

## What are bar models in Maths?

Bar models are pictorial representations of problems or concepts that can be used for any of the operations: addition, subtraction_multiplication and division In word problems, bar models hold the huge benefor helping children decide which operations to use or visualise problems

Bar modes will not, however, do the calculations for the pupil. The bar modelling approach to Maths is much used in Singapore and Astantivatns textbooks and lessons and is a key maths mastery technique.



But this can be confusing.
For example:
Amber gives 8 stickers to Elvis. She now has 11 left.
How many did she start with?

| ? |  |  |
| :--- | :--- | :--- |
| 8 |  | 11 |



Read the question carefully



Choose


## Answer



Underline the keywords and numbers

Choose the correct operation(s) and a mental or written method of calculation.

Solve it! Make sure you follow the steps.

Check that you've answered the question. What did you need to find out in the first place?
$8+11=19$

This is where bar modelling comes in.
Remember it shows them how to work out the answer, it doesn't tell them the answer.

## So here's a maths problem... Can you and your partner work it out?

Working box:

Hussain wins first prize for his spectacular cake version of the Eiffel Tower. He generously gives three fifths of his winnings to his children and spends a third of what he had left. He has $£ 80$ left. How much money did he win?


## How to teach addition word problems with bar models

Pupils in Reception and Year 1 will routinely come across calculations such as 4+3.

Often, these calculations will be presented as word problems: Aliya has 4 oranges. Alfie has 3 oranges. How many oranges are there altogether? With addition, subtraction and multiplication, to help children fully understand later stages of bar modelling, it is crucial they begin with concrete representations.

There are 2 models that can be used to represent addition:


## Concrete... with resources

Once they are used to the format and able to represent word problems with models in this way themselves (assigning 'labels' verbally), the next stage is to replace the 'real' objects with objects that represent what is being discussed (in this case, we replace the 'real' oranges with button counters):


## Concrete... with resources that represent real things

The next stage is to move away from the concrete to the pictorial. As with all the stages, when pupils are ready for the next stage is a judgement call that is best decided upon within your school.

A general rule of thumb would be that towards the end of Year 1 or start of Year 2, pupils should be able to understand and represent simple addition (and subtraction) word problems pictorially and assign written labels in a bar model.


## Pictoral... without resources but using a picture

The penultimate stage is to represent each object as part of a bar, in preparation for the final stage:


## Pictoral... without resources using block diagrams

The final stage stops the $1: 1$ representation. Each quantity is represented approximately as a rectangular bar:


Pictoral... using a bar model


As mentioned before, it is a judgement call for your school to make, but if you want pupils to use the bar model to support them in end of Key Stage 1 SATs tests, they are going to need to have had a fair amount of experience of this final stage.

$$
\begin{aligned}
& 4+3= \\
& 3+4= \\
& \begin{array}{c}
\text { Abstract... using } \\
\text { numbers and } \\
\text { symbols }
\end{array}
\end{aligned}
$$

$7-3=$

## How to teach subtraction word problems with bar models

The same concrete to pictorial stages can be applied to subtraction. However, whereas with addition it is really down to the pupil's preference as to which of the 2 bar representations to use, with subtraction the teacher can nudge to pupils to one or other.

The reason? One represents a 'part-part-whole' model, the other a 'find the difference' model. Each will be more suited to different word problems and different pupils. Let's examine those at the final stage of bar modelling:

Part-part-whole

Austin has 18 lego bricks. He used 15 pieces to build a small car. How many pieces does he have left?


## Find the difference

Austin has 18 lego bricks. Lionel has 3 lego bricks. How many more lego bricks does Austin have than Lionel?


Calculation: $18-3=$

## How to teach multiplication word problems with bar models

Bar models of multiplication start with the same 'real' and 'representative counters' stages as addition and subtraction. Then moves to its final stage, drawing rectangular bars to represent each group:

Each box contains 5 cookies. Lionel buys 4 boxes. How many cookies does Lionel have?


## How to teach division word problems with bar models

Due to the complexity of division, it is recommended to remain grouping and sharing until the final stage of bar modelling is understood. Then word problems such as the 2 below can be introduced:

Sharing

Grace has 27 lollies. She wants to share them into 9 party bags for her friends. How many lollies will go into each party bag?


$$
27 \div 9=3
$$

## Progression in bar modelling on from KS1 to KS2

Now that we have established a structure across school that allows for children to use bar models for KS1 SATs, we are now ready to teach pupils how to use the bar model for a deeper understanding of complex problems during Key Stage 2 and particularly in preparation for KS2 SATs.

The key question at any stage, at any age is what do we know? By training pupils to ask this when presented with word problems themselves, they quickly become independent at drawing bar models.

For example, in the problem: Egg boxes can hold 6 eggs. We need to fill 7 boxes. How many eggs will we need?

