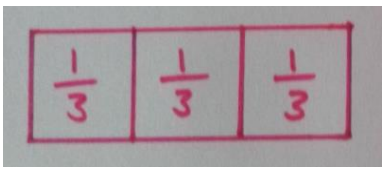
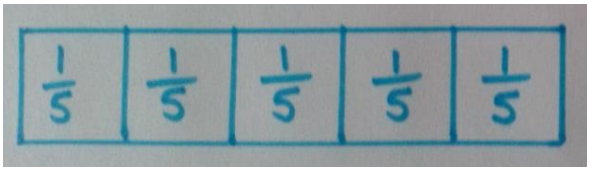
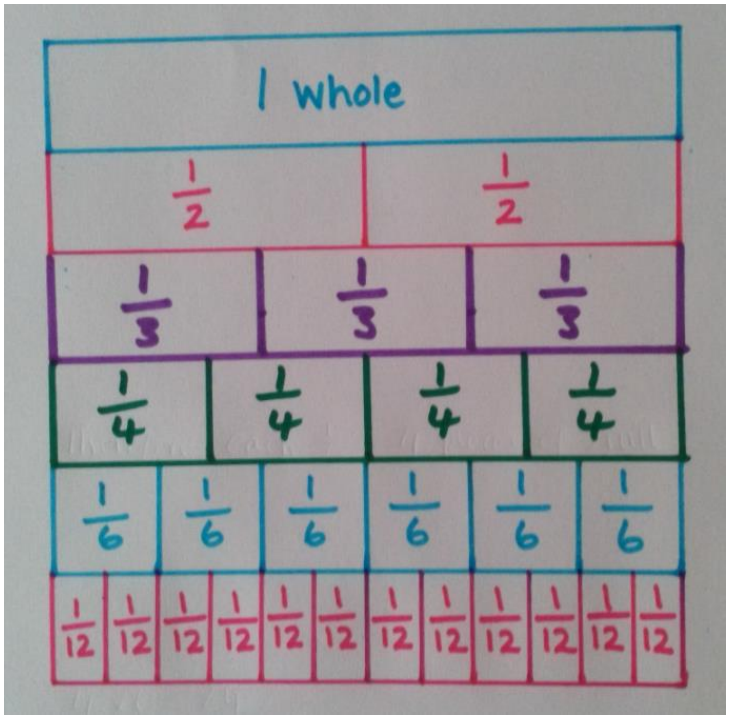
Using a bar model to solve problems involving Fractions

The bar model is useful for all sorts of problems involving fractions. To start with, remember to think of the bar as a whole divided into equal pieces. To work out the number of equal pieces that the bar is divided into, you need to look at the denominator (bottom number of the fraction). For example, to represent thirds (1/3), I divide the bar into three equal pieces, to represent fifths (1/5) I divide the bar into five equal pieces. To help you find fractions of a number by drawing and dividing a bar, you could use squared paper.

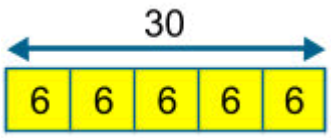




It is important, when you are comparing fractions to keep the size of the whole bar the same. For example, look at the fraction wall below, what equivalent fractions do you notice?



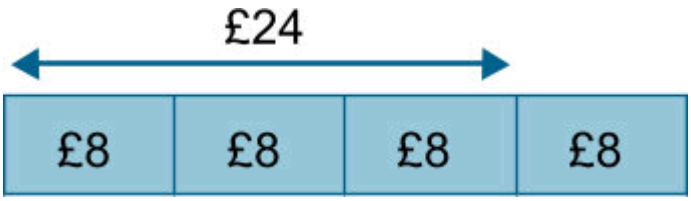
Find 1/5 of 30



The same image can be used to find 2/5 or 3/5 of 30 etc. If 1/5 of 30 equals 6, 2/5 would equal 12 and 3/5 would equal 18…

Finding the original cost of an item that has been reduced in a sale is a problem that can often be tricky to solve. Look below to see how the use of the bar model can make these types of problems much easier to visualise and to solve.

A computer game is £24 in the sale. This is one quarter off its original price. How much did it cost before the sale? (This means that £24 is ¾ of the original price).



The bar represents the original cost. It is divided into quarters to show the reduced cost of £24.

£24 ÷ 3 = £8, giving the value of three sections of the bar. The final section of the bar must also be £8, since it represents the same proportion as each of the other sections.

