step 1	Tenths as fractions
Step 2	Tenths as decimals
Step 3	Tenths on a place value chart
Step 4	Tenths on a number line
Step 5	Divide a 1-digit number by 10
Step 6	Divide a 2-digit number by 10
Step 7	Hundredths as fractions
Step 8	Hundredths as decimals

Small steps

Step 9	Hundredths on a place value chart
Step 10	Divide a 1- or 2-digit number by 100

Tenths as fractions

Notes and guidance

In Year 3, children were introduced to unit and non-unit fractions and learnt to compare and order these. They also explored dividing 100 into 10 equal parts on a number line, so they should already be familiar with the idea of tenths. In this small step, children explore the idea of a tenth as a fraction.

Children explore tenths through different representations of 1 whole split into ten equal parts, including place value counters, straws, counters on a ten frame and bead strings. Number lines are another useful representation of tenths as fractions, and are covered again in a later step.

At this stage, children explore tenths as fractions only – the concept of tenths as decimals is introduced later in the block.

Things to look out for

- Children may see the pattern of $\frac{1}{10}, \frac{2}{10}, \frac{3}{10}$ ... without understanding each part's worth and how it fits in with the whole.
- Seeing one-tenth in an unfamiliar place can confuse children, for example a bar split into 10 with the 9th bar shaded. Children may see this as $\frac{9}{10}$

Key questions

- What is a fraction?
- What is a tenth?
- If a whole is divided into 10 equal parts, what is the value of each part?
- How can you represent the fraction ______ using a model?
- When you are counting up in tenths, what comes before/after ______?
- When you are counting up in tenths, what comes after $\frac{9}{10}$?
- How are tenths similar to ones?

Possible sentence stems

- When a whole is split into ______ equal parts, one of those parts is worth ______
- When counting in tenths, the number before/after ______ is ______

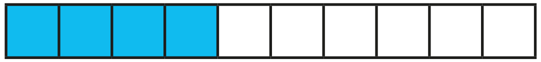
National Curriculum links

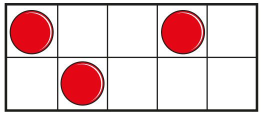
- Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing 1-digit numbers or quantities by 10 (Y3)

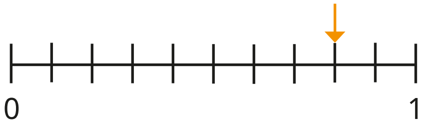
Tenths as fractions

Key learning

- What fraction does each picture show?





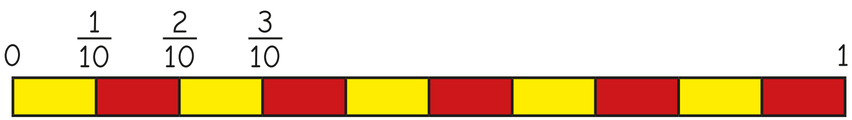


- Draw pictures to show the fractions.

$\frac{1}{10}$ $\frac{6}{10}$ $\frac{10}{10}$ $\frac{7}{10}$

Compare drawings with a partner.

- Scott is counting up in tenths.



Continue Scott's counting until you reach 1

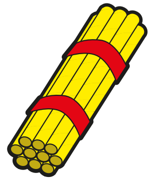
With a partner, count back from 1 to 0 in tenths.

- Dora has a bundle of 10 straws.

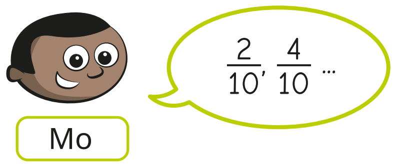
She says that this bundle represents 1 whole.

She gives 3 straws to Kim and 1 straw to Tommy.

What fraction of the straws does Dora have left?

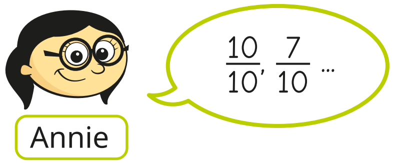


- Mo is counting up in $\frac{2}{10}$s.



What will be the next three fractions he says?

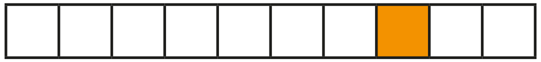
- Annie is counting down in $\frac{3}{10}$s.



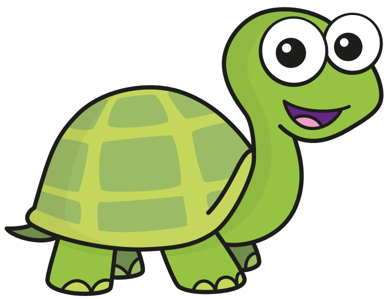
What will be the next two fractions she says?

Tenths as fractions

Reasoning and problem solving



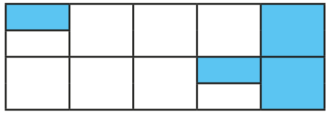
The bar model shows $\frac{8}{10}$ because the 8th part is shaded.

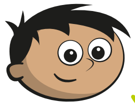


Do you agree with Tiny?

Explain your answer.

No

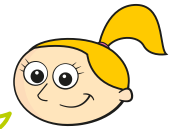




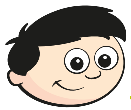
Amir

$\frac{2}{10}$ of the shape is shaded, because only 2 parts out of 10 are fully shaded.

$\frac{4}{10}$ of the shape is shaded, because 4 parts are shaded.



Eva



Dexter

$\frac{3}{10}$ of the shape is shaded, because altogether 3 full parts out of 10 are shaded.

Who do you agree with?

Explain your answer.

Dexter

Tenths as decimals

Notes and guidance

Now that children have an understanding of tenths as fractions, they move on to looking at them as decimals.

This is the first time that children have encountered decimal numbers and the decimal point. Model making, drawing and writing decimal numbers, showing that the decimal point is used to separate whole numbers from decimals.

Children look at a variety of representations of tenths as decimals, up to the value of 1 whole. This leads to adding the tenths column to a place value chart for children to see how tenths fit with the rest of the number system and to understand the need for the decimal point. This will be developed further in the next step, which explores decimal numbers beyond 1 whole.

Things to look out for

- Children may forget to include the decimal point.
- If the number of tenths reaches 10, children may call this “zero point ten” and write 0.10 rather than exchanging for 1 one.
- Children may confuse the words “tens” and “tenths”.