We know that there will be 7 egg boxes, so we know we can draw 7 rectangular bars. We know that each box holds 6 eggs, so we can write ' 6 eggs' or ' 6 ' in each of those 7 rectangular bar. We know we need to find the amount of eggs we have altogether. We can see we will need to use repeated addition or multiplication to solve the problem.


Let's ramp up the difficulty a little. In the sample KS2 SATs, pupils are asked:

A bag of 5 lemons costs $£ 1$. A bag of 4 oranges costs $£ 1.80$. How much more does one orange cost than one lemon?

Pupils could represent this problem in the below bar model, simply by asking and answerin \& 'what do we know?

From here it should be straightforward for the pupils to 'see' or visualise their next step. Namely, dividing $£ 1.80$ by 4 and $£ 1$ by 5 . Some pupils will not need the bar model to represent the next stage, but if they do, they would calculate and then allocate the cost onto the model:

## How to teach using the bar model for word problems with fractions

Here's another example from the sample key stage 2 tests involving fractions. On Saturday Lara read two fifths of her book. On Sunday, she read the other 90 pages to finish the book. How many pages are there in Lara's book? If we create our bar model for what we know:

## How to teach equations with the bar model

There are lots of other areas bar models can assist pupil's understanding such as ratio, percentages and equations. In this final example, we look at how an equation can be demystified:


Let's draw what we know in a comparative model, as we know both sides of the equation will equal the same total:



So if that 'a' is 4 , then both the other 'a's will also be 4. So each side of the equation will total 15 . The below model shows all sections completed. This is not necessary for the pupils to do, the representation is merely useful until they can see the steps necessary to calculate whatever they are faced with:

## What do you find the hardest in the Reasoning papers?

Is it the maths you have to do, or understanding what maths the question wants you to do?

Bar modelling helps you 'see' what the question is asking you...
(a)

What do the bars show?...

What do the bars show?...
(c)


Sarch has 15 more flowers than Katya.
Show this on the diagram.

What is the diagram going to look like?

4

I David catches 35 fish.
Fiona catches 21 fish.
How many more fish does David catch?
Complete the dlagram. Let's add it on


3 Mrs Dawson has two dogs.
Bruno weighs 26 kg .
Lola weighs 12 kg more than Bruna. How much does Lola weigh?

## Complete the diagram.

Complete the number sentence

$$
\ldots-\ldots=-\ldots \ldots \ldots
$$ $=$

Whole unknown...
4 children go to the cinema. They each pay £15. How much do they spend altogether?

$$
15+15+15+15=
$$

Size of groups unknown...
4 children go to the cinema. They pay $£ 60$ altogether. How much do they spend each?

$$
60 \div 4=
$$

Number of groups unknown...
Tickets to the cinema are $£ 15$. Some children buy tickets that cost $£ 60$. How many children bought tickets?

## How deeply do your children understand division?



## How deeply do you understand division?




Unit 9 Year 6 (Spring Term)
212002 Test B


The distance from $\mathbf{A}$ to $\mathbf{B}$ is three times as far as from $\mathbf{B}$ to $\mathbf{C}$.
The distance from $\mathbf{A}$ to $\mathbf{C}$ is 60 centimetres.

So this is interesting...


$$
\text { A to } B=15+15+15=45 \mathrm{~cm}
$$

Calculate the distance from A to B.


## Edexcel GCSE, Summer 2017

$10 A B C$ is a straight line.


The length $A B$ is five times the length $B C$. $A C=90 \mathrm{~cm}$.

Work out the length $A B$.


$$
A \text { to } B=15+15+15+15+15=75 \mathrm{~cm}
$$

> Try these questions in your journal or book.
> Draw a bar model for each question

## Challenge Questions

Bailey has 74 sweets.
She has 25 more sweets than Freda.
How many sweets does Freda have?

Mrs Foster has two children, Joe and Rachel
They start with the same amount of money.
She gives Rachel the following extra coins.


Rachel nows has 60 pence.
How much money does Joe have?

There are 72 adults watching a film.
There are 40 children watching the film.
(a) How many more adults than children are watching the film?

Of the children there are 18 boys
(b) How many girls are watching the film?

A TV show lasts 35 minutes.
A film lasts I hour 21 minutes.
How much longer does the film las $\dagger$ than the TV show?


There are three piles of books in a classroom.


Bailey has 74 sweets.
She has 25 more sweets than Freda.


How many sweets does Freda have?


