Visuals and images for fractions from Reception to Year 6

Guidance

These visuals and images should be used **after** the ideas have been explored using concrete apparatus (e.g. using coloured rods before moving onto the bar model).

All questions should be used as an opportunity to apply reasoning and discuss how children came to a particular answer, rather than just accepting that answers are correct or incorrect. For example, the children should be asked, “How do you know?”, “Prove it!”, “Can you draw a diagram to represent your thought process?” “Can you find any other examples which would fit?”

This applies to **all year groups** and professional judgement should be applied to decide when children are ready to move onto pictorial representations and then abstract ideas.

Commissioned by The PiXL Club Ltd. 2017

Reception and early KS1

Finding half of a set of objects in a problem solving situation.

Share or sort objects into two equal groups:

- distribute a small group of play-people equally between the inside and outside of a house
- distribute buttons between two boxes
- share the cakes equally between two teddies
- share crayons equally between you and your friend
- build the bricks into two towers of equal height

Can you build two equal towers with 4 bricks? Now try 5 bricks?

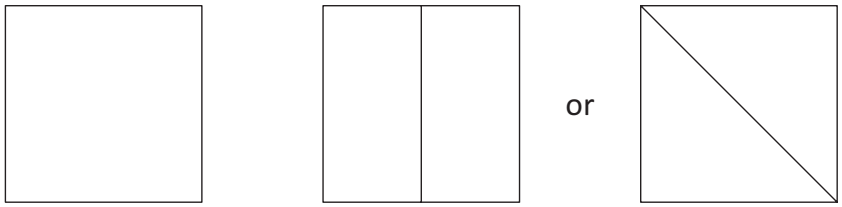
Which sets of bricks can/can't be built into two towers of equal height?

How many bricks are in the sets that can/can't be built into two towers of equal height?

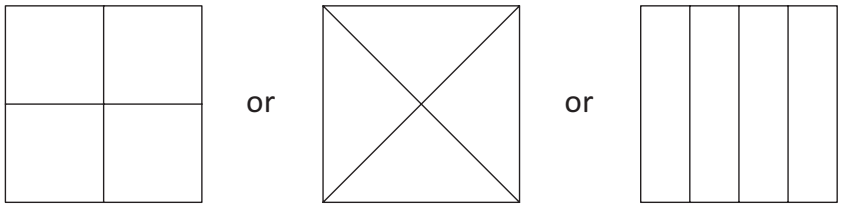
My friend and I shared 5 cakes, we got 2 each but had one left over. How could we share this cake fairly? How many cakes do we have each now?

Key Stage 1

Paper folding to find fractions of shapes:



whole half or half

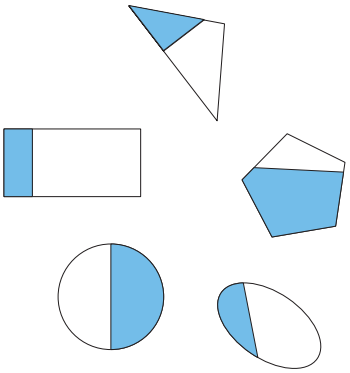


half of a half quarter or half of a half quarter or half of a half quarter

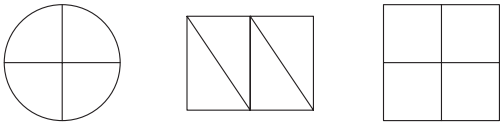
Can you spot any patterns? Can you predict how many pieces the paper will be folded into with each fraction?

Recognising and finding fractions of shapes – example questions

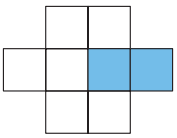
Tick (✔) the shape which has more than half shaded blue.



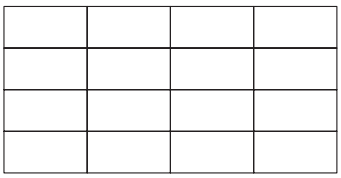
Shade one quarter of each shape.



Shade more squares so that $\frac{3}{4}$ of the shape is shaded.



