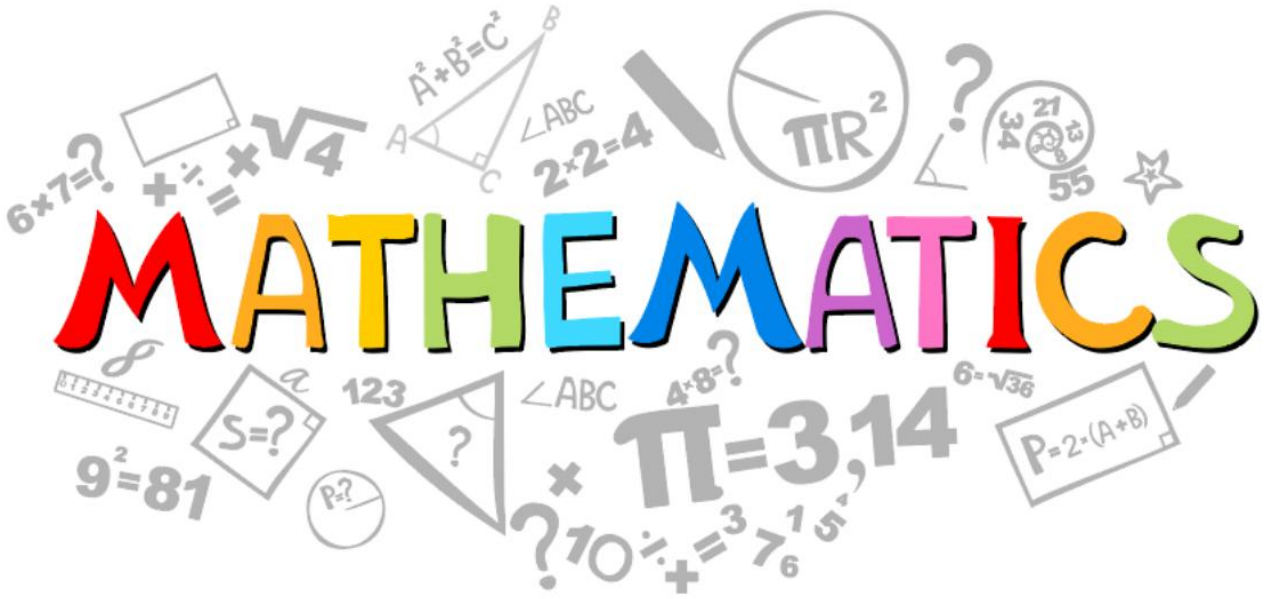
Which is the odd one out and why?

5 10 12



Upper School Maths Workshop

Mrs Patey

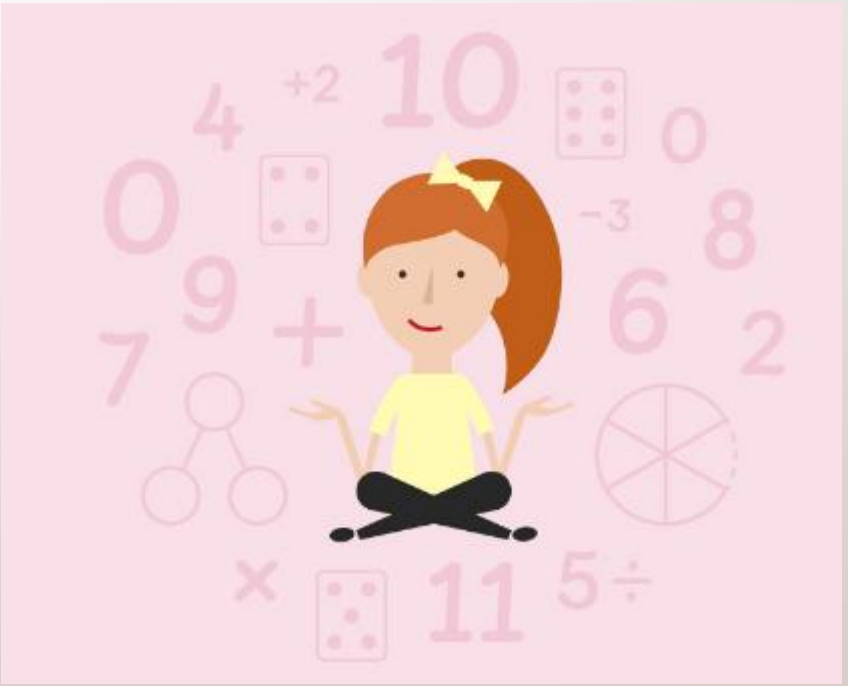
Mrs Caunce

Our purpose today is to:

- Explain and demonstrate how mathematics is taught in Upper School at Holy Trinity.
- Build a positive mindset.
- Understand what is meant by 'mastery' in mathematics.
- Identify how fluency impacts on achieving mastery.
- Increase confidence and understanding in supporting your child at home.
- Ways to use games at home to develop and encourage fluency

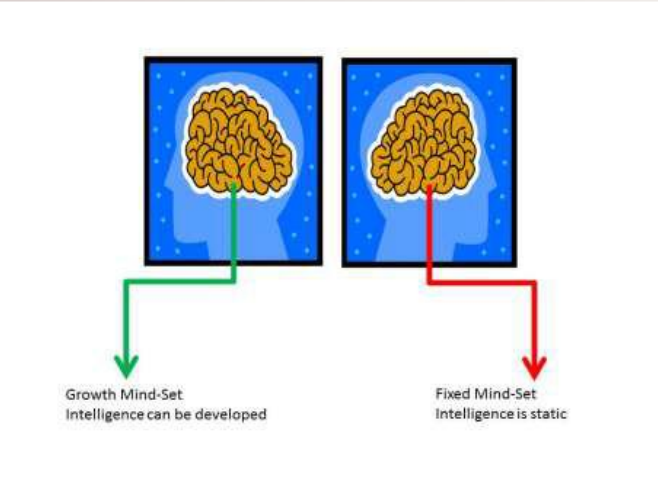
Think about 3 positive and negative experiences of Maths you had when you were a child.

We want your children to move away from maths anxiety and instead feel confident that they can achieve



If children hear 'I can't do maths' from parents, teachers, friends they begin to believe it isn't important.

People become less embarrassed about maths skills as it is acceptable to be 'rubbish at maths'



Fixed vs Growth mindset
Carol Dweck

- We believe that **everyone** can get better at maths…when they put in the **effort** and work at it.
- Do not praise children for being clever when they succeed at something, but instead should praise them for working hard.
- Children learn to associate achievement with effort (which is something they can influence themselves – by working hard!), not 'cleverness' (a trait perceived as absolute and that they cannot change).

FIXED MINDSET

Intelligence is static

Avoid challenges

It's too hard

Expect reward without effort

Ignore feedback

Threatened by success of others

GROWTH MINDSET

Intelligence can be developed

Embrace challenges

I can train my brain.

Effort is a path to mastery

Learn from feedback

Inspired by success of others

The Mastery Approach

*Focus on children learning to **'reason mathematically, solve problems and develop mathematical fluency'***
These are the key aims of the Mastery Curriculum.