A TV show lasts 35 minutes.
A film lasts I hour 21 minutes.
How much longer does the film lost than the TV show?

$$
\text { Film }=1 \mathrm{hr} 21 \mathrm{mins}=81 \quad \mathrm{mins}
$$

5 There are three piles of books in a classroom.

$$
81-35=?
$$



- The first pile contains 46 books.
- The second pile contains 32 books.
- The third pile contains 15 fewer books than in the second pile. $\square$

$$
46-17=?
$$

(a) How many more books are in the first pile than the third pile?
(b) How many books are there in total?

| 46 | 32 | 17 |
| :---: | :---: | :---: |
| Total books $=$ ? |  |  |



## One to finish with ...A question for Year 5 children in Singapore!



$$
\text { so } 5 / 10=1 / 2=200
$$

In total there were 400

Thank you so much for coming. I do hope you have found it useful.

If you have a look at the website you will find some examples to have a go on with your children.

Google: Roundwood Primary mathematics.
It is definitely worth a look, as I have now added Revision sheets for each year group to help you see the coverage.

## Direct addition or comparison? (2LS18)

There were 52 frogs in a pond. 30 hopped out. How many were left?

## 52



Use paper strips: One is 52

Other is 30
Put them
above/below each other to see that you need to take away if order to find the ?

Sally has 21 fewer sweets than Julia. If Sally has 43 sweets, how many does Julia have?

## Julia Sally



## Addition

Martin has 30 fewer Match Attax cards than John. If John has 200 Match Attax cards, how many cards does Martin have?


## Result, Change or Start?

Claire has 15 Big Hero 6 stickers, she is given 7 more. How many stickers does she now have?

Claire has 15 Big Hero 6 stickers, she is given some more. She now has 22 stickers. How many stickers was she given?

22
Claire has some Big Hero 6 stickers, she is given 7 more. She now has 22 stickers. How many stickers did she have to start?

## Making the Links

| ${ }^{2+7}=0$ | 雨 |  | $10-10=0$ |
| :---: | :---: | :---: | :---: |
|  |  |  | $c^{\circ}{ }^{\circ}$ |
| -000000 | $\begin{aligned} & 00000 \\ & \text { j0030 } \end{aligned}$ | $\rightleftharpoons$ | $8=1$ |

## KS1 Paper 22017

19 Ben and Sita count cars.


Ben counts 38 red cars.

Sita counts 23 blue cars.


## Part whole: Algebra



Herts
for Learning

## All four operations

6 pens cost $£ 2.84$.
3 pens and 1 pad cost£2.00.
How much does 1 pad cost?


5LS16


Herts
for Learning

## Inversion

## What does this model show?




## Ratio

Jason and Kylie have had hit records in the ratio of 1 to 3 . Altogether they had 48 hits. How many did Kylie have?


How many more hits does Kylie have than Jason?

## Ratio comparison

Peter and Harry have borrowed books from the library in the ratio of $2: 3$. If Harry borrowed 18 books, how many more books has Harry borrowed than Peter?


## SATS 2017 paper 2

14 Amina planted some seeds.
For every 3 seeds Amina planted, only 2 seeds grew.
Altogether, 12 seeds grew.
How mary seeds dd Amina plant?

| grew | grew |  |
| :--- | :--- | :--- |
| grew | grew |  |
| grew | grew |  |
| grew | grew |  |
| grew | grew |  |
| grew | grew |  |

TMank

Year 1

## Anna has 50 pencils.

She puts 5 pencils in each party bag.
How many bags does she put pencils in?


## Anna has 50 pencils.

She puts 5 pencils in each party bag.
How many bags does she put pencils in?

## 50

5
How many 5s will fit...?


Write numbers in the boxes to make these correct.

$$
3+\square=8
$$



Write numbers in the boxes to make these correct.

$$
3+5=8
$$



## Ben puts 15 buttons on a table.

He hides some of them under his hand.
How many buttons is Ben hiding?


Ben puts 15 buttons on a table.
He hides some of them under his hand.
How many buttons is Ben hiding?


Ben has
4 red cars,
8 green cars and
3 yellow cars.


Write a sum to work out how many cars he has altogether.

## Ben has 4 red cars, <br> 8 green cars and <br> 3 yellow cars.



Write a sum to work out how many cars he has altogether.

$$
4+8+3=15
$$




Sita puts 2 shoes in each of these boxes.
How many shoes are there altogether?


Sita puts 2 shoes in each of these boxes.
How many shoes are there altogether?

| $?$ |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 |



How many shells does Amy have?


How many shells does Amy have?


There are 6 eggs in each box.


How many eggs are there altogether?


There are 6 eggs in each box.


How many eggs are there altogether?

## 12 eggs

Year 2

## Sita has 50 raisins.

## She gives 23 to Ben.

## She gives 15 to Amy.

How many raisins does Sita have left?

Sita has 50 raisins.

She gives 23 to Ben.

She gives 15 to Amy.


How many raisins does Sita have left?
$50-38=?$

Apples cost 10p each. Pears cost 25p each.


Amy buys 1 apple and 2 pears.
How much change does she get from $£ 1$ ?