Key questions

- What is a decimal?
- What is a tenth?
- If a whole is divided into 10 equal parts, what is the value of each part?
- How can you represent the decimal ______ using a model?
- How are decimals similar to fractions?
- How can you convert between tenths as fractions and tenths as decimals?
- How is $\frac{1}{10}$ similar to 0.1? How is it different?

Possible sentence stems

- If a whole is split into 10 equal parts, then each part is worth ______
- Zero point ______ is equal to ______ tenths.
- ______ as a fraction/decimal is ______

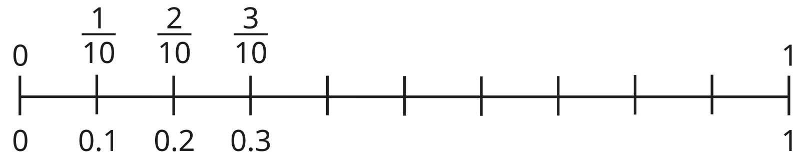
National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths

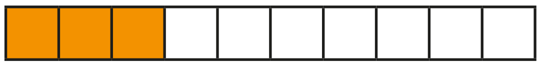
Tenths as decimals

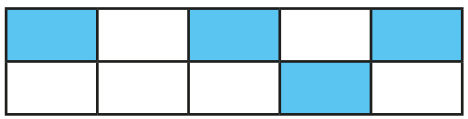
Key learning

- Complete the number line counting in tenths.



- What decimal numbers are shown by each picture?

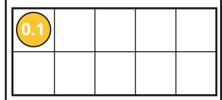
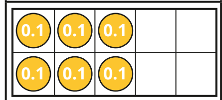




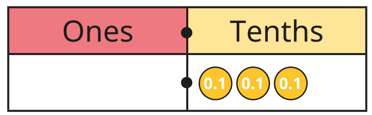
- Draw a picture to show each number.

0.4 | 0.8 | 0.2 | 0.7

- Complete the table.

Picture	Words	Fraction	Decimal
	one tenth	$\frac{1}{10}$	0.1
			
			0.9

- What number is shown on the place value chart?



Use a place value chart to show the numbers.

0.6 | $\frac{7}{10}$ | 0.5 | $\frac{1}{10}$

- Esther puts 10 tenths into the tenths column of a place value chart.

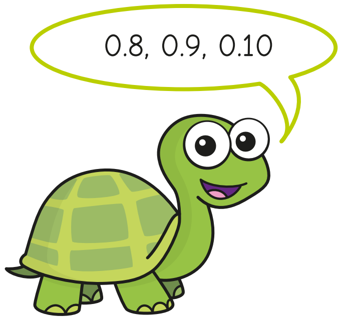
  What number has she made?

  What does she need to do?

Tenths as decimals

Reasoning and problem solving

Tiny is counting up in 0.1s.



Do you agree with Tiny?

Explain your answer.

No

Rosie thinks of a number.

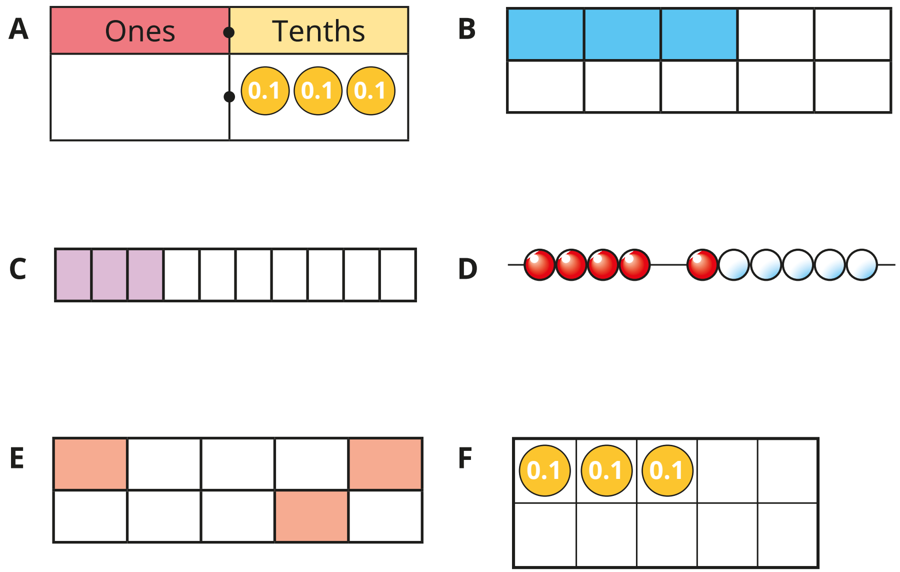
$\frac{1}{10}$ more than her number is $\frac{7}{10}$

What is Rosie's number?

Give your answer as a decimal.

0.6

Which is the odd one out?



Explain your answer.

D

Tenths on a place value chart

Notes and guidance

In this small step, children continue to explore the tenths column in a place value chart, extending their previous learning to include numbers greater than 1

It is important that children understand that 10 tenths are equivalent to 1 whole, and therefore 1 whole is equivalent to 10 tenths. Children use this knowledge when counting both forwards and backwards in tenths. When counting forwards, children should know that 1 comes after 0.9, and when counting backwards that 0.9 comes after 1. Links can be made to the equivalence of 10 ones and 1 ten to support understanding.

Things to look out for

- If the number of tenths reaches 10, children may call this "zero point ten" and write 0.10 rather than exchanging for 1 one.
- When counting up in tenths, children may go from 9 tenths to 0 tenths, but then forget to increase the value of the ones column, for example 1.8, 1.9, 1.0, 1.1 …
- Similarly, when counting down in tenths, children may forget to subtract a 1 to exchange, for example 2.2, 2.1, 2.0, 2.9, 2.8 …

Key questions

- What is a tenth?
- What is a decimal point?
- If you have ______ in the tenths column, what number do you have?
- How many tenths make 1 whole?
- If you have 10 in the tenths column, can you make an exchange?
- How many wholes/tenths are in the number ______?

Possible sentence stems

- There are ______ tenths in 1 whole.
- 1 whole is equivalent to ______ tenths.
- There is/are ______ whole/wholes and ______ tenths.
- The number is ______

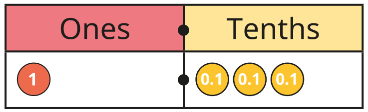
National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths

Tenths on a place value chart

Key learning

- Teddy uses place value counters and a place value chart to represent the number 1.3



There is 1 whole and 3 tenths.
The number is 1.3

▸ Use Teddy's method to represent the numbers.