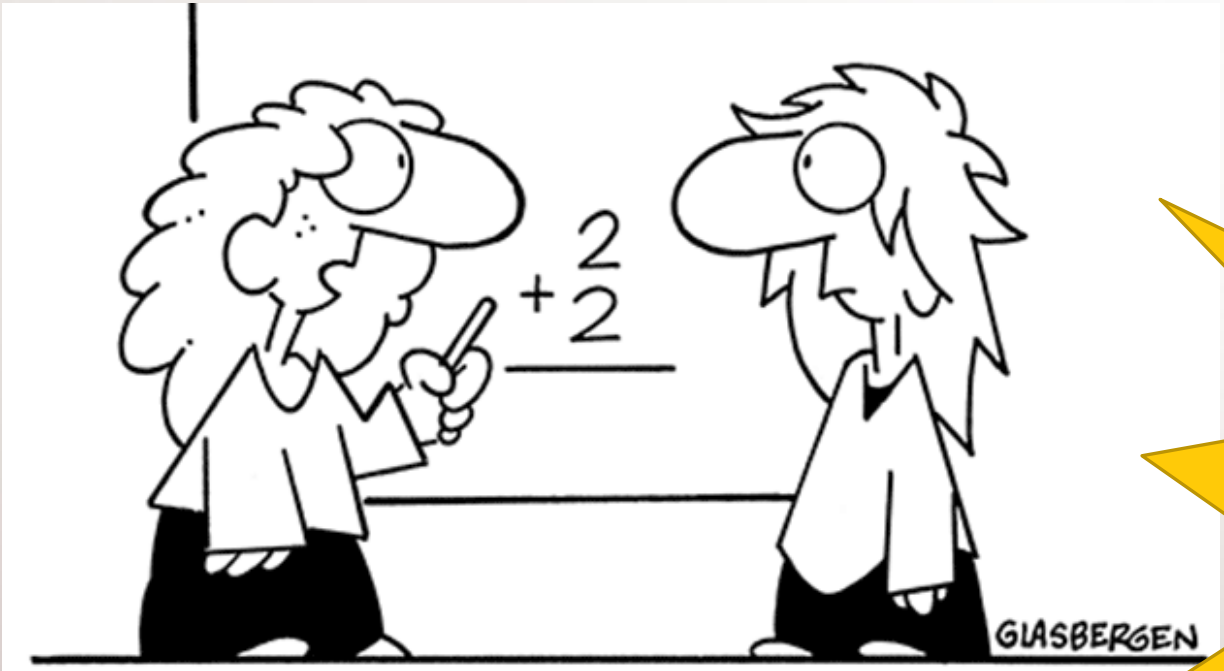
*…(Mastery) is about **deep**, secure **learning for all**, with extension of able students (more things on the same topic) rather than acceleration (rapidly moving on to new content).*

Final Commission on the Commission on Assessment without Levels

What does it mean to master something?

- *I know how to do it.*
- *It becomes automatic and I don't need to think about it e.g. driving.*
- *I'm really good at doing it, painting a room or a picture.*
- *I can show someone else how to do it.*

Mathematical Fluency - what is it and why is it important for my child?



"First they build up your confidence with simple addition and subtraction, then they slam you with algebra and calculus. It's quite a clever scheme."

Fluency is key to developing mastery

What is fluency?

Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand and can explain these methods, and produce accurate answers efficiently.

Mathematical Paper - US 2014

The three aspects of fluency with number

Efficiency - this implies that children do not get bogged down in too many steps or lose track of the logic of the strategy. An efficient strategy is one that the student can carry out easily, keeping track of sub-problems and making use of intermediate results to solve the problem.

Accuracy depends on several aspects of the problem-solving process, among them careful recording, knowledge of number facts and other important number relationships, and double-checking results.

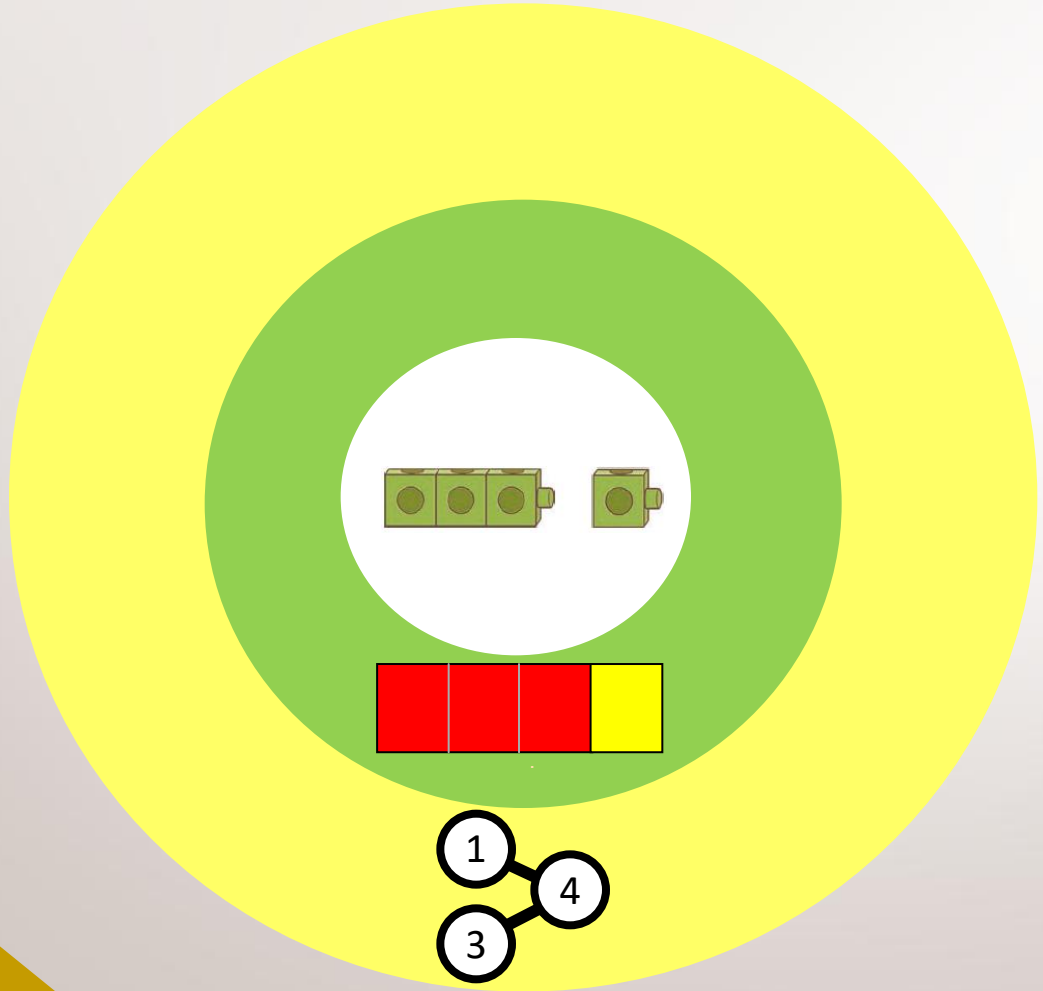
Flexibility requires the knowledge of more than one approach to solving a particular kind of problem, such as two-digit multiplication. Students need to be flexible in order to choose an appropriate strategy for the numbers involved, and also be able to use one method to solve a problem and another method to check the results.

So fluency demands more of students than memorising a single procedure – they need to understand why they are doing what they are doing and know when it is appropriate to use different methods.

How Fluency links to Mastery Maths

Children will be challenged to explain their thinking from the start. This is a key part of any lesson and mathematical language is at the heart of the mastery curriculum.

The CPA approach



Concrete:

resources such as cubes, counters and shapes

Pictorial:

pictures, drawings

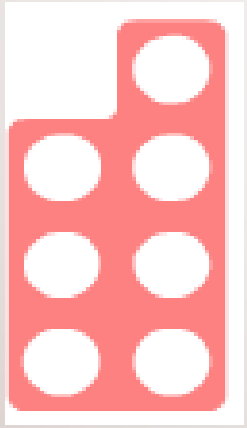
Abstract:

numbers and symbols

The beginning

Knowing everything there is to know about a number.

What do you know about 7?



It is an odd number.

It is a quarter of 28.

It is made up of a 3 and a 4.

It is two more than 5.

It is made up of a 3 twos and a one.

It is half of 14.

It is three fewer than 10.

It is a single digit number.

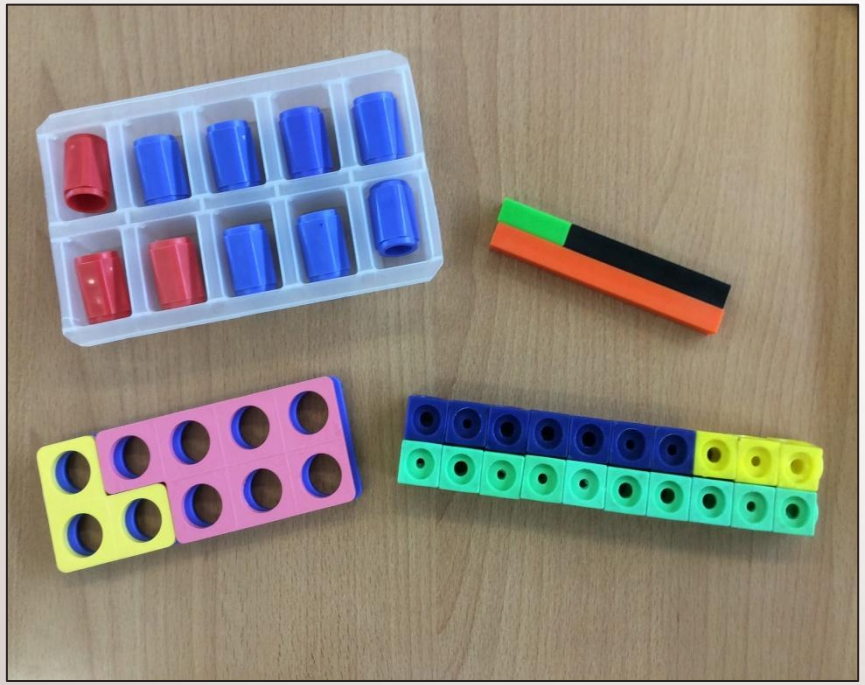
It is double three and a half.