Apples cost 10p each. Pears cost 25p each.


Amy buys 1 apple and 2 pears.
How much change does she get from $£ 1$ ?

| 1025 | 25 | $?$ |
| :---: | :---: | :---: |
| $£ 1=100$ |  |  |
| 60 |  |  |

$100-60=?$


12 children are on a bus.
8 children get off the bus.
Then 4 more children get off the bus.
Tick $(\checkmark)$ the number of children left on the bus.
8
2
0
1
4


12 children are on a bus.
8 children get off the bus.
Then 4 more children get off the bus.
Tick $(\sqrt{ })$ the number of children left on the bus.

8
2
0

$$
12-12=?
$$




Kemi and Ben share these pencils equally.
How many pencils do they each get?


Kemi and Ben share these pencils equally.
How many pencils do they each get?


There are 40 crayons in a box.
Sam takes 17 crayons.
Kemi takes 10 crayons.
How many crayons are left?


There are 40 crayons in a box.
Sam takes 17 crayons.
Kemi takes 10 crayons.


How many crayons are left?

$$
40-27=?
$$

## Sam is collecting cards.

He wants to collect 100 cards altogether.
Last week he collected 50 cards.

This week he collects 30 cards.


How many more cards does he need?


Sam is collecting cards.

He wants to collect 100 cards altogether.
Last week he collected 50 cards.

This week he collects 30 cards.


| 100 |  |  |
| :---: | :---: | :---: |
| 50 | 30 | $?$ |
| 80 |  | $?$ |


$100-80=$ ?

Amy plants 4 rows of carrots.

There are 3 carrots in each row.

A rabbit eats 2 of the carrots.


How many carrots are left?

Amy plants 4 rows of carrots.

There are 3 carrots in each row.

A rabbit eats 2 of the carrots.


How many carrots are left?

| 3 | 3 | 3 | 3 |
| :--- | :--- | :--- | :--- |
| 12 |  |  |  |

Year 3

Kirsty, Seb and Mina made toffee apples to sell at the school fair.
They made 80 toffee apples altogether.


Kirsty sold 12 toffee apples.
Seb sold 25 toffee apples.
Mina sold 17 toffee apples.
How many toffee apples were left?

Kirsty, Seb and Mina made toffee apples to sell at the school fair.
They made 80 toffee apples altogether.

Kirsty sold 12 toffee apples.
Seb sold $\mathbf{2 5}$ toffee apples.
Mina sold 17 toffee apples.
How many toffee apples were left?

| 80 |  |  |  |
| :---: | :---: | :---: | :---: |
| 12 | 25 | 17 | $?$ |
| 54 |  |  |  |

$80-54=?$

Holly has a box of mints.


She has 10 friends.
She gives them 5 mints each.
She has 13 mints left.
How many mints were in the box at the start?


Holly has a box of mints.


She has 10 friends.
She gives them 5 mints each.
She has 13 mints left.


How many mints were in the box at the start?
$50+13=?$

Write the missing number.
One is done for you.


Write the missing number.
One is done for you.


## 6 pencils cost: $\mathbf{£ 1 . 2 0}$

3 pencils and 1 rubber cost $£ 1.09$


What is the cost of 1 rubber?

## 6 pencils cost $\mathbf{£ 1 . 2 0}$



1 pencil $=£ 1.20 \div 6$

| 20 | 20 | 20 | $?$ |
| :--- | :--- | :--- | :--- |
| $£ 1.09$ |  |  |  |
| 60 |  |  | $?$ |

What is the cost of 1 rubber?

A pack of paper has 150 sheets.
4 children each take 7 sheets.
How many sheets of paper are left in the packet?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Show |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| your method |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

A pack of paper has 150 sheets.
4 children each take 7 sheets.
How many sheets of paper are left in the packet?


2 marks

Year 4

Liam buys two apples.

He pays with a $£ 1$ coin and gets 64 p change.


How much does one apple cost?

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | | Show |
| :--- |
| your |
| method |

Liam buys two apples.

He pays with a $£ 1$ coin and gets 64 p change.


How much does one apple cost?


Seb has 77 cubes left over.
He builds two more towers.
One tower uses 18 cubes and the other uses 35 cubes.
How many of his 77 cubes has he got left now?


Seb has 77 cubes left over.
He builds two more towers.
One tower uses 18 cubes and the other uses 35 cubes.
How many of his 77 cubes has he got left now?


Books are 25 p each at a car boot sale.
Alfie wants to buy 12 books.
He only has $£ 2.35$
How much more money does Alfie need?

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |

Books are 25 p each at a car boot sale.
Alfie wants to buy 12 books.
He only has $£ 2.35$
How much more money does Alfie need?



Dev and Joe each buy a book.
Dev pays with a $£ 5$ note and gets $£ 1.05$ change.
Joe's book costs $£ 7$
How much more does Joe's book cost than Dev's book?