How many ways can you find to colour in half/quarter/third of this shape:



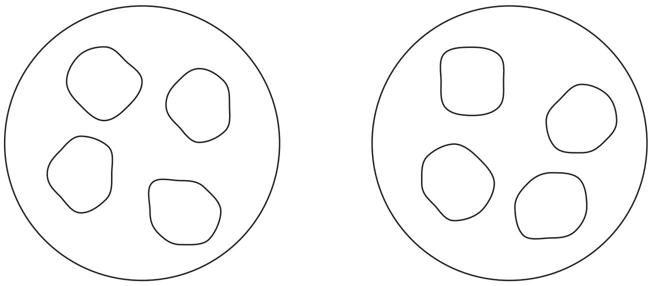
Children should understand that equal parts will not necessarily look the same but will have the same area.

Recognising and finding fractions of a quantity, a set of objects or a length (including equivalent fractions).

Share or sort objects equally into 2 parts, understanding that $\frac{1}{2}$ (half) is one of 2 equal parts. Repeat for quarters and thirds understanding that e.g. $\frac{1}{4}$ is one of 4 equal parts etc. (This leads to the understanding that $\frac{2}{4}$ is 2 of 4 equal parts etc).

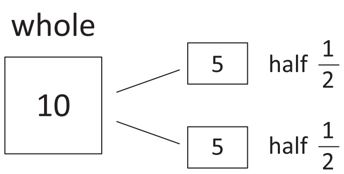
Small sets can be represented on paper.

To find half of a number (e.g. 8) share out whole objects between two sets.

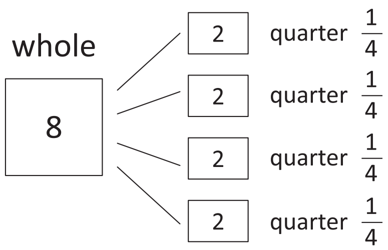


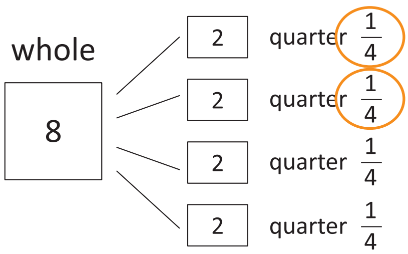
A part, part, whole model can be used to find fractions of amounts

$\frac{1}{2}$ of 10

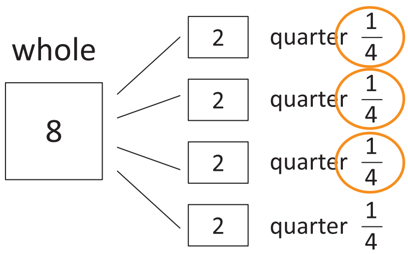


$\frac{1}{4}$ of 8



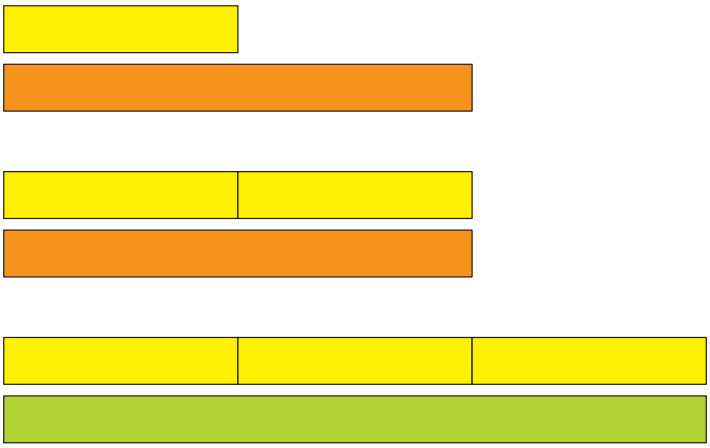


$\frac{2}{4}$ of 8 = 4



$\frac{3}{4}$ of 8 = 6

Coloured rods



Children can explore the coloured rods to find fractions of the different rods. E.g. Which rod is half the length of the orange rod? Which rod is a third of the dark green rod?