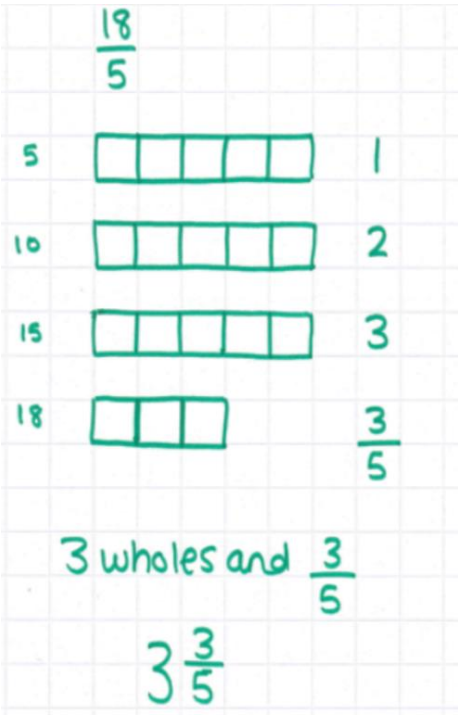
£8 × 4 = £32

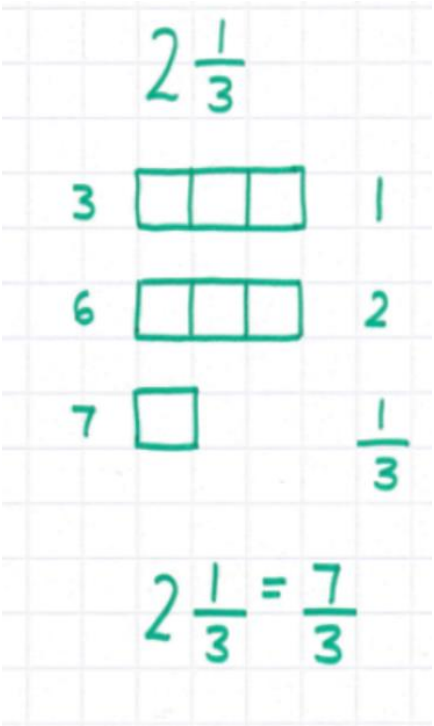
The original cost of the computer game is £32 – Remember to always answer the question in the context of the problem.

(Taken from the NCETM website)

Using bar models for mixed number and improper fractions

- An improper fraction is when you have more than one whole.
- The numerator is larger than the denominator, such as 5/4
- A mixed number is a whole number plus a fraction e.g. 1 ½



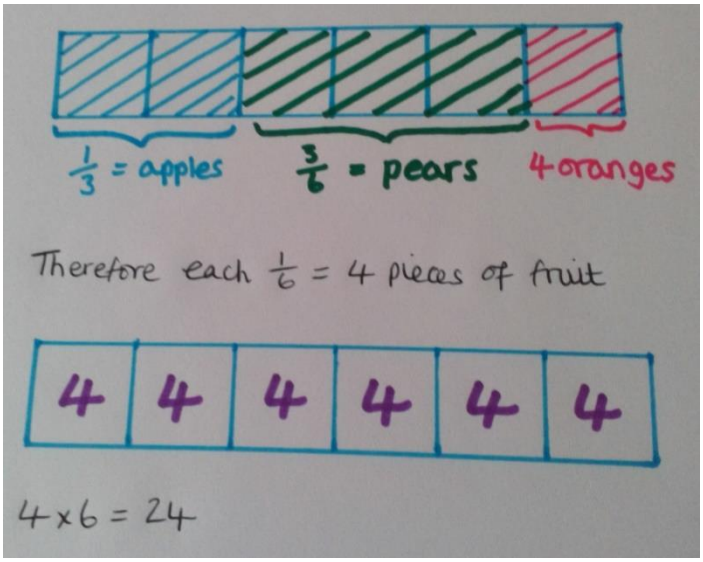


On the next page you will find a worked example of how to use a bar model to solve a problem involving fractions.

Then, there are several questions that lend themselves to this approach for you to practise. For each problem, read the question carefully, out loud if you need to, or ask an adult to read the question to you. Then think about how you could draw a bar model to help you unpick the problem and to make sense of what you are being asked to solve.

You will need to use blank or squared paper to draw your bar models, but remember that if you are comparing fractions, that you will need to keep the size of the whole bar the same. Then answer the question in the context of the problem. Good luck!