It is a prime number.

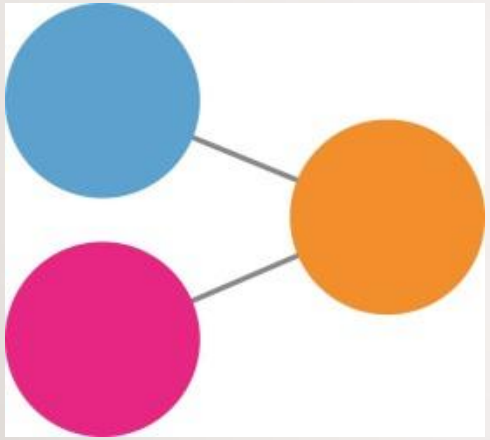
It comes after 6 and before 8.

It is fewer than 10.

Starting Point in Key Stage 1 – concrete resources

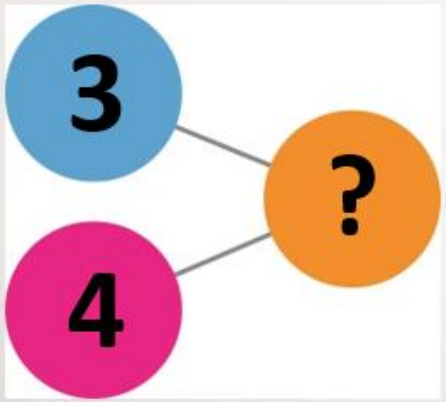


Moving on to the Pictoral
One example of this is the part-whole model

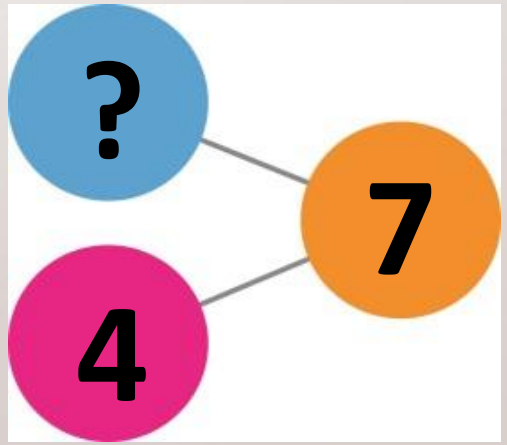


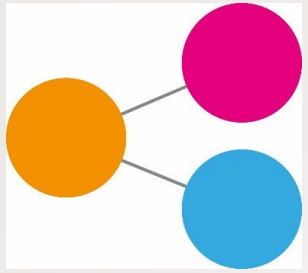
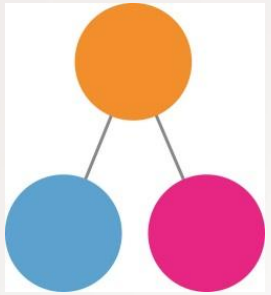
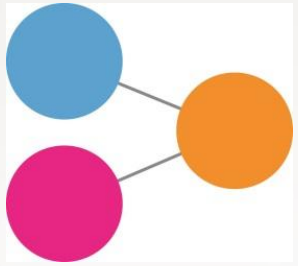
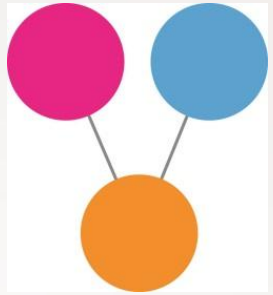
Here is the part-whole model used in the mastery curriculum. It works on the principle that if you know two values out of three in a calculation, you can calculate the missing value using addition or subtraction.

The two parts (3 and 4) combine to make the whole (7).

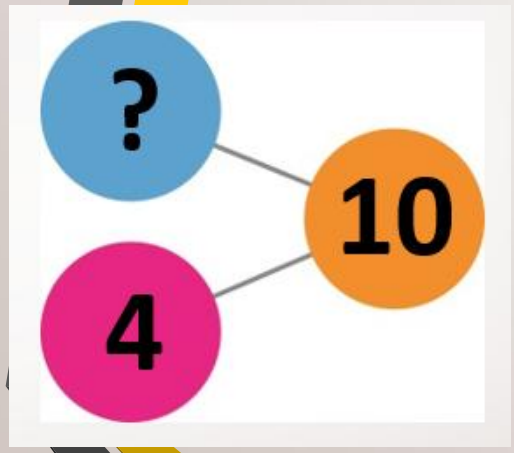


We can now use the model to find the missing ‘part’



The part-whole model can be orientated differently, and is used for addition and subtraction problems or multiplication and division problems.



An unknown number and 4 makes 10.
This leads to a missing box calculation:

□ + 4 = 10

In other words, algebra.

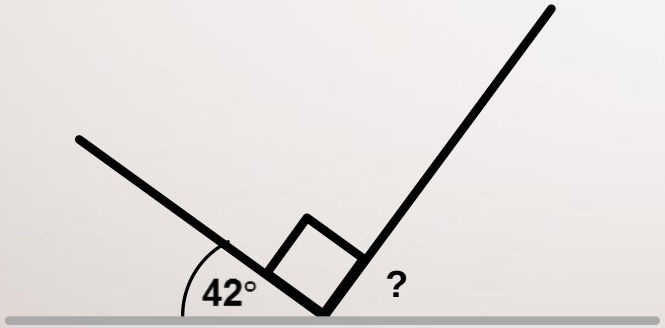
The National Curriculum requires that children know their number families for all the operations, for example:

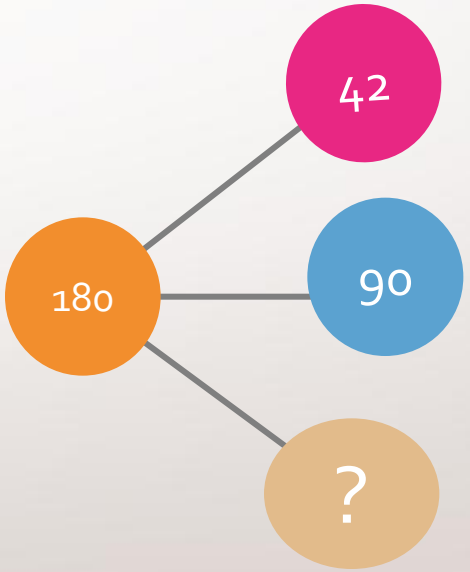
6 + 4 = 10	3 × 7 = 21
4 + 6 = 10	7 × 3 = 21
10 – 6 = 4	21 ÷ 7 = 3
10 – 4 = 6	21 ÷ 3 = 7

The part-whole model

The part-whole model can involve more than two parts.