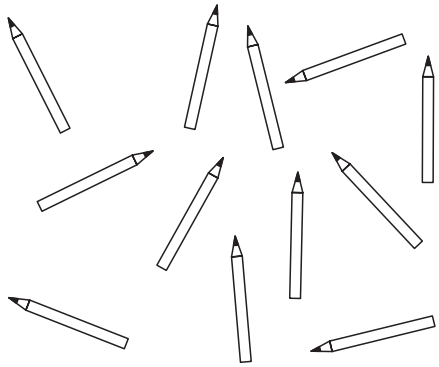
Bar models:

Bar models can also be used as a representation of fractions.
Along with coloured rods this helps to model equivalence and non- unit fractions such as $\frac{2}{4}$ and $\frac{3}{4}$

16			
$\frac{1}{2}$ =		$\frac{1}{2}$ =	
$\frac{1}{4}$ =	$\frac{1}{4}$ =	$\frac{1}{4}$ =	$\frac{1}{4}$ =

Finding fractions of objects, quantities or lengths – example questions

Here is a set of 12 pencils. Half of them are red. How many pencils are red?



How many is half the set?

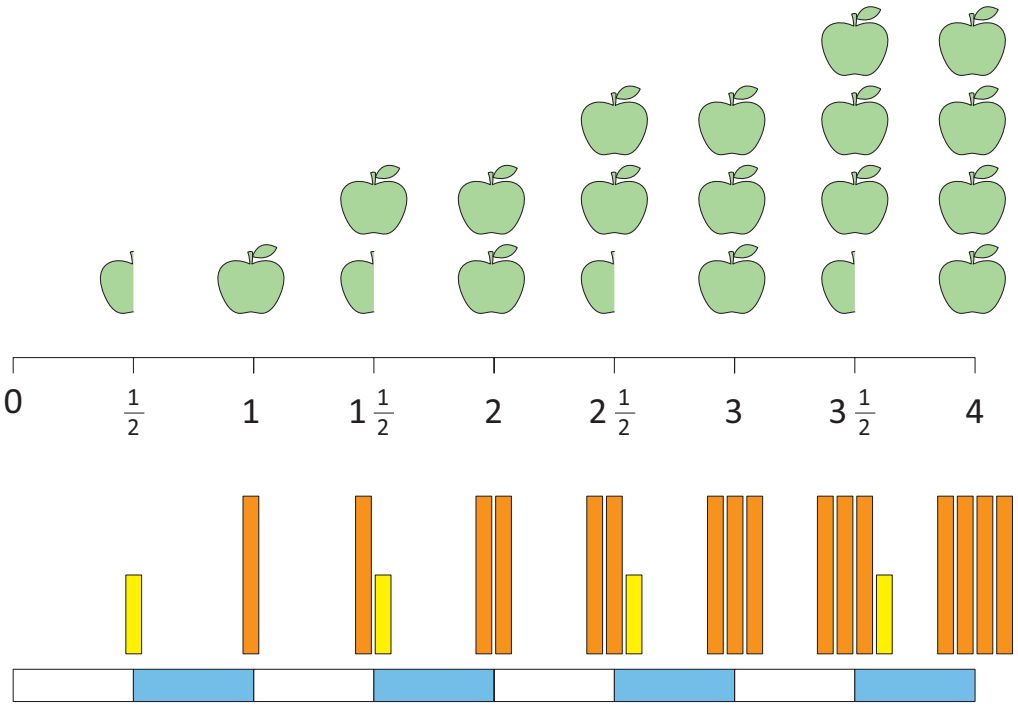
$\frac{1}{2}$ of 12 = ☐

How many is quarter of the set?

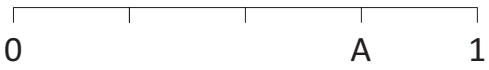
$\frac{1}{4}$ of 12 = ☐

- Jack has 16 marbles. He gives $\frac{1}{4}$ of them to his friend. How many does he have left?
- Bobby says that it helps him to find a quarter of a quantity if he finds half first. Do you agree with him?
- Can you prove that $\frac{2}{4} = \frac{1}{2}$
- I cut a piece of string in half. If one of the pieces measured 14cms how long was the piece of string I started with?
- If half of the rod I chose is yellow which rod did I choose?
- Use the coloured rods to prove that $\frac{2}{4} = \frac{1}{2}$
- Would you rather have half of £8 or a quarter of £16?
- $\frac{1}{\square}$ of 12 = 3
- $\frac{3}{4}$ of ☐ = 15

Using a number line or counting stick to count forwards or backwards in steps of $\frac{1}{4}$ and $\frac{1}{2}$.