1.6   3.5   0.3   9.8

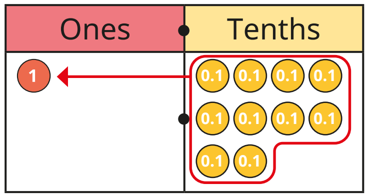
▸ Complete the sentences for each number.

There is/are ______ whole/wholes and ______ tenths.

The number is ______

- Mo is counting up in tenths.

When he gets to 10 tenths, he exchanges them to make 1 one.



▸ Use place value counters to count up in 0.1s from 1 whole.

▸ Complete the number track.

1	1.1									

- Complete the sentences for the number in the place value chart.

Ones	Tenths
3	2

There are ______ ones and ______ tenths.

______ ones + ______ tenths = 3 + 0.2

= 3.2

- Use a place value chart and sentences to describe the decimals.

4.0   5.9   2.2   7.6

- Complete the number tracks.

	0.7		0.9		1.1	1.2

2.2	2.4		2.8		3.2

7.4	7.3		7.1			6.8

2.8	2.6			2	

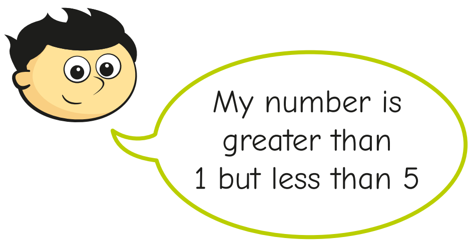
Tenths on a place value chart

Reasoning and problem solving

Jack uses the digit cards and the place value chart to make a number.

3	4	5	6	7

Ones	Tenths



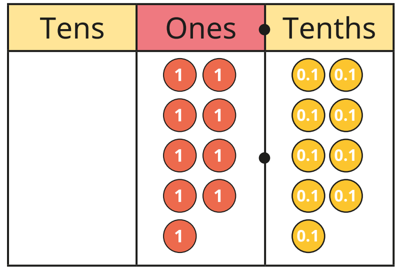
What number could Jack have made?

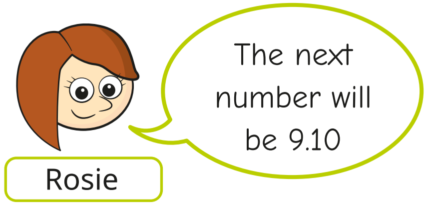
Find as many possibilities as you can.

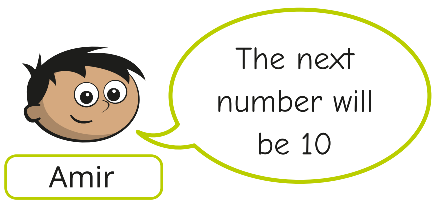
ten possible numbers:

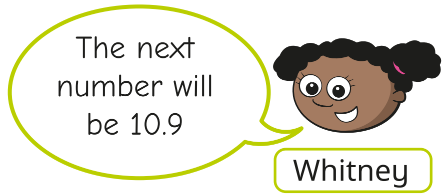
3, 3.4, 3.5, 3.6, 3.7,
4, 4.3, 4.5, 4.6, 4.7

Rosie, Whitney and Amir are counting up in 0.1s.
They get to this number.









Who do you agree with?

Explain your answer.

Amir

Tenths on a number line

Notes and guidance

In this small step, children extend their understanding of tenths by exploring them on a number line.

Number lines help children to see the relationship between tenths and whole numbers. They find missing decimal numbers in a sequence, deepening their understanding of the value of 1 tenth. The sequences initially go up and down in steps of 1 tenth and then in varying intervals, including crossing the whole. Seeing this modelled on a number line helps children with their understanding.

From their learning in the fractions block earlier in Year 4, children should be able to see fractions greater than 1 as mixed numbers, but for this step the numbers will be kept as decimals.

Things to look out for

- Children may assume each interval is 0.1 without checking other numbers on the number line to see if the interval is greater than 0.1
- When counting past the whole in 0.1s, children may say "0.9, 0.10, 0.11 …"
- When crossing the whole, children may miss out the whole number, for example 0.8, 0.9, 1.1, 1.2 …

Key questions

- How can you show these numbers on a number line?
- If there are 10 intervals between two whole numbers, what is each interval worth?
- How can you work out the missing number in the sequence?
- What intervals does the number line go up in?
- How do you count in 0.1s past a whole number?

Possible sentence stems

- The start point is ______
  The end point is ______
  The number line is counting up in ______
- The missing number is ______ because …

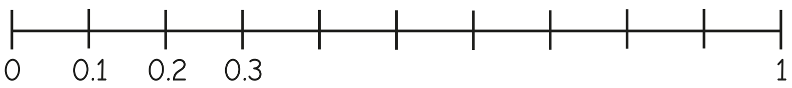
National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Compare numbers with the same number of decimal places up to 2 decimal places

Tenths on a number line

Key learning

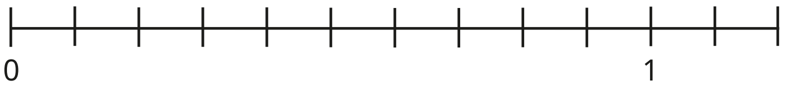
- Dani is counting in tenths on a number line.



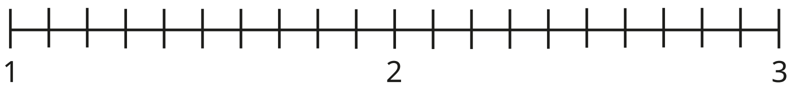
Finish labelling Dani's number line.

- Label the numbers on the number line.

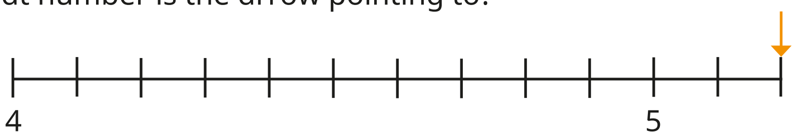
0 .5 | 0.9 | 1.1



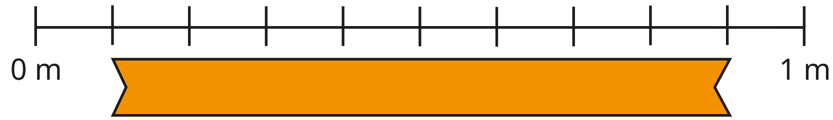
- Complete the number line.