Here is an example from a Year 6 geometry lesson:

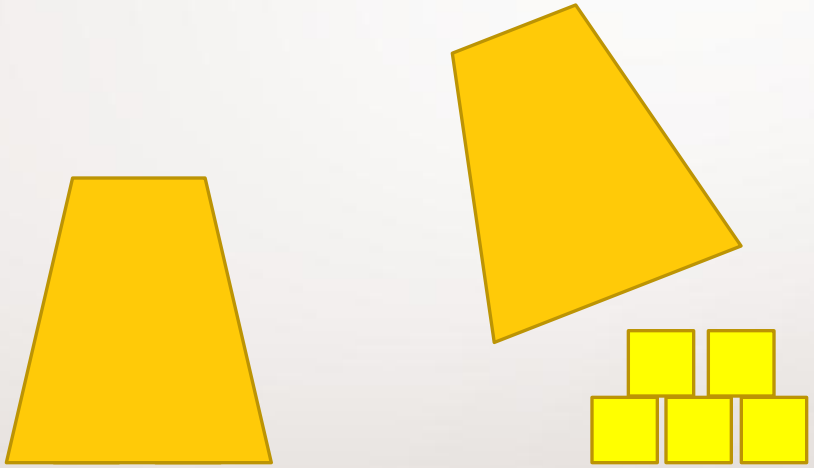




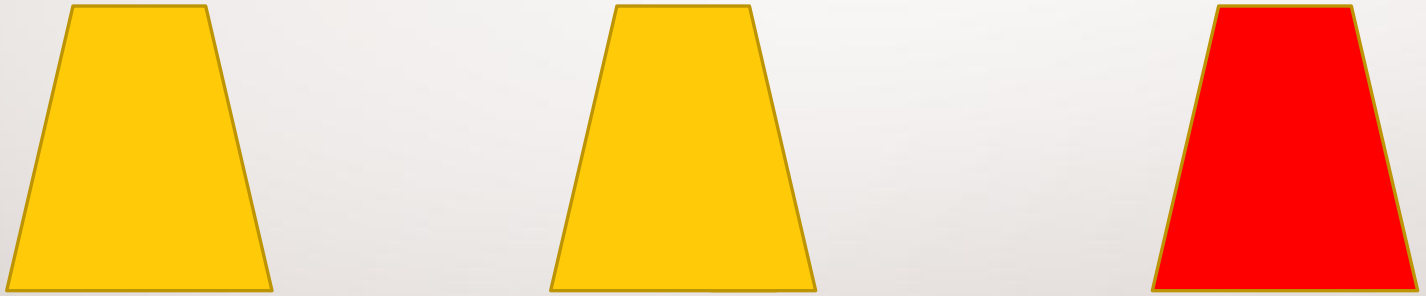
Activities and games

There are 7 cubes under the cups. You can only lift one cup up. Can you work out how many cubes are under the second cup?

There are 5 cubes under this cup. There are 7 cubes altogether. 7 – 5 = 2. I know that there are 2 cubes under the other cup.



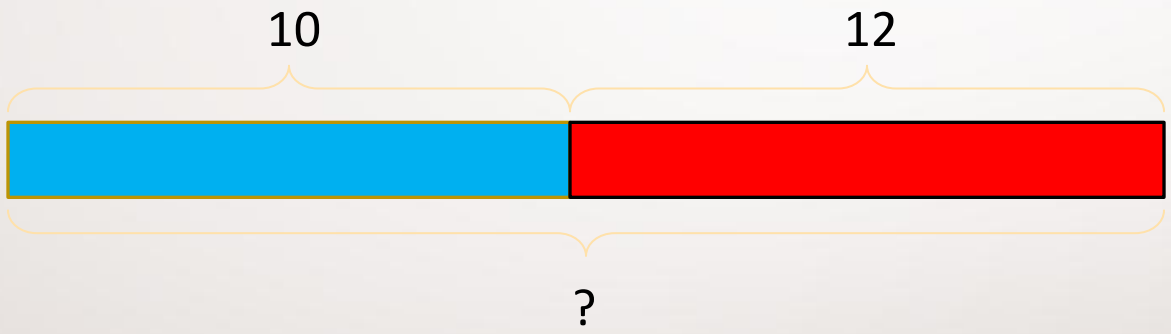
I have 3 cups and 10 cubes. I've hidden the same number of cubes under both blue cups and a different number under the red cup. You can only lift one cup. Can you work out what is hiding under the other 2 cups without lifting them?



Another example of Pictoral is the Bar Model

Introducing the bar model

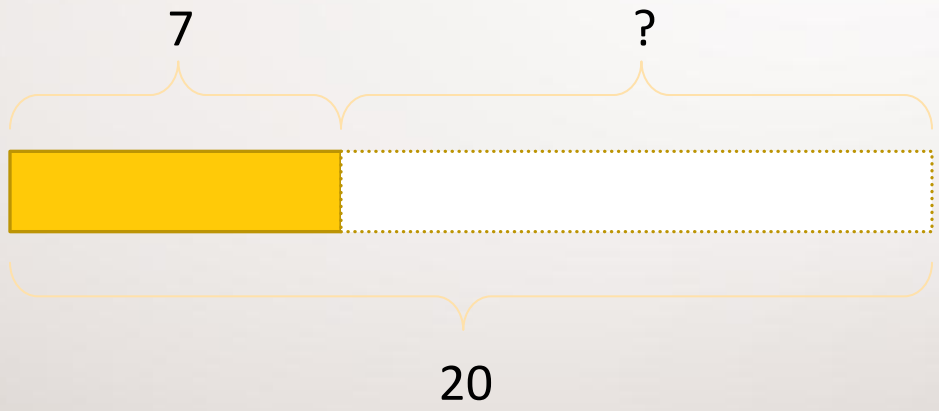
Omar bakes 10 biscuits.
Ruby bakes 12 biscuits.
How many biscuits do they bake altogether?



They bake 22 biscuits altogether.

Introducing the bar model

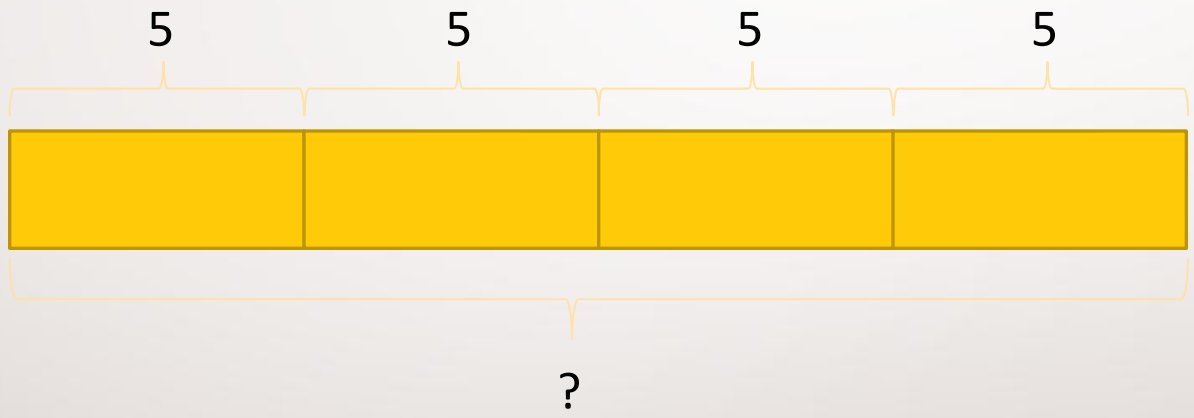
Hardeep buys large eggs and small eggs.
Altogether he buys 20 eggs
There are 7 small eggs.
How many large eggs are there?



There are 13 large eggs.

Extending the bar model to multiplication

Peter puts 5 bread rolls into each packet.
He has 4 packets.
How many bread rolls does he put into the 4 packets altogether?



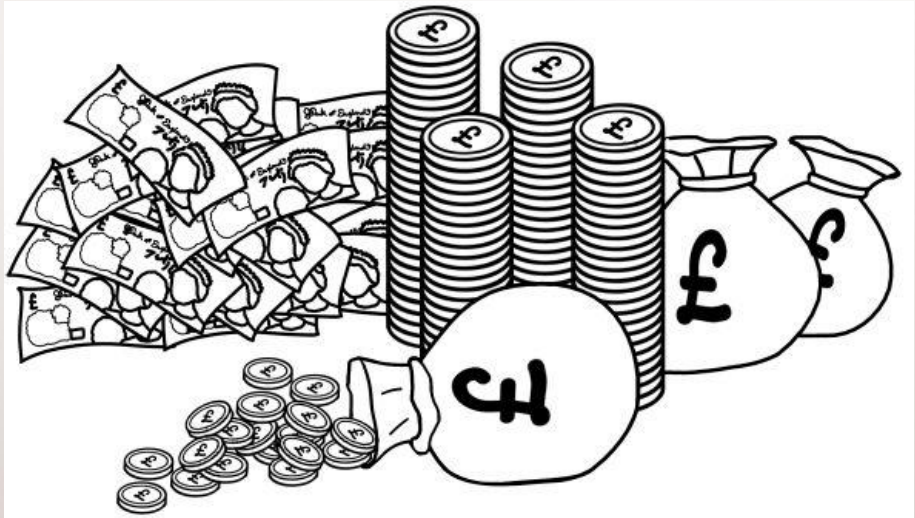
There are 20 bread rolls altogether.