A framework for using a bar model to solve a problem involving Fractions (worked example)

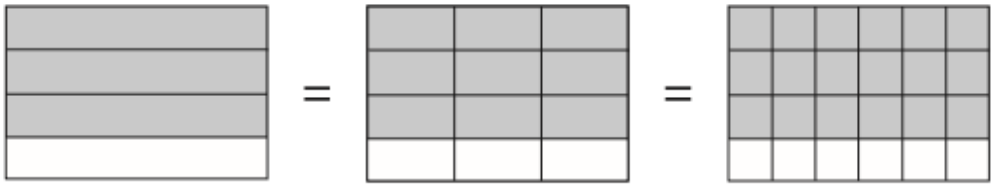
Problem to solve:	**A fruit bowl holds a range of different fruit, $^1/_3$ of the fruit are apples, $^3/_6$ of the fruit are pears and the rest are oranges. If there are 4 oranges, how many pieces of fruit are there in the bowl altogether?**
Bar model:	You need to use your knowledge of equivalent fractions here… The fruit bowl represents the whole bar. 3/6 of the fruit are pears, that is the same as ½ . 1/3 of the fruit are apples, that is the same as 2/6. There are 6/6 in one whole. Therefore 1/6 of the fruit are oranges. 4 pieces of fruit represents 1/6 of the fruit bowl. This can be shown in the bar model below: 
Answer in context of the problem:	There are 24 pieces of fruit in the bowl altogether. There are 4 oranges, 8 apples and 12 pears.

Problems to solve – use the bar model approach

1.	I win some money in a raffle and, feeling generous, I give $^1/_2$ to charity. $^1/_2$ of what's left I give to my Mum to pay back a loan and I share the remainder equally between my sister and myself. I get £30. How much did I win?
2.	In a large box of Smarties, $^3/_8$ of the Smarties are red and $^1/_6$ are green. The rest are yellow. What fraction of the box are yellow Smarties?
3.	Matt thinks of a number. $^5/_8$ of his number is 25. What is his number?
4.	In a pie eating competition, Luke eats 2 and $^3/_4$ of his pies while Matt eats $^{20}/_8$ of his pies. Who won the competition?
5.	$^2/_9$ of a sum of money is £1.08. What is the total amount of money?
6.	Would you rather have $^3/_5$ of £10 or 70% of £10? Explain your thinking.
7.	My local shop had a sale and was offering a 30% discount on cameras. I bought a new camera and paid £140. How much money did I save?

8.

These diagrams show three equivalent fractions.



Write the missing values.

$$\frac{3}{4} = \frac{9}{\square} = \frac{\square}{24}$$

9

Tick the **two** numbers that are equivalent to $\frac{1}{4}$

Tick **two**.

0.25	☐
0.75	☐
$\frac{25}{100}$	☐
0.5	☐
$\frac{2}{5}$	☐

How could you represent these using bar models?

10.

Circle the improper fraction that is equivalent to $6\frac{7}{8}$

$\frac{67}{8}$ $\frac{48}{8}$ $\frac{62}{8}$ $\frac{55}{8}$ $\frac{76}{8}$

How could you use bar models to represent these improper fractions?

11.

$\frac{6}{5}$ $\frac{3}{5}$ $\frac{3}{4}$

Write these fractions in order, starting with the **smallest**.

☐ ☐ ☐

smallest

12.

Layla wants to estimate the answer to this calculation.

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

Tick the calculation below that is the best estimate.

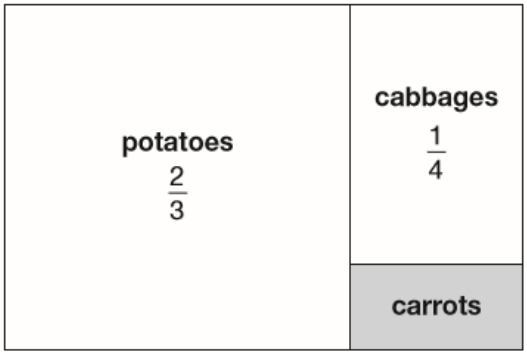
Tick **one**.

3 – 2 + 2 ☐

4 – 2 + 1 ☐

4 – 2 + 2 ☐

3 – 2 + 1 ☐

13.	A book has 276 pages. Amina has read $\frac{1}{3}$ of the book. How many pages are **left** for Amina to read? How could you show this on a bar model?
14.	This is a diagram of a vegetable garden. It shows the fractions of the garden planted with potatoes and cabbages.  **Not to scale** The remaining area is planted with carrots. What **fraction** of the garden is planted with carrots? Remember to use your knowledge of equivalent fractions here.