Six classes at Winward Primary School collected some money.
The chart shows how much money the boys and girls collected.


In Class 4, how much more money did the girls collect than the boys?

Six classes at Winward Primary School collected some money.
The chart shows how much money the boys and girls collected.

$12-5=$ ?

In Class 4, how much more money did the girls collect than the boys?

These are some prices in a fish and chip shop.

| Fish £2.30 | Peas 35p |
| :---: | :---: |
| Sausage $£ 1.80$ | Curry sauce 40p |
| Chips (small bag) 60p | Bread roll 30p |
| Chips (large bag) 90 p | Pickled onion 28p |

Alfie buys one fish, a large bag of chips and a pickled onion.
How much does he pay?

Megan buys a sausage and a bread roll.
Chen buys a small bag of chips and a curry sauce.
How much more does Megan pay than Chen?

These are some prices in a fish and chip shop.

| Fish £2.30 | Peas 35p |
| :---: | :---: |
| Sausage £1.80 | Curry sauce 40p |
| Chips (small bag) 60p | Bread roll 30p |
| Chips (large bag) 90 p | Pickled onion 28p |


| $£ 2.30$ | 90 | 28 |
| :---: | :---: | :---: |
|  | $?$ |  |
| $£ 2.30+90+28=?$ |  |  |

Alfie buys one fish, a large bag of chips and a pickled onion.
How much does he pay?

Megan buys a sausage and a bread roll.


1 mark

Chen buys a small bag of chips and a curry sauce.
Chen
60
40
£2.10-£1 = ?
How much more does Megan pay than Chen?

Year 5

## Year 6 Bar model examples

- Read the question...
- Draw each part of the question, using ? For missing numbers
- Calculate the ?
- Check that putting the answer in works in your diagram.
- Check what the question asked you to do.

Seb bought 2 apples and 3 pears.
He spent $£ 1.59$ altogether.


Apples cost 24 p each.
How much does one pear cost?


Seb bought 2 apples and 3 pears.
He spent $£ 1.59$ altogether.


| apple | apple | pear | pear | pear |
| :--- | :--- | :--- | :--- | :--- | f 1.59



How much does one pear cost?

## £1.59-48 = 3 pears



```
pear pear pear
    f 1.11
```

$£ 1.11 \div 3=1$ pear

Alfie buys two books, each at the same price.
He pays with a $£ 10$ note and gets $£ 2.30$ change.


What is the cost of one book?


Alfie buys two books, each at the same price.
He pays with a $£ 10$ note and gets $£ 2.30$ change.


What is the cost of one book?


Chen and Megan each buy a sandwich.
Chen gets 5 p change from $£ 2$
Megan gets $£ 2.25$ change from $£ 5$
How much more does Megan pay than Chen?


Chen and Megan each buy a sandwich.
Chen gets 5 p change from $£ 2$
Megan gets $£ 2.25$ change from $£ 5$
How much more does Megan pay than Chen?


A shop sells pairs of socks.


1 pair for $£ 5.45$


3 pairs for $£ 7.50$


5 pairs for $£ 8.50$

Kirsty buys 1 pair of knee socks and 3 pairs of ankle socks.
She pays with a $£ 20$ note
How much change does she get?

A shop sells pairs of socks.


1 pair for $£ 5.45$


3 pairs for $£ 7.50$

£12.95


| $£ 5.45$ | $£ 7.50$ | $?$ |
| :---: | :---: | :---: |
|  | $£ 20$ |  |

$£ 20-£ 12.95=?$

The mass of a 10 p coin is 6.5 g .
The mass of a $5 p$ coin is half the mass of a 10 p coin.
What is the mass of these six coins altogether?


The mass of a 10 p coin is 6.5 g .
The mass of a $5 p$ coin is half the mass of a $10 p$ coin.
What is the mass of these six coins altogether?


Jacob cuts 4 metres of ribbon into three pieces.
The length of the first piece is $\mathbf{1 . 2 8}$ metres.
The length of the second piece is $\mathbf{1 . 6 5}$ metres.
Work out the length of the third piece.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Show |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| method |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | metres |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | metres |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Jacob cuts 4 metres of ribbon into three pieces.
The length of the first piece is $\mathbf{1 . 2 8}$ metres.
The length of the second piece is $\mathbf{1 . 6 5}$ metres.
Work out the length of the third piece.



Big Wheel
£2.50
each ride
Rollercoaster £1.50 each ride

Liam spends $£ 14$ altogether on the Big Wheel and the Rollercoaster.
He goes on the Big Wheel twice.
How many times does he go on the Rollercoaster?


Liam spends $£ 14$ altogether on the Big Wheel and the Rollercoaster.
He goes on the Big Wheel twice.
How many times does he go on the Rollercoaster?