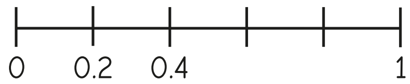
- What number is the arrow pointing to?



- How long is the ribbon?



- Brett has drawn this number line.



  - Complete the sentences to describe Brett's number line.

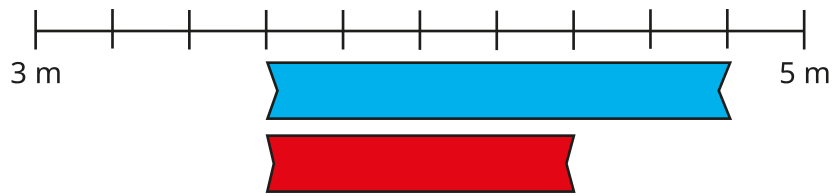
    The start point is ______

    The end point is ______

    The number line is counting up in ______

  - Label the missing numbers on the number line.

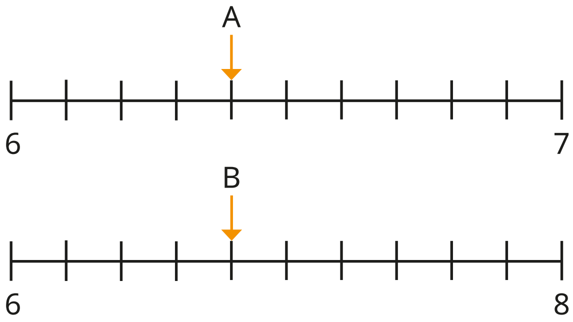
- How much longer is the blue ribbon than the red ribbon?

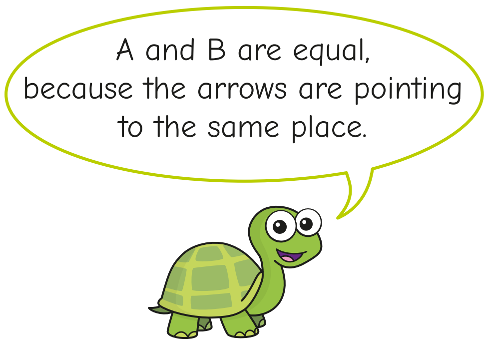


Tenths on a number line

Reasoning and problem solving

Tiny has drawn arrows to two numbers, A and B, on two number lines.





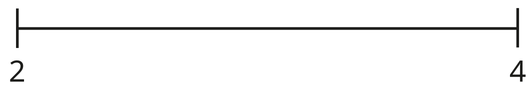
Do you agree with Tiny?

Explain your answer.

No

Estimate the positions of the numbers on the number line.

2.7	2.3
3.9	2.5
2.9	3.2



Talk about your method with a partner.

In which order did you place your numbers on the number line?

arrows pointing approximately to the correct positions

Divide a 1-digit number by 10

Notes and guidance

In this small step, children divide a 1-digit number by 10, resulting in a decimal number with 1 decimal place.

To begin with, they see that the number is shared into 10 equal parts. This can be shown by exchanging each place value counter worth 1 for ten 0.1 counters.

They recognise that when using a place value chart, they move all of the digits one place to the right when dividing by 10. Any misconceptions around "tricks" that work for this step, such as moving the decimal point to the beginning of the number or adding "zero point" in front of the word should be addressed at this stage. This will help to prevent errors later on, when children progress to dividing 2-digit numbers by 10 and then move on to dividing by 100 and dividing by decimals.

Things to look out for

- Children may overgeneralise and see dividing by 10 as putting the decimal point in front of the number.
- Children may move the digits in the wrong direction.

Key questions

- What number is represented on the place value chart?
- When dividing a number by 10, how many equal parts is the number split into?
- How many tenths are there in 1 whole/2 wholes/3 wholes?
- How can you use counters and a place value chart to show dividing a number by 10?
- What is the same and what is different before and after a 1-digit number is divided by 10?

Possible sentence stems

- ______ is 10 times the size of ______
- ______ is one-tenth the size of ______

National Curriculum links

- Find the effect of dividing a 1- or 2-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths

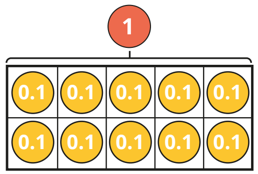
Divide a 1-digit number by 10

Key learning

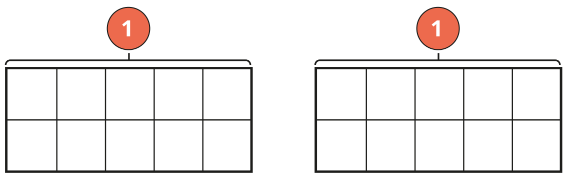
- Huan is dividing 1 by 10

  He exchanges 1 whole for 10 tenths and uses a ten frame to share the counters.

  He knows that one of these counters is the answer to 1 ÷ 10



  - Use Huan's model to work out the answer to 1 ÷ 10
  - Use Huan's method to work out 2 ÷ 10

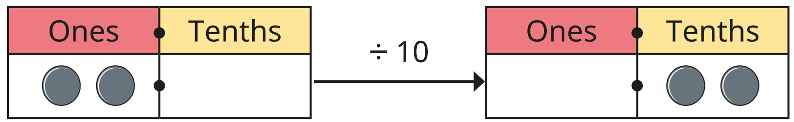


- Use counters to help you work out the divisions.

  3 ÷ 10 | 4 ÷ 10 | 7 ÷ 10 | 9 ÷ 10

  What do you notice about your answers?

- Dora uses a place value chart to work out that 2 ÷ 10 = 0.2



  - What is the value of the 2 in the question?
  - What is the value of the 2 in the answer?

- Use a place value chart to find the missing numbers.