Counting in halves and quarters-example questions.



- Which of these fractions is A ? $\frac{1}{2}$ $\frac{1}{3}$ $\frac{3}{4}$
- Continue the patterns:

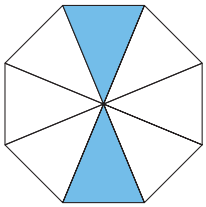
  2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, _____, _____

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

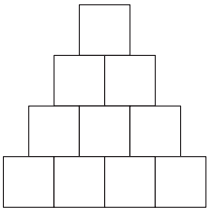
Lower Key Stage 2

Finding fractions of shapes – example questions:

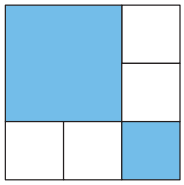
This shape is divided into equal parts.
What fraction of this shape is shaded?



Shade $\frac{1}{5}$ of this shape.



The diagram is made of squares.
What fraction of the diagram is shaded?



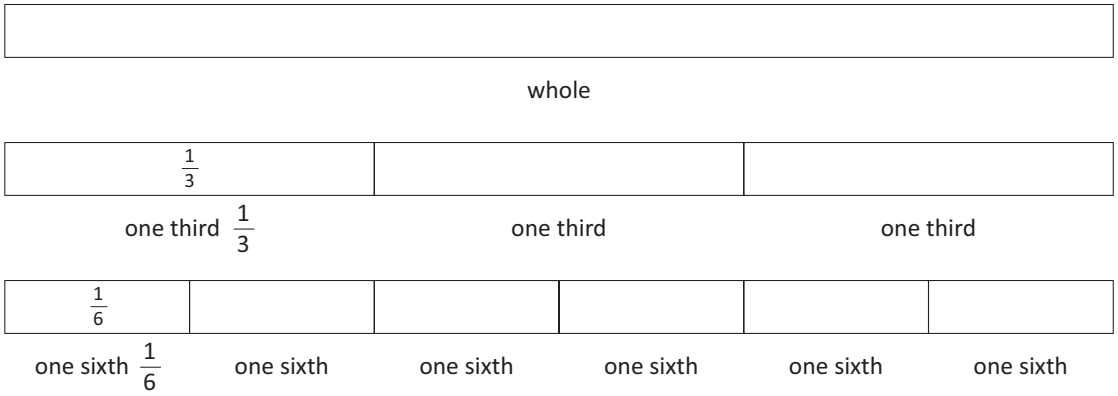
Put a ring around the fraction which is equal to one-half.

$\frac{1}{20}$ $\frac{1}{100}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{10}$

Paper folding for fractions of shapes and equivalence:

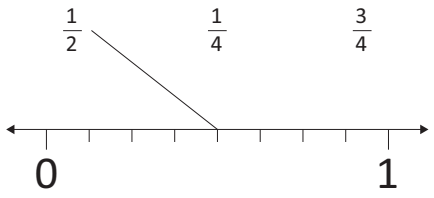
Using a whole sheet of paper works well for halves, quarters, eighths, sixteenths – see Key Stage 1.

For thirds, sixths, fifths and tenths it may be easier to start with a strip of paper, concertina fold and cut off the excess to keep the parts equal or use a fraction wall to explore relationships between fractions.

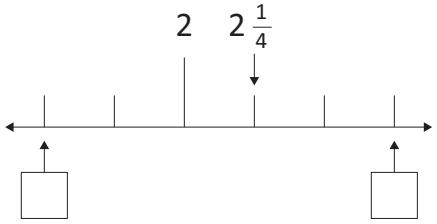


Finding fractions of numbers – example questions:

Look at the number line. Join each fraction to the correct place. One is done for you.



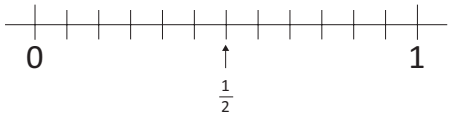
Here is part of a number line.
Write in the two missing numbers.



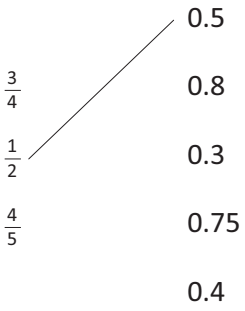
Look at these fractions.