It can also be used to help children to understand ratio

Tim and Sally share marbles in the ratio of 2:3
If Sally has 36 marbles, how many are there altogether?

Back to the Start!

Tai saves 4 times as much money as Farha.
Ruby saves £12 less than Tai.
Farha saves £32.
How much money does Ruby save?



This is an extract from Pupil Textbook 3A p.115

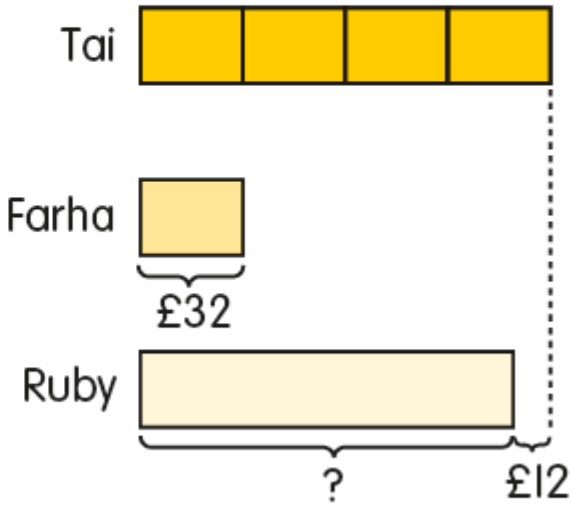
Back to the start…..

Tai saves 4 times as much money as Farha.
Ruby saves £12 less than Tai.
Farha saves £32.
How much money does Ruby save?

1 unit → £ 32

4 units → £ 32 × 4 = £ 128

Tai saves £ 128.

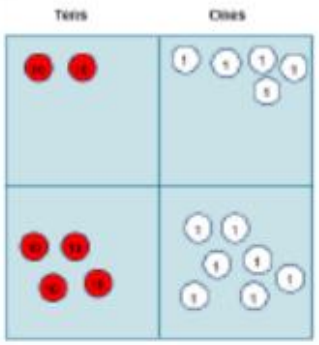
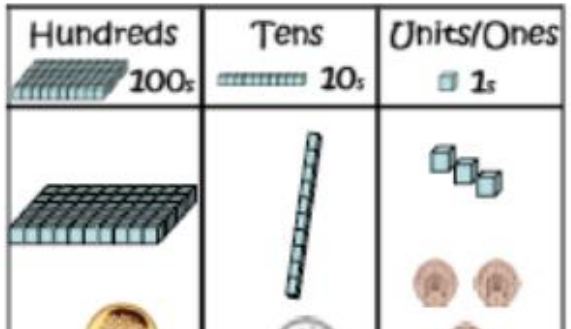


£ 128 − £ 12 = £ 116

Ruby saves £ 116.

Finally we move onto abstract

These are our more formal written calculations and our school follows the progression of calculation document which you can access from the school website.

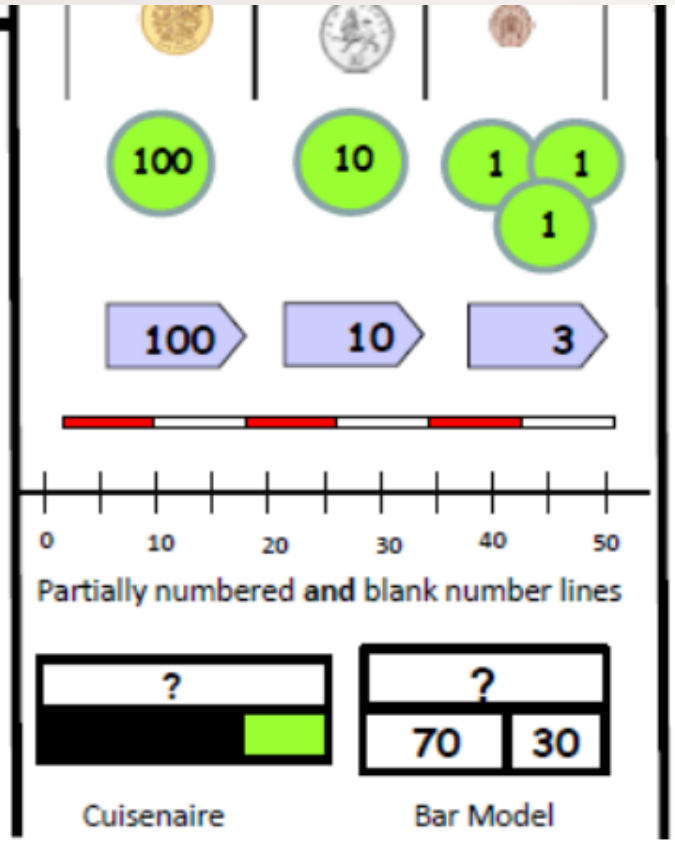
End of Year Expectations	Possible Concrete and Visual Representations	Teacher Modelling/Children's Recording	Fluency
Year 3 Add numbers with up to three-digits (leading to formal written column method) ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD MORE THAN TWO NUMBERS WITH DIFFERING NUMBERS OF DIGITS Children should partition numbers, up to 1000, in different ways e.g. 100 + 40 + 6 or 100 + 30 + 16 Solve problems in different contexts including missing number problems	   	Children apply, develop and secure their understanding of place value and begin to record in columns *Manipulatives SHOULD be used alongside algorithms* Column addition (no exchanging) with up to three-digits 40 + 1 + 20 + 8 60 + 9 = 69 *Expanded recording without exchange* 40 + 3 20 + 8 70 + 1 = 71 10 *Expanded recording with exchange* 100 + 40 + 1 + 100 + 20 + 8 200 + 60 + 9 = 269 *Expanded recording* H T U 1 4 1 + 1 2 8 2 6 9	Count in ones, tens and hundreds maintaining fluency through varied and frequent practice Count from 0 in multiples of 4, 8, 50 and 100 Find 10 or 100 more than a number Mentally add HTU + ones, HTU + tens, HTU + hundreds Perform mental calculations with two-digit numbers, the answer could exceed 100

Year 4

Add numbers with up to four-digits (formal written column method) including numbers with up to two decimal places in the context of money

ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD MORE THAN TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

Solve two-step problems in different contexts including missing number problems



Partially numbered **and** blank number lines

Cuisenaire Bar Model

Expanded recording

Compact (column) recording

```
  143
+ 128
-----
  271
  1
```

Column addition (with exchanging)

```
HTU
789
+ 642
------
1431
1 1
```

```
  £7.89
+ £6.42
-------
£14.31
 1 1
```

Add decimals in the context of money

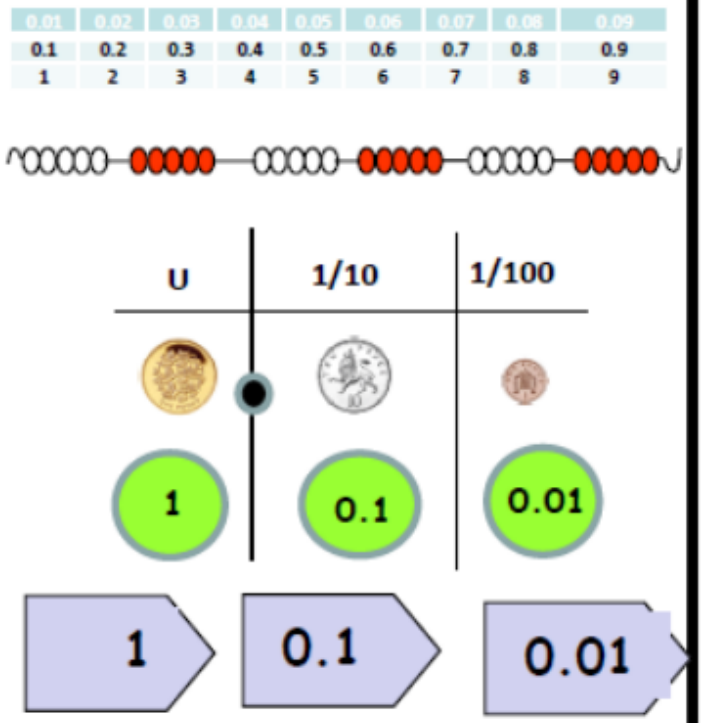
Compact (column) recording

Count in 6s, 7s, 9s, 25s and 100s

Find 1000 more than a number

Perform mental calculations with increasingly large numbers to aid fluency

Babcock 4S Progression in Calculation

End of Year Expectations	Possible Concrete and Visual Representations	Teacher Modelling/Children's Recording	Fluency
Year 5 Add numbers with more than four-digits and decimals up to three places (formal written column method) N.B. ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS Solve multi-step problems selecting and justifying methods Perform mental calculations with increasingly large numbers		***Manipulatives could be used alongside algorithms*** 2141 + 1128 = 3269 21.41 + 1.12 + 0.35 = 22.88 Column addition (no exchanging)	Count forwards in powers of ten up to 100000 Count forwards in positive and negative whole numbers through zero Practise mental calculations with increasingly large numbers Practise fluency of written methods