  - 8 ÷ 10 = ______
  - ______ = 9 ÷ 10
  - 0.4 = ______ ÷ 10

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

  5 ÷ 10 ◯ 10 ÷ 5

  3 tens ◯ 3 ÷ 10

  7 tenths ◯ 7 ÷ 10

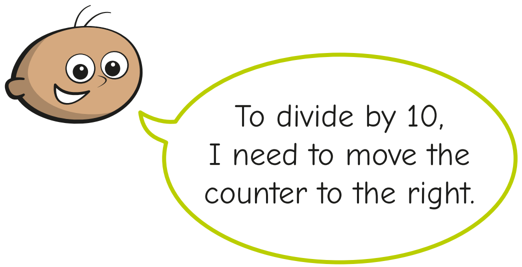
  3 ÷ 10 ◯ 4 ÷ 10

Divide a 1-digit number by 10

Reasoning and problem solving

Choose a digit card from 1 to 9 and place a counter over the top of that number on the Gattegno chart.

10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9



Do you agree with Tommy?

Use the Gattegno chart to explain your answer.

No

Complete the number sentences.

4 ÷ 10 = 8 ÷ ______ ÷ 10

15 ÷ 3 ÷ 10 = ______ ÷ 10

64 ÷ ______ ÷ 10 = 32 ÷ 4 ÷ 10

______ × 10 = 6

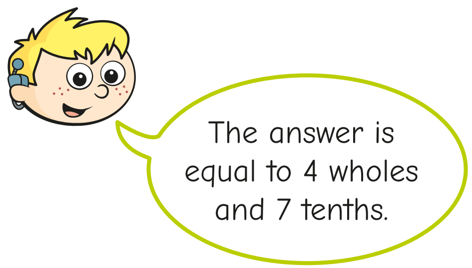
2

5

8

0.6

Max thinks of a number and divides it by 10



What number was Max thinking of?

47

Divide a 2-digit number by 10

Notes and guidance

In this small step, children divide 2-digit numbers by 10, building on their learning from the previous step.

Counters on a place value chart are a good resource for this concept. Children make the number using counters, then move all the counters one place to the right. The key learning is that both digits of the number move in the same direction by the same number of places. The digits are together before dividing and are still together after dividing.

Children may think that certain "tricks" always work, such as placing a decimal point between the digits. Reinforce with children that this does not always work and so is not a method they should rely on. Also discuss that if a multiple of 10 is divided by 10, then nothing is needed in the tenths column, for example 50 ÷ 10 = 5, not 5.0

Things to look out for

- If children are not using a place value chart, they may move the digits an incorrect number of places.
- Children may move only one of the digits one place to the right.
- Children may forget to add the decimal point to their answer, in effect leaving the original number unchanged.

Key questions

- How can you show this 2-digit number on a place value chart?
- How can you show this 2-digit number in a part-whole model?
- When dividing a number by 10, how many equal parts are you splitting it into?
- How can you use a part-whole model to help you divide a 2-digit number by 10?
- What could a 2-digit number look like once it has been divided by 10?
- What happens to a number when you divide it by 10?

Possible sentence stems

- ______ divided by 10 is equal to ______

National Curriculum links

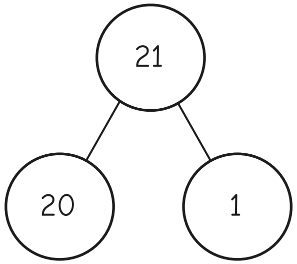
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Find the effect of dividing a 1- or 2-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths

Divide a 2-digit number by 10

Key learning

- Kim knows that to divide a number by 10, she must split it into 10 equal groups.

  She uses partitioning to divide 21 by 10

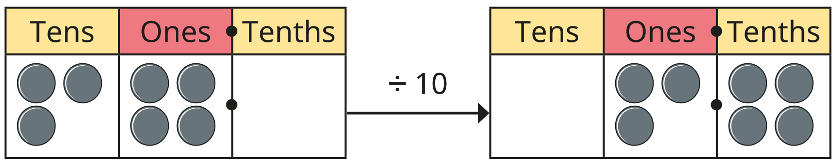


20 ÷ 10 = 2
1 ÷ 10 = 0.1
So 21 ÷ 10 = 2 + 0.1 = 2.1

Use Kim's method to work out the divisions.

52 ÷ 10 | 27 ÷ 10 | 19 ÷ 10 | 37 ÷ 10

- Filip uses a place value chart to find that 34 ÷ 10 = 3.4



Use Filip's method to work out the divisions.

12 ÷ 10 | 45 ÷ 10 | 90 ÷ 10 | 80 ÷ 10 | 78 ÷ 10

- Jack uses a Gattegno chart to work out that 23 ÷ 10 = 2.3

10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9

Use Jack's method to work out the divisions.

27 ÷ 10 | 65 ÷ 10 | 91 ÷ 10 | 30 ÷ 10

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

  50 ÷ 10 ○ 45 ÷ 10

  85 ÷ 10 ○ 90 ÷ 10

  double 0.2 ○ 22 ÷ 10

  halfway between 4 and 5 ○ 46 ÷ 10

- Eva has 34 cm of ribbon.

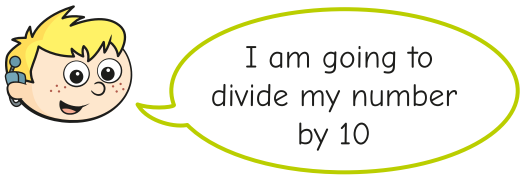
  She cuts it up to share equally between her 10 friends.

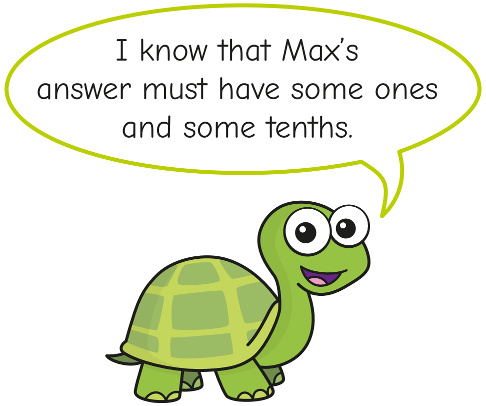
  What length of ribbon do they each get?

Divide a 2-digit number by 10

Reasoning and problem solving

Max is thinking of a 2-digit number.





Do you agree with Tiny?

Explain your answer.

No

Max might be thinking of a multiple of 10, e.g. 50

50 ÷ 10 = 5 and 5 does not have a digit in the tenths column.

Jo has used a Gattegno chart to divide a 2-digit number by 10

Here is her answer.

10	20	30	40	50	60	70	80	90
1	**2**	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	**0.6**	0.7	0.8	0.9

What was Jo's original number?