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

Mark each fraction on the number line.
The first one is done for you.



Match each fraction to the decimal number which has the same value. One has been done for you.

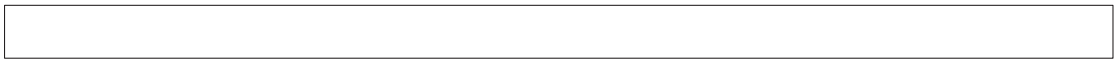


Circle the two fractions that are greater than $\frac{1}{2}$.

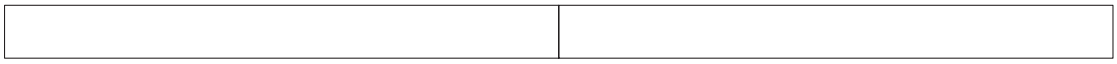
$\frac{1}{8}$ $\frac{6}{10}$ $\frac{5}{8}$ $\frac{3}{10}$

Using a number line to find fractions of numbers:

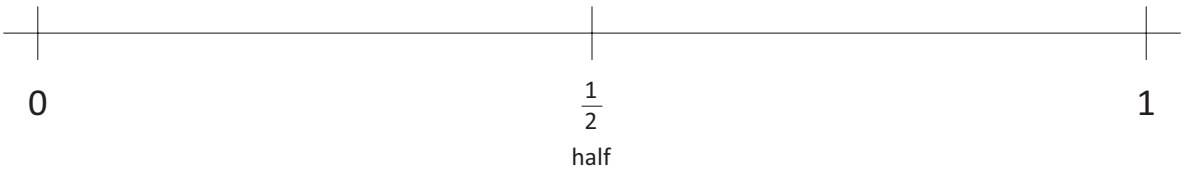
Firstly, this can be linked to the paper folding activities.



Fold this strip of paper to find half.

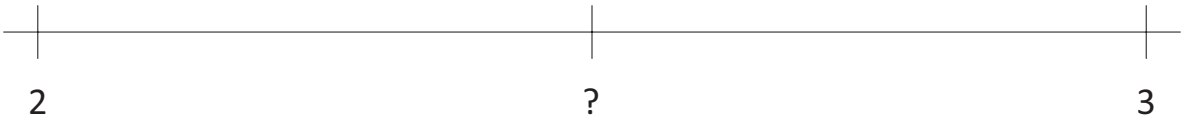


You can find half of a piece of paper. This will help you to find half on a number line, as you can imagine folding the line in half.



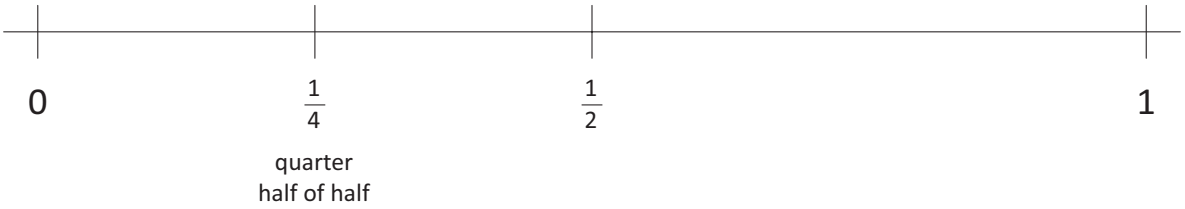
You have divided the line into two pieces.

What would happen if the line started at 2?

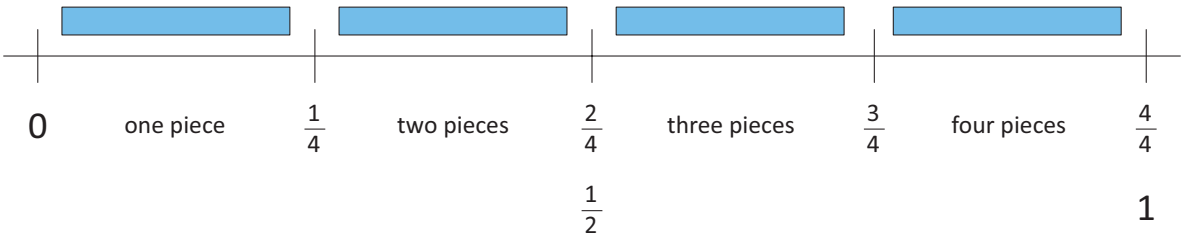


The middle line is half way between the 2 and the 3. So we have 2 and a half or $2\frac{1}{2}$.