Year 6

Add numbers with more than four-digits and decimals up to three places

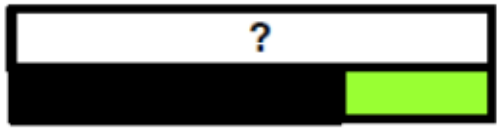
(formal written column method)

N.B. ENSURE CHILDREN HAVE THE OPPORTUNITY TO ADD **MORE THAN** TWO NUMBERS, INCLUDING DECIMALS, WITH DIFFERING NUMBERS OF DIGITS

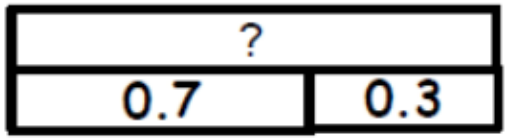
Solve more complex calculations mentally

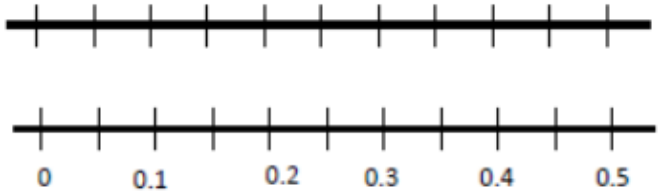
Solve multi-step problems in contexts, deciding which operations and methods to use and why

Cuisenaire



Bar Model





Partially numbered and blank number lines

$$\begin{array}{r} 5189 \\ +\ 3128 \\ \hline 8317 \\ \hline 11 \end{array} \qquad \begin{array}{r} 51.89 \\ +\ \ 3.128 \\ \hline 55.018 \\ \hline 1\ \ 1 \end{array}$$

Column addition (with exchanging)

Addition with decimals up to three decimal places including in different contexts e.g. money and measures

Count in tens and hundreds increasing fluency of order and place value

Perform increasingly complex mental calculations and those with increasingly large numbers to aid fluency

Babcock 4S Progression in Calculation

Problems that encourage mathematical thinking are key to fluency

Pairs of Numbers

Stage: 1 ★

If you have ten counters numbered 1 to 10, how many can you put into pairs that add to 10?

Can you use them all?
Say how you got your answer.

Now put the counters into pairs to make 12.

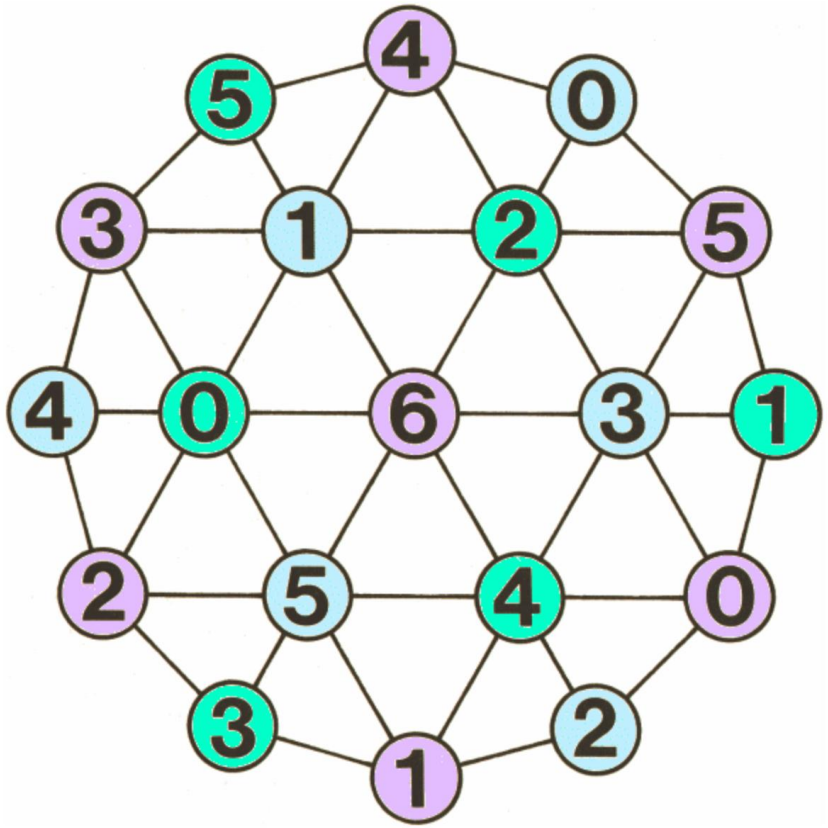
- Can you use them all?
- Say how you got your answer.

Now put the counters into pairs to make 13.

- Can you use them all?
- Say how you got your answer.

Now put the counters into pairs to make 11.

- Can you use them all?
- Say how you got your answer.



Games of strategy can help

1. Player 1 chooses a target to reach. This is the total both players try to make.

2. Player 2 places their counter on the game board over one of the numbers and says that number.

3. Player 1 moves the same counter in any direction along a line segment to a neighbouring number and announces the total of the two numbers.

4. Player 2 moves the same counter to cover a neighbouring number, adds on that number, and announces the 'running' total of the three numbers.

5. Players take it in turns to slide the counter to cover a neighbouring number and to add that number to the 'running' total.

6. Players must move when it is their turn.

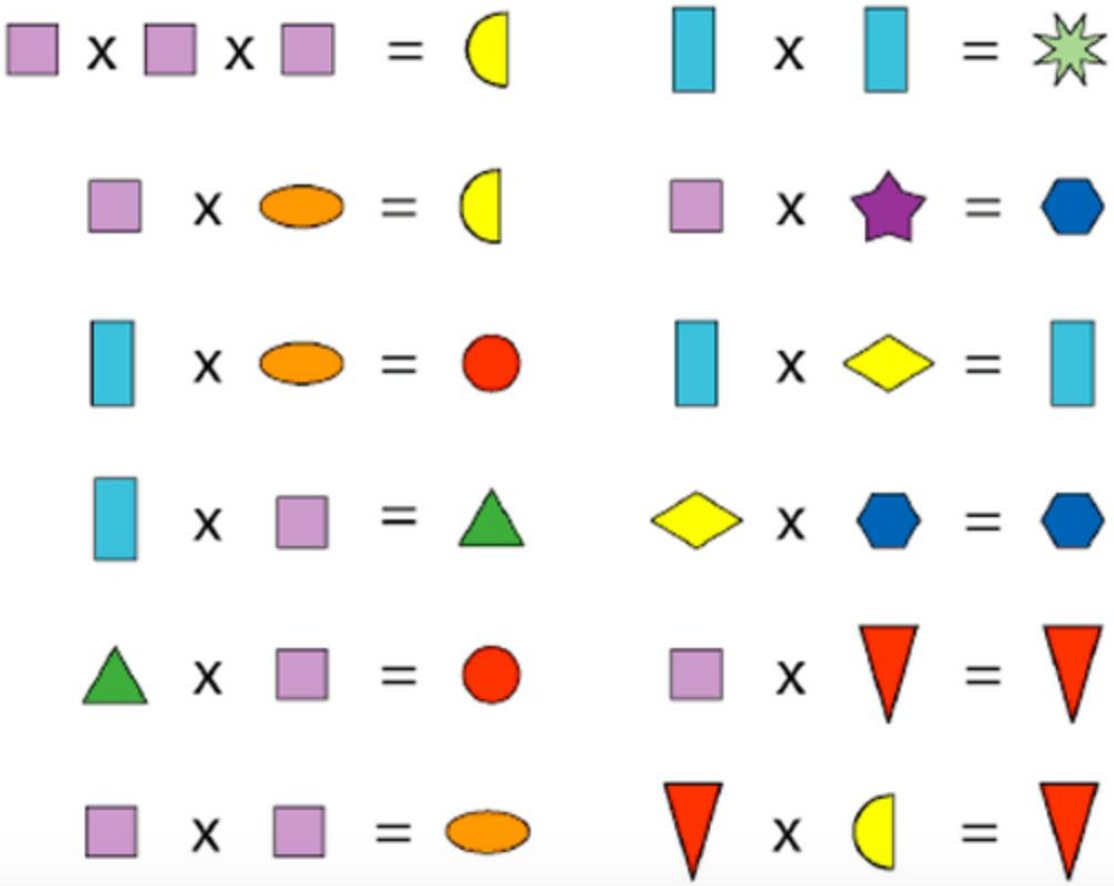
7. No 'jumping' is allowed.