How does the Gattegno chart help?

26

Sam thinks of a 2-digit number.

When she divides it by 10, the answer has 4 tenths.

Is Sam's number even or odd?

How do you know?

even

Hundredths as fractions

Notes and guidance

In this small step, children build on their previous learning of tenths as they begin to explore hundredths. They learn that a hundredth is 1 whole split into 100 equal parts. This idea can be explored using a variety of representations, including hundred squares, bead strings, Rekenreks and number lines. Place value charts representing hundredths are introduced in a later step.

Children relate this learning to the previous steps by understanding that 1 tenth is equivalent to $\frac{10}{100}$. They partition hundredths into tenths and hundredths, for example $\frac{21}{100}$ is made up of $\frac{2}{10}$ and $\frac{1}{100}$, or $\frac{1}{10}$ and $\frac{11}{100}$

Things to look out for

- Children may incorrectly partition a fraction and think that, for example, $\frac{12}{100}$ is made up of $\frac{1}{100}$ and $\frac{2}{100}$
- Children may confuse the words “hundred” and “hundredth”.
- Children may think that hundredths are greater than tenths because 1 hundred is greater than 1 ten.

Key questions

- How many hundredths are there in 1 whole?
- How is a hundredth similar to/different from a tenth?
- How can you represent hundredths in a hundred square?
- How many hundredths are equivalent to 1 tenth?
- How can you use base 10 to represent both tenths and hundredths?
- How can you partition ______ into tenths and hundredths?

Possible sentence stems

- There are ______ hundredths in ______ tenths.
- ______ hundredths is equivalent to ______ tenths and ______ hundredths.

National Curriculum links

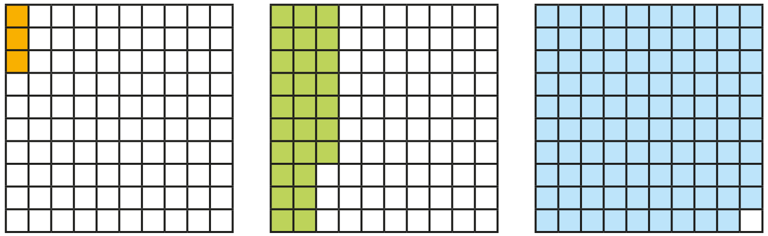
- Count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10
- Recognise and show, using diagrams, families of common equivalent fractions

Hundredths as fractions

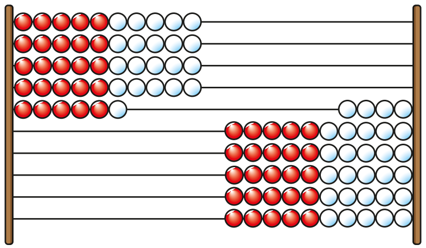
Key learning

- Each part of a hundred square is worth $\frac{1}{100}$

  What fraction of each hundred square is shaded?



- This Rekenrek is made up of 100 beads.



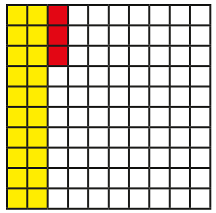
  If the Rekenrek represents 1 whole, what fraction is shown on the left?

  What fraction is shown on the right?

- Use a hundred square to help fill in the missing numbers.

  ▸ $\frac{3}{10} = \frac{\square}{100}$ ▸ $\frac{70}{100} = \frac{\square}{10}$ ▸ $\frac{90}{100} = \frac{\square}{10}$

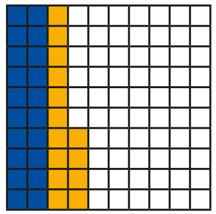
- Eva uses a hundred square to see that $\frac{23}{100}$ is equivalent to $\frac{2}{10} + \frac{3}{100}$



  Use Eva's method to help fill in the missing numbers.

  ▸ $\frac{45}{100} = \frac{\square}{10} + \frac{\square}{100}$ ▸ $\frac{59}{100} = \frac{\square}{10} + \frac{\square}{100}$ ▸ $\frac{\square}{100} = \frac{7}{10} + \frac{73}{100}$

- Dexter has partitioned $\frac{34}{100}$ into $\frac{2}{10}$ and $\frac{14}{100}$

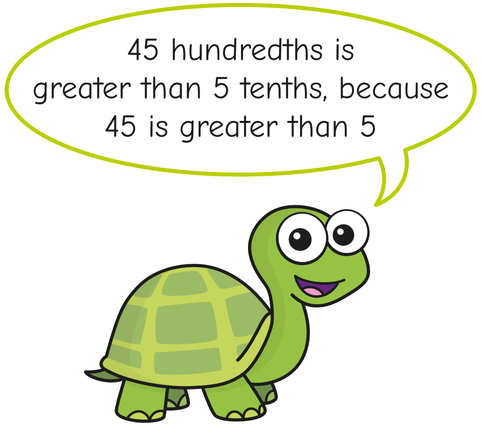


  Use Dexter's method to partition the numbers in two different ways.

  $\frac{52}{100}$ $\frac{81}{100}$ $\frac{39}{100}$

Hundredths as fractions

Reasoning and problem solving



Do you agree with Tiny?

Explain your answer.

No

Work out the missing number.

$$\frac{3}{10} + \frac{12}{100} = \frac{\square}{100}$$

How did you work it out?

42

Fill in the missing numbers.

$$\frac{3}{10} + \frac{2}{100} = \frac{2}{10} + \frac{\square}{100}$$

$$\frac{14}{100} + \frac{3}{10} = \frac{4}{10} + \frac{\square}{100}$$

$$\frac{5}{10} + \frac{1}{100} < \frac{5}{10} + \frac{\square}{100}$$

$$\frac{5}{10} + \frac{1}{100} > \frac{\square}{10} + \frac{5}{100}$$

$$\frac{37}{100} + \frac{\square}{100} = \frac{100}{100}$$

$$\frac{2}{10} + \frac{\square}{100} = 1$$

Is there more than one answer for each number sentence?

12

4

any number greater than 1

0, 1, 2, 3 or 4

63

80

Hundredths as decimals

Notes and guidance

Now that children have an understanding of hundredths as fractions, in this small step they explore hundredths as decimals.