Year 6

A shop sells fruit.

Chen buys 2 apples and 3 bananas.
He pays $£ 2.35$


Megan buys 2 apples and 1 banana.
She pays $£ 1.25$


How much does one banana cost?

A shop sells fruit.

Chen buys 2 apples and 3 bananas.
He pays $£ 2.35$



A A B
£1.25

Megan buys 2 apples and 1 banana.
She pays $£ 1.25$


How much does one banana cost?
1 banana $=£ 1.10 \div 2$

Seb had some cherries.
Every day he ate 10 cherries and gave 5 away.
After he gave the last 5 cherries away, he had eaten 40 cherries altogether.


How many cherries did Seb have at the start?


Seb had some cherries.
Every day he ate 10 cherries and gave 5 away.
After he gave the last 5 cherries away, he had eaten 40 cherries altogether.


How many cherries did Seb have at the start?


Large pizzas cost $£ 8.50$ each.
Small pizzas cost $£ 6.75$ each.
Five children together buy one large pizza and three small pizzas.
They share the cost equally.
How much does each child pay?


Large pizzas cost $£ 8.50$ each.
Small pizzas cost $£ 6.75$ each.
Five children together buy one large pizza and three small pizzas.
They share the cost equally.
How much does each child pay?
£28.75


A toy shop orders 11 boxes of marbles.
Each box contains 6 bags of marbles.
Each bag contains 45 marbles.


How many marbles does the shop order in total?

A toy shop orders 11 boxes of marbles.
Each box contains 6 bags of marbles.
Each bag contains 45 marbles.

$270 \times 11=?$


How many marbles does the shop order in total?

Olivia buys three packets of nuts.


She pays with a $£ 2$ coin.
This is her change.


What is the cost of one packet of nuts?

Olivia buys three packets of nuts.


She pays with a£2 coin.
This is her change.

| Nuts | Nuts | Nuts | change |
| :---: | :---: | :---: | :---: |
| $£ 2$ |  |  |  |


| Nuts | Nuts | Nuts | $95 p$ |
| :--- | :--- | :--- | :--- |
| $£ 2$ |  |  |  |


£ $2-95 p=3$ bags of nuts
What is the cost of one packet of nuts?
$£ 1.05 \div 3=1$ bag of nuts

All of the examples so far are of 1 step problems but all similar problems in the KS2 SATs have at least 2 steps, some of them have 3 or 4 . Having grasped the use of bar models for 1 step problems, let's look at a way to use their skills for multi-step problems.

See 2017 problem solving questions

Lara chooses a number less than 20
She divides it by 2 and then adds 6
She then divides this result by 3
Her answer is 4.5
What was the number she started with?


Lara chooses a number less than 20
She divides it by 2 and then adds 6
She then divides this result by 3
Her answer is 4.5
What was the number she started with?


200 children went on holiday.
$10 \%$ of the children went to Wales.
$25 \%$ of the children went to Scotland.
How many more children went to Scotland than went to Wales?


200 children went on holiday.
$10 \%$ of the children went to Wales.
$25 \%$ of the children went to Scotland.
How many more children went to Scotland than went to Wales?


Now multi step... from SATs papers

- Reasoning 1 \& 240 MINS EACH

1 Circle the number that is closest to 1,000 $1,003 \quad 909 \quad 1,090 \quad 996$

Write the missing value to make this number sentence correct.
$+100=14,507$


This table shows average house prices in five cities in Britain:

| Town | Average house price |
| :---: | :---: |
| Portsmouth | $£ 215,700$ |
| Bournemouth | $£ 265,000$ |
| Southampton | $£ 214,600$ |
| Edinburgh | $£ 203,500$ |
| Bristol | $£ 253,400$ |

Which of these cities has the
lowest average property price?
$\square$


Write the three missing digits to make this subtraction correct.


2 marks

This table shows the number of new car registrations in one year.

| Brand | Registrations |
| :---: | :---: |
| Fiat | 38,549 |
| Hyundai | 56,580 |
| Jaguar | 19,958 |
| Land Rover | 49,015 |
| Toyota | 62,030 |

What was the combined total of the two highest selling brands?


Volvo had 11,515 fewer registrations than Fiat. Complete the table to show the number of Volvo registrations.

| Brand | Registrations |
| :---: | :---: |
| Fiat | 38,549 |
| Hyundai | 56,510 |
| Jaguar | 19,958 |
| Land Rover | 49,015 |
| Toyota | 62,030 |
| Volvo |  |


(5) $140+77=\square-20$

6 Draw the reflection of the shape in the mirror line.

$7 \frac{2}{6}+\frac{3}{12}+\frac{1}{3}=\square$


Write the letter for each fraction in order of size starting with the smallost fraction.