Shape Times Shape

Stage: 2 ★

The coloured shapes stand for eleven of the numbers from 0 to 12. Each shape is a different number.

Can you work out what they are from the multiplications below?



There are a number of resources on our school website that can help you to feel more confident in understanding how your child is learning maths and how you can best support them.

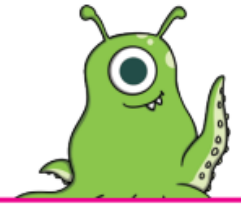
Number of the Day sheets

Number of the Day

Today's number is:

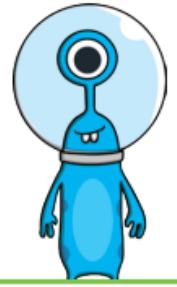
10 less (– 10)

1 less (– 1)



1 more (+ 1)

10 more (+ 10)



Write the number in words:

_____

Round to the nearest 10:

Circle if it is:

Odd Even

Year 3 Number of the Day Maths Fluency

in words:

_____

_____

draw it:

today's number >

today's number <

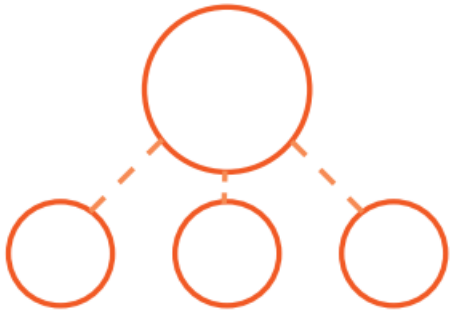
Which digit is in the...?

1s column: _____

10s column: _____

100s column: _____

complete this part-whole model:



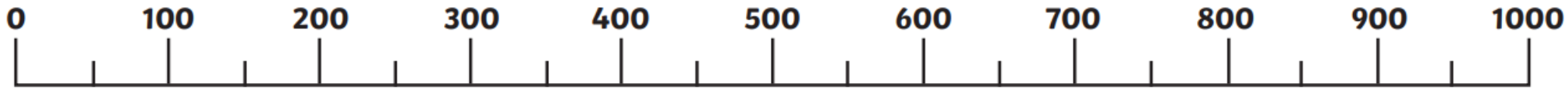
100 more:

_____

100 less:

_____

Where is it? Draw an arrow on the number line:



partition it: (e.g. 356 = 300 + 50 + 6)

_____

subtract 153: _____

add 348: _____

Is it in these times tables?

2× ☐ 3× ☐ 4× ☐ 5× ☐ 8× ☐ 10× ☐

Year 5 Number of the Day Maths Fluency

write it:

_____

_____

multiple of:

2 × ☐ 3 × ☐ 4 × ☐ 5 × ☐ 6 × ☐ 7 × ☐

8 × ☐ 9 × ☐ 10 × ☐ 11 × ☐ 12 × ☐

× 10 = _____

× 100 = _____

10%= _____

25%= _____

÷ 10 = _____

÷ 100 = _____

35%= _____

round to:

the nearest 10: _____

the nearest 100: _____

the nearest 1000: _____

Today's Number Is...

<, > or =

20^2 × today's tens digit ☐ 1000

Label the number line and show today's number.

-100 + today's number =

subtract 137.4:

_____

add 484.8:

_____

in Roman numerals:

_____

Knowledge Organisers

Addition and Subtraction — Knowledge Organiser

Key Vocabulary

- add
- total
- plus
- sum
- more
- altogether
- difference
- subtract
- less
- minus
- take away
- column addition
- column subtraction
- exchange
- estimate
- inverse operation
- solve problems
- number facts
- place value

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Addition and Subtraction Methods

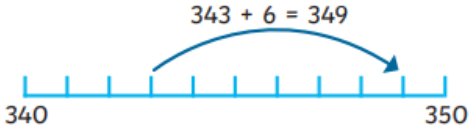
3-digit and 1-digit numbers

Not crossing 10s

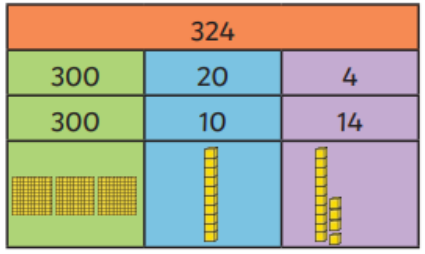
268 – 4 = 264

Hundred	Ten	Ones
●●	●●●	●●●●

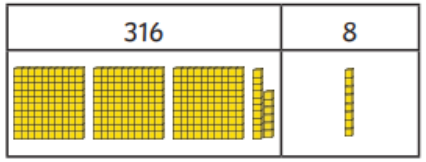
343 + 6 = 349



Crossing 10s (Exchanging)



316 + 8 = 324



324 - 8 = 316

3-digit and 2-digit numbers

Add and subtract tens

Hundred	Ten	Ones
●●	●●●	●

451 + 3 tens = 481 (5 + 3 = 8)

451 – 4 tens = 411 (5 – 4 = 1)

Crossing 10s (Exchanging)

258 + 80 = 338

- Column method
- Count in 10s mentally
- Add 100, subtract 20

Crossing 10 and 100

$$\begin{array}{r} 368 \\ +73 \\ \hline 1 \\ \hline 1 \end{array} \qquad \begin{array}{r} 368 \\ +73 \\ \hline 41 \\ \hline 11 \end{array} \qquad \begin{array}{r} 368 \\ +73 \\ \hline 441 \\ \hline 11 \end{array}$$

$$\begin{array}{r} {\scriptstyle 3\,1} \\ 441 \\ -73 \\ \hline 8 \end{array} \qquad \begin{array}{r} {\scriptstyle 3\,13\,1} \\ 441 \\ -73 \\ \hline 68 \end{array} \qquad \begin{array}{r} {\scriptstyle 3\,13\,1} \\ 441 \\ -73 \\ \hline 368 \end{array}$$

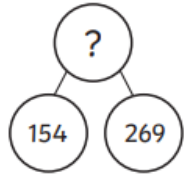
3-digit numbers

Not crossing

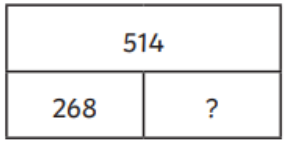
679 – 351 = 328

Hundred	Ten	Ones
●●●	●●●	●●●●

Crossing 10s (Exchanging)



$$\begin{array}{r} 269 \\ +154 \\ \hline 423 \\ \hline 11 \end{array}$$



$$\begin{array}{r} {\scriptstyle 4\,10\,1} \\ 5\not{1}4 \\ -\ 268 \\ \hline 246 \end{array}$$

Add and Subtract 100s

284 + 300 = 584

Hundred	Ten	Ones
■■	▮	▪
■■■		

Addition and Subtraction — Knowledge Organiser

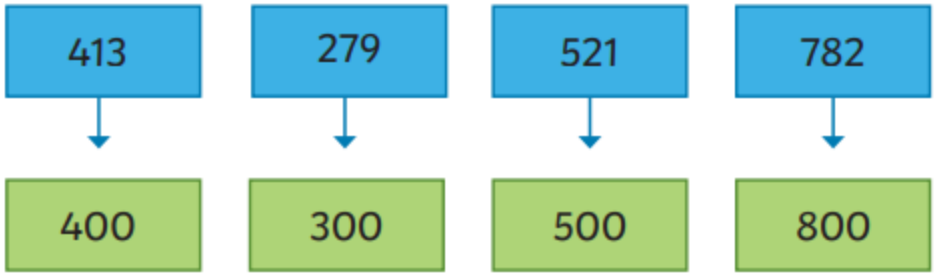
Estimate

Estimate by dividing the hundred into 250 and 225.