Moving onto quarters: to find a quarter of a piece of paper we had to half it and half it again.
This works the same on a number line.



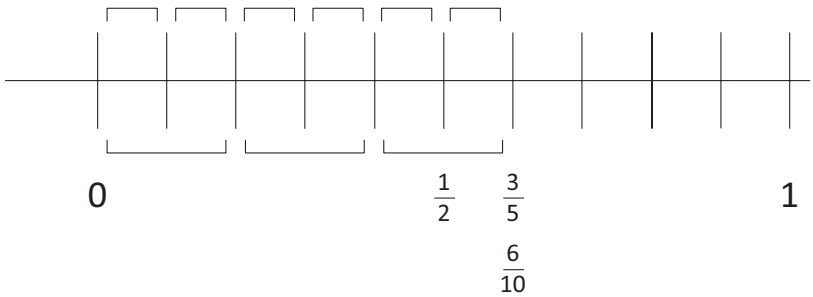
Finding a quarter means dividing the line into 4 equal pieces. If we had folded a piece of paper the other line would already be there. On a number line, we have to divide the other half into half as well to give us four pieces of line.



How would you show thirds on a number line? What about tenths?

This can also be used to support comparing and ordering fractions, as well as finding equivalent fractions (see M5a).

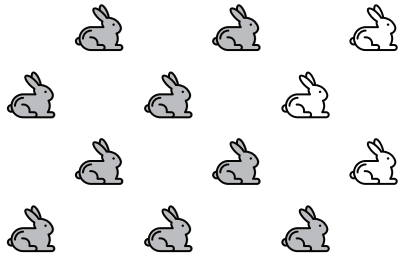
e.g. Which of these fractions is NOT equivalent to the other two? $\frac{3}{5}$ $\frac{1}{2}$ $\frac{6}{10}$



One half is not equivalent.

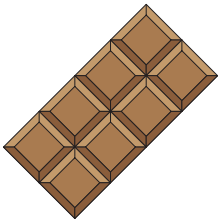
Finding fractions of objects/quantities – example questions:

What fraction of these rabbits is grey?



Write the fraction.

Here is a chocolate bar.



William eats 3 pieces and Amber eats 2 pieces.
What fraction of the chocolate bar remains?

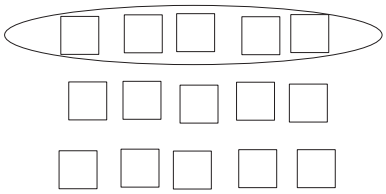
Calculate $\frac{3}{4}$ of £16

Calculate $\frac{3}{4}$ of £14

Grouping to find fractions of objects/quantities:

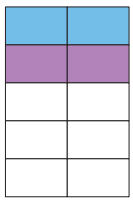
Move on from sharing to grouping. Make links with arrays and division.

$\frac{1}{3}$ of 15



15 ÷ 3 = 5

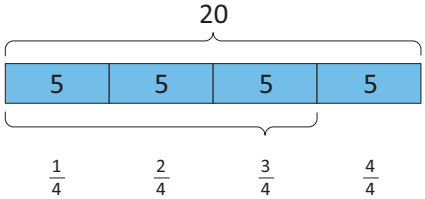
$\frac{2}{5}$ of 10



10 ÷ 5 = 2 (one fifth)
2 + 2 =4 (two fifths)

The bar model can also be used.