Representations such as hundred squares, Rekenreks and bead strings continue to be used to help understanding, and in this step 0.01 decimal place value counters are also introduced. Children explore the idea that ten 0.01s are equivalent to 0.1, meaning that decimal numbers can be partitioned into tenths and hundredths, for example 0.12 = 0.1 + 0.02. When confident with this, they also explore flexible partitioning of numbers, for example 0.23 = 0.2 + 0.03 or 0.1 + 0.13. Encourage children to think back to the learning from the previous step and to make links between hundredths as fractions and hundredths as decimals.

Things to look out for

- Children may confuse tenths and hundredths by missing out a zero from their decimal number, e.g. $\frac{3}{100}$ = 0.3
- Children may think that a larger number of hundredths is greater than a smaller number of tenths, e.g. 0.06 > 0.1
- Children may confuse the words "hundred" and "hundredth".

Key questions

- How is a decimal similar to/different from a fraction?
- How many hundredths are there in 1 whole?
- How can you write 1 hundredth as a decimal number?
- Are $\frac{1}{100}$ and 0.01 the same or different?
- Is ______ greater or smaller than ______?
- How many hundredths are equivalent to 1 tenth?

Possible sentence stems

- ______ hundredths as a decimal is ______
- There are ______ hundredths in 1 tenth.
- ______ hundredths can be partitioned into ______ tenths and ______ hundredths.

National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Compare numbers with the same number of decimal places up to 2 decimal places

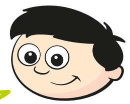
Hundredths as decimals

Key learning

- Dexter makes a number using place value counters.

0.01 0.01

My number is 0.02 or $\frac{2}{100}$



  - What do these place value counters represent?

    0.01 0.01 0.01 0.01

    Give your answer as a fraction and as a decimal.

  - Make a number using hundredth place value counters for a partner to write as a decimal and as a fraction.

- Annie makes 0.23 using place value counters.

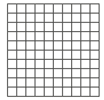
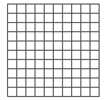
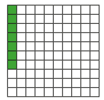
0.1 0.1 0.01 0.01 0.01

What numbers do these counters represent?

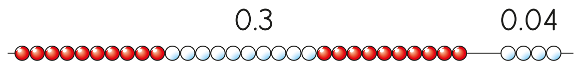
  - 0.1 0.1 0.1 0.01
  - $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{100}$ $\frac{1}{100}$ $\frac{1}{100}$ $\frac{1}{100}$ $\frac{1}{100}$ $\frac{1}{100}$

Give your answers as decimals.

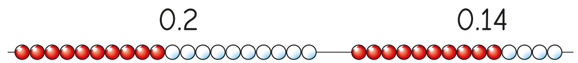
- Complete the table.

Picture	Words	Fraction	Decimal
	fifty-six hundredths		
		$\frac{17}{100}$	
			

- Dani uses a bead string to partition 0.34 into 0.3 and 0.04



She can also partition 0.34 into 0.2 and 0.14



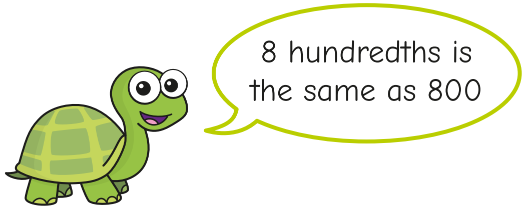
Find different ways to partition the numbers.

0.24 0.59 0.48

Compare answers with a partner.

Hundredths as decimals

Reasoning and problem solving



Do you agree with Tiny?

Explain your answer.

No

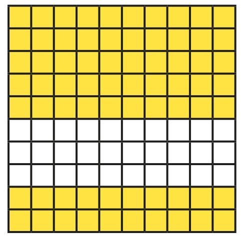
0	1	2	3	4
5	6	7	8	9

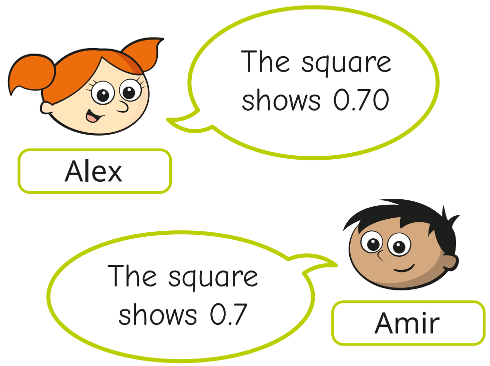
0.8☐ < 0.☐5

Which of the digit cards can be used to make this statement correct?

multiple possible answers, e.g.
7 and 9
3 and 8

Alex and Amir have been asked what decimal is shown on the hundred square.





Who do you agree with?

Explain your answer.

They are both correct, but the zero is not needed as a placeholder in the hundredths column.

White Rose Maths

Hundredths on a place value chart

Notes and guidance

In this small step, children continue to explore hundredths as decimals by looking at the hundredths column in a place value chart.

Children should be confident with the understanding that 10 hundredths make up 1 tenth. Exchanging ten 0.01 counters for one 0.1 counter in a place value chart will help to reinforce this understanding. It is important that children understand that 0.1 is greater than 0.09 even though 1 is less than 9. This can be seen when putting both numbers in a place value chart and considering the value of each column.

Children use place value counters to flexibly partition decimal numbers involving tenths and hundredths.

Discuss with children why no zero placeholder is needed in the hundredths column if there are no digits after the tenths, for example 1.5, not 1.50

Things to look out for

- Children may not realise that, for example, 0.3 = 0.30
- Children may see numbers such as 0.45 as greater than 0.5 because 45 is greater than 5
- Children may confuse the words "hundred" and "hundredth".

Key questions

- What is a hundredth?
- How many hundredths are equivalent to 1 tenth?
- How many hundredths are equivalent to 1 whole?
- Is ______ greater/smaller than ______?
- How can you represent this decimal number on a place value chart?
- How is the hundredths column on a place value chart similar to/different from the ______ column?

Possible sentence stems

- ______ is equal to ______ ones, ______ tenths and ______ hundredths.

National Curriculum links

- Recognise and write decimal equivalents of any number of tenths or hundredths
- Compare numbers with the same number of decimal places up to 2 decimal places

Hundredths on a place value chart

Key learning

- Write the decimal numbers shown in the place value charts.

  How many ones, tenths and hundredths are there in each number?