One has been done for you.
A. $\frac{9}{10}$
B. $\frac{1}{2}$
C. $1 \frac{3}{4}$
D. $\frac{40}{30}$
E. $\frac{4}{5}$
$\ldots+$


8 Put the correct symbol, $\langle$ or $\rangle$, in each box.


1 mark

8 oranges cost $£ 1.52$.


4 oranges and a banana cost 90 p.


How much does one benane cost?
Show your method.

his diagram shows some parcels on a balance scale. Each small parcel is identical.

Calculate the weight of one small parcel, in grams.

$\square$

12 Work out the value of $p$.

$$
7 p-4=24
$$

If $t=12$, what is $5 t+8$ ?


13 In the sale a pair of boots has been reduced by $25 \%$. They now cost $£ 37.50$. What was the original price of the boots?


14 Complete this calculation using two different prime numbers.



1 mark

15 A delivery company charges $£ 9.75$ to deliver parcels weighing up to 20 kg , then 30 p for every 500 grams over that weight.

How much would they charge to deliver a parcel weighing 32 kg ?


16 Write the number that is twenty less than one million.


Write the number that is ten thousand less than ten million.


1 mark

17 Calculate the sizes of angles $a$ and $b$. The diagram is not to scale.


18 Write the missing numbers.


19 Shape A is an isosceles triangle drawn on co-ordinate axes.

Write the missing co-ordinate.


20 Mr and Mrs Scott have employed a decorator to paint their kitchen and lay a new floor.

The decorator charges $£ 10$ per hour.
The paint costs $£ 11.40$ per litre.
Flooring costs $£ 26.70$ per m²
The decorator spends $18 \frac{1}{2}$ hours decorating the kitchen.

He uses 3 litres of paint and $20 \mathrm{~m}^{2}$ of flooring.
Calculate the total cost to decorate the kitchen.



## Balance of difficulty <br> of questions in the paper <br> 5 marks at working towards <br> 22 marke at the expected standard <br> 8 marks at working at greater depth

## Thresholds

Working towerds the oxpected standard: Citeria for "working at the expected standord' howe not been met.
Wonking at the expected standerd: at lest 11 of the 22 'expected' mank are obtsined, together with all 5 of the working towards marks, but none of the 8 merks greded 'greater depth'. This mark is 16 out of 35 .

Working at greater depth: all of the 5 wonking towerd marks are obts ned, pus at lest $90 \%$ of the "epected' marks and at least $50 \%$ of the 'grester depth' marks. This mark is 29 out of 35.

Page 2 of 23


1 mark

| Home Tools | KS2_SATs_Practice_.. | KS2_SATs_Practice_.. $\times$ |
| :---: | :---: | :---: |
|  | - ¢ (4) |  |


(1) $465+\square=605$

■
$\square$
$\square$$\quad$ Third Space Learning

```
Key Stage 2 SATs
Mathematics Practice Test
Paper 3: Reasoning
```



Export PDF

Adobe Export PDF ©
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...Pack_1).pdf X

Convert to
Microsoft Word (*.docx) $V$

Document Language:
English (U.S.) Change

Convert

Store and share files in the Document Cloud

Learn More











Mathematics Practice Test
Paper 3：Reasoning

10
Tick $(\checkmark)$ the two rectangles that have the same area Diagrams have not been drawn to scale．


Convert


Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATS＿P．．．．Pack＿1）．pdf $\times$

Convert to
－Microsoft Word（＊．docx）
Document Language：
English（U．S．）Change

## Store and share files in the

 Document CloudLearn More

三 NOTES $\qquad$ COMMENTS

回
H













Can use Bar modelling for the arithmetic too Arith 30 MINS
File Edit View Window Help
Home Tools KS2_SATs_Practice_...

Key Stage 2 SATs
Mathematics Practice Test
Paper 1: Arithmetic


## Convert

Store and share files in the Document Cloud


Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\checkmark$

Document Language： English（U．S．）Change




## Adobe Export PDF ©

Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\checkmark$

Document Language： English（U．S．）Change

Third Snanelanrnina
Pnan 3 of 14
Home Tools $\quad$ KS2_SATs_Practice_... $\quad$ KS2_SATs_Practice_... $\quad$ KS2_SATs_Practice_... $\times$


Key Stage 2 SATs
Mathematics Practice Test
Paper 1: Arithmetic


Convert

Store and share files in the Document Cloud

| Home Tools | KS2_SATs_Practice_... | KS2_SATs_Practice_... | KS2_SATs_Practice_... $\times$ |
| :--- | :--- | :--- | :--- | :--- |





## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$

Document Language: English (U.S.) Change
File Edit View Window Help
Home Tools KS2＿SATs＿Practice＿．．．KS2＿SATs＿Practice＿．．．KS2＿SATs＿Practice＿．．．$\times$



Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\checkmark$

Document Language：
English（U．S．）Change

|  |
| :---: |



```
Export PDF
```


## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to

- Microsoft Word (*.docx)

Document Language: English (U.S.) Change
■ ¢



Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language: English (U.S.) Change

## Convert

Store and share files in the Document Cloud
Home Tools KS2_SATs_Practice_... ${ }^{\text {H }}$ KS2_SATs_Practice_... $\quad$ KS2_SATs_Practice_... $\times$



Third Space Learning
Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language:
English (U.S.) Change

| Home Tools | KS2_SATs_Practice_... | KS2_SATs_Practice_... | KS2_SATs_Practice_... $\times$ |
| :--- | :--- | :--- | :--- | :--- |



Home Tools KS2＿SATs＿Practice＿．．．


## Convert

Store and share files in the Document Cloud


Third Space Learning
Page 6 of 14

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\downarrow$

Document Language English（U．S．）Change



## Convert

Store and share files in the Document Cloud




Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to

- Microsoft Word (*.docx) $\checkmark$

Document Language: English (U.S.) Change



Export PDF

Adobe Export PDF ©
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx)

Document Language:
English (U.S.) Change

Key Stage 2 SATs
Mathematics Practice Test
Paper 1：Arithmetic


## Convert

Store and share files in the Document Cloud
Home Tools KS2＿SATs＿Practice＿．．．



## Convert

Store and share files in the Document Cloud


Third Space Learning
Page 8 of 14

Export PDF

## Adobe Export PDF $\oplus$

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language: English (U.S.) Change
Home Tools KS2＿SATs＿Practice＿．．．$\square Q$
（ㄱ）（1） 9122
a inf $\odot \oplus$ 114\％


Key Stage 2 SATs
Mathematics Practice Test
Paper 1：Arithmetic


## Convert

Store and share files in the Document Cloud

| 回 |
| :---: |
|  |  |



## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

# Convert to 

Microsoft Word（＊．docx）$\vee$

Document Language： English（U．S．）Change


## Convert

Store and share files in the Document Cloud


Export PDF

## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language:
English (U.S.) Change



## $2423 \times 5.4=$

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

## Convert to

Microsoft Word（＊．docx）$\vee$

Document Language： English（U．S．）Change


Third Space Learning


Store and share files in the Document Cloud

Learn More
囚 Q
（ㄷ）（1）
11 ／22
＊IIII $\Theta \oplus$ 14\％崮 困䍜

Mathematics Practice Test
Paper 1：Arithmetic


$$
26 \frac{3}{1}-\frac{1}{9}=
$$

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\downarrow$

Document Language English（U．S．）Change


| 27 | $5 \%$ of $680=$ |
| :--- | :--- |

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\vee$

Document Language English (U.S.) Change



Third Space Learning
Page 11 of 14
Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\checkmark$

Document Language：
English（U．S．）Change



## 29

$\square$

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language: English (U.S.) Change


\section*{| , | 75 |
| :--- | :--- |}

Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\vee$

Document Language English (U.S.) Change




## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language: English (U.S.) Change

## Convert

Store and share files in the Document Cloud

Learn More

Third Snace I earnina
Pace 12 of 14
Home Tools $\quad$ KS2＿SATs＿Practice＿．．．$\quad$ KS2＿SATs＿Practice＿．．．$\quad$ KS2＿SATs＿Practice＿．．．$\times$
个昌 $\triangle$ Q
（1）（1） $13 / 22$
a inl $\Theta \oplus$ 14\％


Key Stage 2 SATs
Mathematics Practice Test
Paper 1：Arithmetic


## Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2＿SATs＿P．．．ack＿1）．pdf

Convert to
Microsoft Word（＊．docx）$\downarrow$

Document Language： English（U．S．）Change



$33 \quad 1 \frac{1}{5}-\frac{1}{2}=$

Export PDF

Adobe Export PDF ©
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

## Convert to

Microsoft Word (*.docx) $\vee$

Document Language: English (U.S.) Change





\section*{| ァ上 3 v 175 _ |
| :---: | :--- |}

## Export PDF

## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language:
English (U.S.) Change

## Convert

Store and share files in the Document Cloud

Learn More


Export PDF

Adobe Export PDF
Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to
Microsoft Word (*.docx) $\checkmark$
Document Language:
English (U.S.) Change

| Home Tools | KS2_SATs_Practice_... | KS2_SATs_Practice_... | KS2_SATs_Practice_... $\times \mathrm{C}$ |
| :--- | :--- | :--- | :--- | :--- |




## Export PDF

## Adobe Export PDF

Convert PDF Files to Word or Excel Online

Select PDF File
KS2_SATs_P...ack_1).pdf

Convert to

- Microsoft Word (*.docx)

Document Language:
English (U.S.) Change

Convert

Store and share files in the Document Cloud