$\frac{3}{4}$ of 20

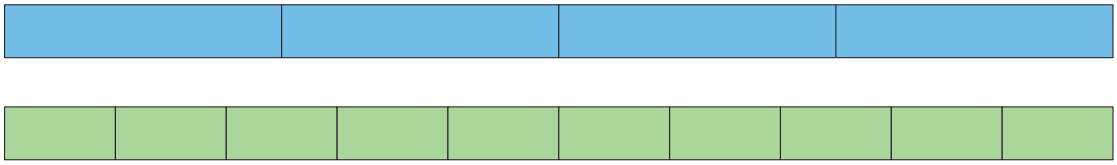


20 ÷ 4 = 5

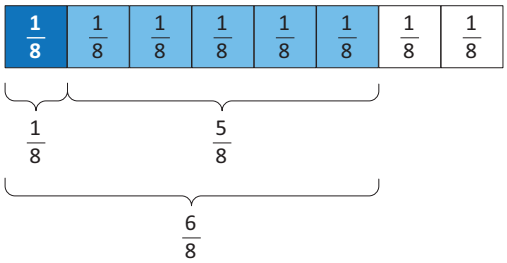
5 + 5 + 5 = 15

Coloured rods (or a fractions wall) for equivalence and adding and subtracting fractions

Bec says: one quarter is the same as two tenths. Do you agree or disagree?
Explain your answer (using diagrams).



$\frac{1}{8} + \frac{5}{8}$

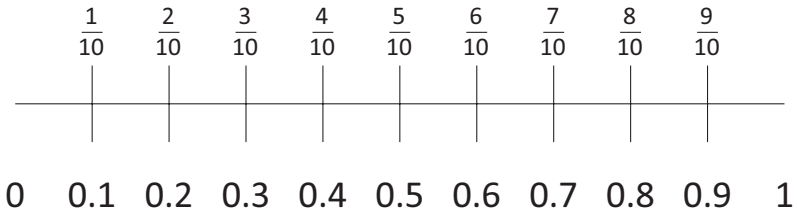


Finding decimal equivalence – example question:

Which of these means $\frac{9}{10}$?

A) 90 B) 9 C) 0.9 D) 0.09

Using number lines to find decimal equivalence:

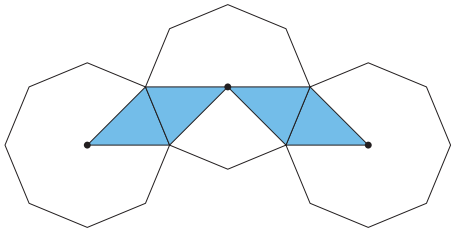


Make links with measure.

Upper Key Stage 2

Finding fractions of shapes – example questions

The diagram shows three regular octagons joined together. There is a dot at the centre of each one.



What fraction of the diagram is shaded?

Make each fraction equivalent to $\frac{3}{5}$.

$\frac{\square}{10}$ $\quad \frac{12}{\square}$ $\quad \frac{\square}{15}$

Write these fractions in order of size starting with the smallest.

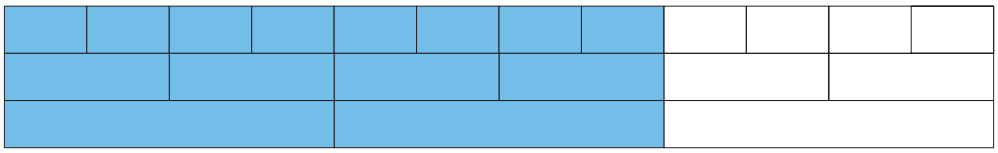
$\frac{3}{4}$ $\quad \frac{3}{5}$ $\quad \frac{9}{10}$ $\quad \frac{17}{20}$

Which is larger, $\frac{1}{3}$ or $\frac{2}{5}$?
Explain how you know.

Paper folding for fractions of shapes:

Make your own fractions wall.

$\frac{\square}{3}$ $\quad \frac{8}{12}$ $\quad \frac{4}{\square}$



eight twelths

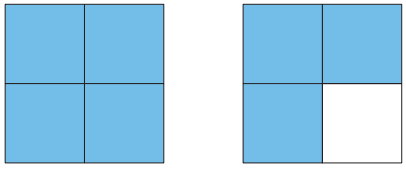
four sixths

two thirds

Drawing shapes:

To support conversion from mixed numbers to improper fractions (see M5h and i)