Ones	Tenths	Hundredths
1	0.1 0.1	0.01 0.01 0.01

Ones	Tenths	Hundredths
1 1		0.01 0.01 0.01

Ones	Tenths	Hundredths
1 1 1		0.01 0.01 0.01 0.01

- Use a place value chart and counters to make the numbers.

  0.34 | 2.15 | 0.03 | 1.01

  Complete the sentences to describe each number.

  There are ______ ones.

  There are ______ tenths.

  There are ______ hundredths.

  The number represented is ______

- Brett uses place value counters to partition 0.23

  0.1 0.1 | 0.01 0.01 0.01 — 0.23 = 0.2 + 0.03

  0.1 | 0.1 0.01 0.01 0.01 — 0.23 = 0.1 + 0.13

  Use Brett's method to help you partition the numbers in three different ways.

  0.34 | 0.68 | 0.92 | 0.51

- Write <, > or = to complete the statements.

  0.01 ◯ $\frac{1}{100}$

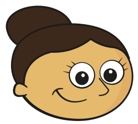
  0.4 ◯ 0.05

  $\frac{3}{10}$ ◯ 0.31

  eleven hundredths ◯ 0.11

Hundredths on a place value chart

Reasoning and problem solving



0.09 is greater than 0.1 because 9 is greater than 1

Do you agree with Dora?

Use a place value chart to help you explain your answer.

No

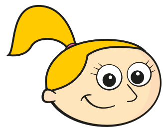
Is the statement always true, sometimes true or never true?

A number with 5 in the hundredths column is smaller than a number with 6 in the tenths column.

Explain your answer.

sometimes true

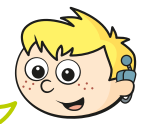
Eva and Max are each thinking of a number.



Eva

My number can be partitioned into 3 tenths and 24 hundredths.

My number has 5 tenths, so my number must be greater than Eva's.



Max

Do you agree with Max?

Explain your answer.

No

Divide a 1- or 2-digit number by 100

Notes and guidance

Building on their learning from the multiplication and division block and the earlier steps in this block, in this small step children divide 1-and 2-digit numbers by 100

Children should build numbers using place value counters and use exchanges to support their understanding. Once confident working with place value counters, they could move to using place value charts and recognise that dividing a number by 100 moves all the counters two places to the right. Exploring the difference between moving two places for 100 and one place for 10 is important at this stage.

Things to look out for

- Children may move just one of the digits rather than all of them.
- Children may move the digits one place instead of two places.
- Children may move the decimal point two places as well as the digits and so keep the original number.
- Children may spot "tricks" that work for some questions and they should be reminded that these do not work in all cases, so are not a reliable method.

Key questions

- What exchanges can you make?
- How can you use a place value chart to show dividing a number by 100?
- How is dividing by 100 similar to/different from dividing by 10?
- What happens to a number when you divide it by 100?
- Does the decimal point ever move?
- If you divide by 10 twice, what do you notice?

Possible sentence stem§s

- To divide something by ______, split it into ______ equal parts.
- When dividing a number by 100, move all the digits ______ places to the ______

National Curriculum links

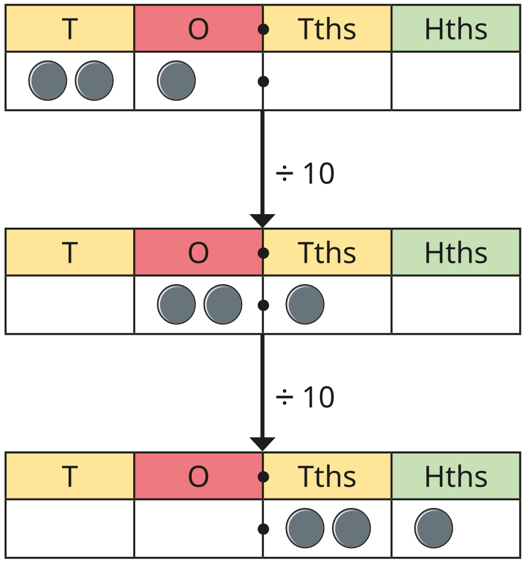
- Recognise and write decimal equivalents of any number of tenths or hundredths
- Find the effect of dividing a 1- or 2-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths

Divide a 1- or 2-digit number by 100

Key learning

- Rosie uses a place value chart to divide 21 by 100

  She divides it first by 10, and then by 10 again.



> 21 ÷ 10 = 2.1
> 2.1 ÷ 10 = 0.21
> So 21 ÷ 100 = 0.21

Use Rosie's method to work out the divisions.

26 ÷ 100	52 ÷ 100	4 ÷ 100
35 ÷ 100	78 ÷ 100	9 ÷ 100

What do you notice about the divisions and the answers?

- Here is a 2-digit number on a place value chart.

T	O	Tths	Hths
7	2		

▸ Complete the sentences.

When dividing by 100, move the digits two places to the ______

72 ÷ 100 = ______

▸ Use this method to fill in the missing numbers.

82 ÷ 100 = ______

______ = 93 ÷ 100

0.23 = ______ ÷ 100

- Write <, > or = to complete the statements.

99 ÷ 100 ◯ 100 ÷ 100

86 ÷ 100 ◯ 26 ÷ 10

4 ÷ 10 ◯ 50 ÷ 100

24 ÷ 6 ◯ 40 ÷ 100

Divide a 1- or 2-digit number by 100

Reasoning and problem solving

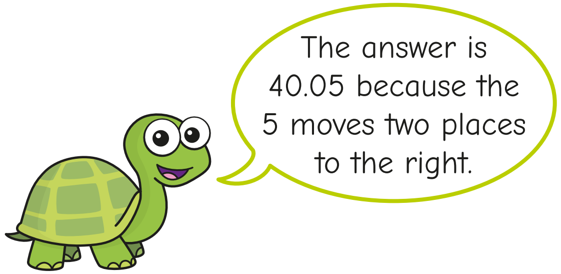
Is the statement true or false?

When you divide any whole 2-digit number by 100, there will be a zero in the ones column.

Explain your answer.

True

Tiny is working out 45 ÷ 100



Do you agree with Tiny?

Explain your answer.

No

Fill in the missing numbers.

62 ÷ ______ = 0.62

______ ÷ 100 = 0.62

______ ÷ 10 = 6.2

______ ÷ 10 = 2.4

______ ÷ 10 = 0.24

______ ÷ 100 = 0.24

What patterns can Ron see?

100

62

62

24

2.4

24