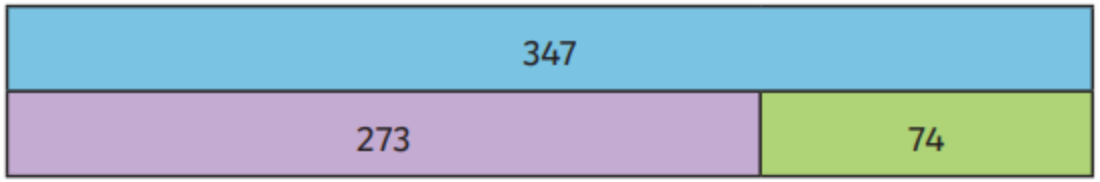
Estimate 10s (330, 340) between 325 and 350.

Estimate 167 – 89
Use near numbers 170 – 90 = 80

Near numbers:



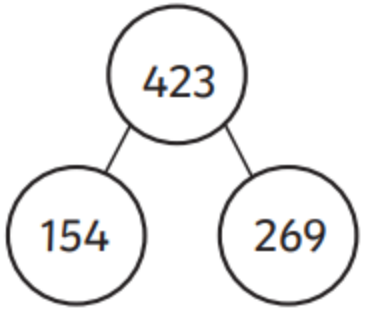
Check Answers



347 – 74 = 273 can be checked using

273 + 74 = 347

This part whole shows the inverse calculations using these three numbers.



154 + 269 = 423	269 + 154 = 423
423 – 154 = 269	423 – 269 = 154

Maths Vocabulary Mats

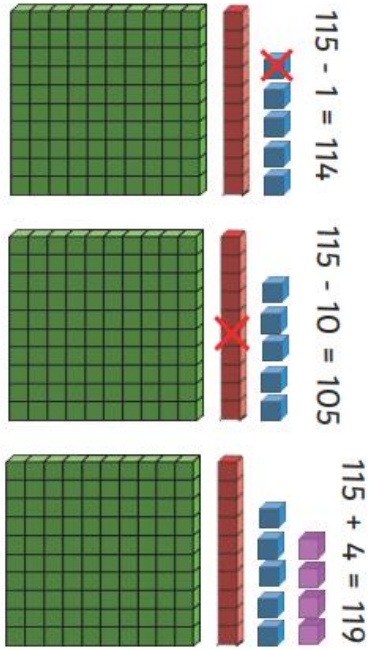
Year 3 Addition and Subtraction

Subtraction: Column Method

1 453 -348	2 453 -348
Place the numbers one on top of the other, lining up the hundreds, tens and ones.	Subtract the ones (note that the answer to 3 - 8 is negative).
3 453 -348 5	4 453 -348 05
Exchange a 10 from the 50 to give 13 ones. Subtract the ones: 13 - 8 = 5	Subtract the tens: 40 - 40 = 0
5 453 -348 105	6 453 -348 105
Subtract the hundreds: 400 - 300 = 100	Check your answer. ✓

Addition: Column Method

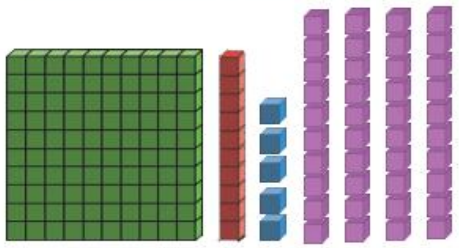
1 453 +348	2 453 +348 1
Place the numbers one on top of the other, lining up the hundreds, tens and ones.	Add the ones and write the answer.
3 453 +348 1 1	4 453 +348 01 11
Regroup any tens under the tens column.	Add the tens including any tens you have regrouped. Regroup any hundreds under the hundreds column.
5 453 +348 801 11	6 453 +348 801
Add the hundreds including any hundreds you have regrouped.	Check your answer. ✓

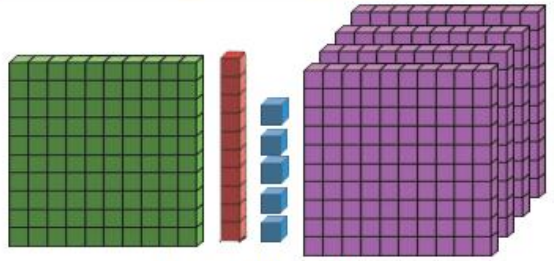


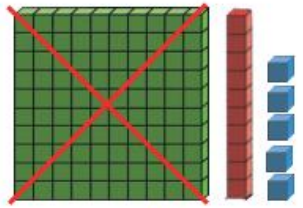
combined
altogether sum
more add
and plus
total

take away
minus reduce
how many more?
fewer less
How many remain?
difference subtract

equals
makes


115 + 40 = 155


115 + 400 = 515


115 - 100 = 15

How can I help my child?

You can help your child by finding and talking about maths in everyday situations. For example, a shopping trip is rich in mathematical opportunities, such as:

- spending money, calculating change and working out which offers give the best value for money.
- empty packaging can provide your child will immediate access to 3D shapes and nets.
- using packets and tins as a source of mathematical information to discuss, such as mass and volume.
- using items often sold in pairs, fours and sixes (such as drinks or yogurts) to talk about multiples or times tables.
- Working together at reading the time and talking about passing time.

How can I help my child?

You can also help your child in a number of other ways:

- Encourage a *secure knowledge of number*, by asking questions which help them explain what comes before or after a given number, or how the number is made, for example tens and ones.
- Encourage them to *draw pictures and models* such as part-whole and bar models to answer questions.
- Support them with home activities, and encourage them to answer questions in full sentences.
- Visit the Holy Trinity website for additional resources.
- If you are unsure about any concepts, please ask your child's teacher to explain how it is taught and how you can support your child.

At home

- Cooking Measure ingredients and set the timer together. Practise counting up to 20 and back to 0.
- Find the same amount of different items to help your child understand what numbers mean. e.g. find 3 spoons, 3 cars. Talk about the shape and size of objects e.g. big car, round ball.
- Ask questions like "pass me the biggest box", or "which is the smallest shoe?"
- Play with items like shells, bottle tops, beads, Lego and compare them.
- Try making patterns with them together. Put items in order You could do this by weight, height or size.
- Make patterns with objects, colouring pencils, paint or Play-Doh
- Build structures with Duplo, Lego or boxes.
- Solve problems Work out "how many altogether" and "how many more".
- Ask your child questions such as "We have 3 red apples and 2 green apples, so how many apples do we have altogether?"

Year Two

- Set up a shop at home and choose 6 different items each costing less than £1.
Make a price label for each one, e.g. 39p, 78p.
Shuffle the labels. Then ask your child to do one or more of these.
Place the labels in order, starting with the lowest.
Say which price is an odd number and which is an even number.
Add 9p to each price in their head.
Take 20p from each price in their head.
Say which coins to use to pay exactly for each item.
Choose any two of the items, and find their total cost.
Work out the change from £1 for each item. How much?

- Once a week, tip out the small change from a purse.
Count it up with your child.

- On a car journey/walking…

Recognising bus numbers
Looking at road signs and read distances
How much further to their destination?
Number plate hunt.
Who can find a 3 digit number?
Add the numbers up.

- Time

How long until dinner? Breakfast?
How long until bedtime?
Help with birthday card buying using the calendar.

- Going shopping

Reading price tags, find the most expensive and the cheapest?
Counting items into the basket
Finding and counting coins
Comparing weights – what are they measured in?
Can you find an item that is heavier than 1kg?

- Guess my shape

Think of a 2-D shape (triangle, circle, rectangle, squa
pentagon or hexagon).
Ask your child to ask questions to try and guess what it is.
You can only answer Yes or No. For example, your child could ask: Does it have 3 sides? or: Are its sides straight?
See if they can guess your shape using fewer than five questions.
Now ask them to choose a shape so you can ask questions.

- Identify an object in the room – describe the object using the language of 3D shapes e.g. cube, cylinder, cuboid. Describe the faces, lines of symmetry, number of edges… Which object was being described?

- Identify around the house different 3D shapes

- Guess my shape

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- Identify around the house different 3D shapes

There will be weekly Rock Legend Classes and we also hope to link this to our number day later this year

Please encourage your children to use TTRockstars or Hit the Button regularly as those number skills are key to their maths fluency.

How to navigate the Holy Trinity Website:

Visit Curriculum – Subjects – Maths – Useful resources for parents or Useful websites