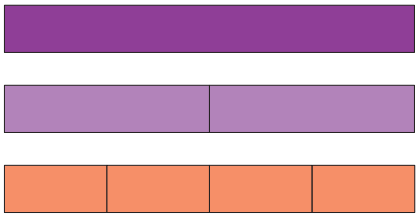
$1\frac{3}{4} = \frac{\square}{4}$

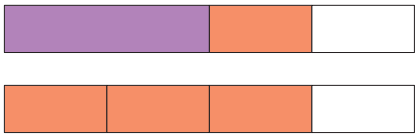


$1\frac{3}{4} = \frac{7}{4}$

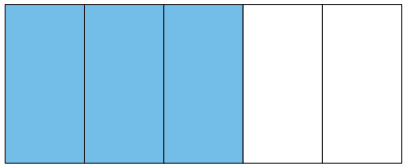
To support adding and subtracting fractions (see M5d)

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

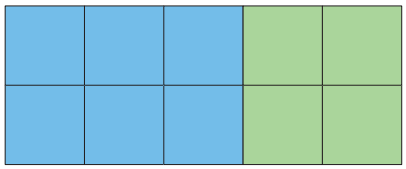


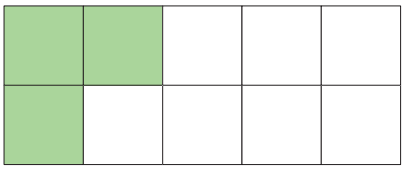


$\frac{3}{5} + \frac{7}{10}$



To make tenths, the fifths must be halved.

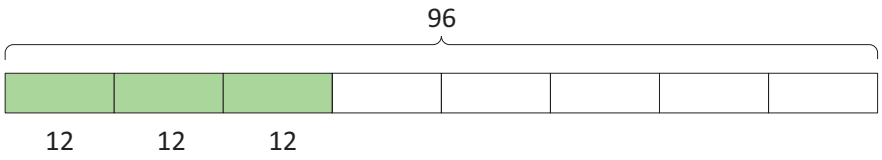


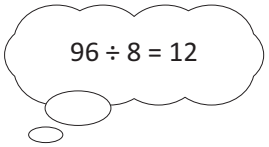


$\frac{3}{5} + \frac{7}{10} = 1\frac{3}{10}$ or $\frac{13}{10}$

Grouping to find fractions of objects/quantities:

$\frac{3}{8}$ of 96





12 x 3 = 36

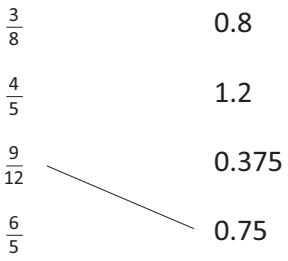
Three eighths of 96 is 36.

For visuals and images for other areas of fractions see suggested therapies below:

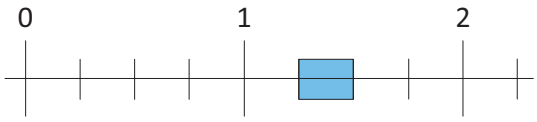
Refer to M5e for ideas for multiplying proper fractions by whole numbers
Refer to M5f for ideas for multiplying simple pairs of proper fractions
Refer to M5g for ideas for dividing proper fractions by whole numbers
Refer to M5j for ideas for decimal equivalence

Example questions:

Match each decimal number to its equivalent fraction. One has been done for you.



Part of this number line is shaded.



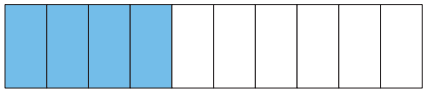
Circle all the numbers below that belong in the shaded part of the number line.

1.1 1.4 $1\frac{1}{3}$ $1\frac{1}{5}$

Refer to M5k for ideas for percentage equivalence

Example questions:

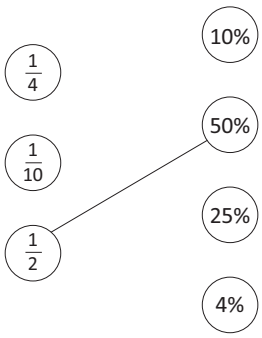
What percentage of the bar is shaded?



Circle the two fractions that are equivalent to 0.6.

$\frac{6}{10}$ $\frac{1}{60}$ $\frac{60}{100}$ $\frac{1}{6}$

Draw a line to join each fraction to a percentage of the same value.



Put a ring around the percentage that is equal to three fifths

20% 30% 40% 50% 60%

Refer to M5l for ideas for equivalence between fractions, decimals and percentages