



Serious Learning,
Serious Play, Serious Fun

How we teach calculation

3rd April 2017



Aims of this evening

- To show you the methods we teach for calculation.
- To work with our teachers and take part in a variety of calculation activities:
 - addition and subtraction
 - multiplication and division
 - fractions
- To take away some ideas to support your children at home.



National curriculum for maths

Children should:

- Become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- **Reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations and developing an argument, justification or proof using mathematical language.
- **Solve problems** by applying their mathematics to a variety of problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.



Four pillars for confident calculation:



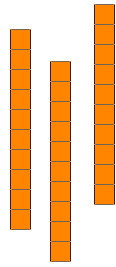

1. A sound understanding of place value and how our number system works.
2. Knowledge of a growing bank of number facts.
3. Confidence with doubling and halving.
4. Consistent images and models.

Place Value



- Place value is at the heart of our number system. All digits have a value and a secure understanding of how this is organised and recorded will enable children to use and understand different calculation methods.

- Pitfalls can include...
1. Writing the number seventeen in figures.
 2. Writing the number one hundred and one in figures.
 3. Writing one pound and 5 pence as a decimal.

hundreds	tens	ones
2  	3 	9 

Knowledge of number facts

- For example recognising number bonds, different pairs of numbers with the same total.

10

$$7 + 3$$

$$10 - 7$$

$$6 + 4$$

$$10 - 6$$



$$6 + 2 = 8$$

8

$$8 - 3 = 5$$



6

$$3 + 3$$

$$6 + 3$$

$$5 + 4$$

9

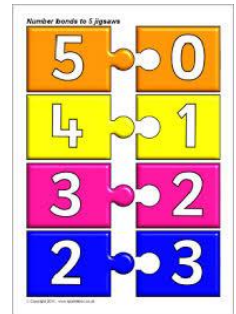
$$3 + 2 = 5$$

$$5 - 2 = 3$$

5

$$1 + 4 = 5$$

$$5 - 4 = 1$$



$$6 + 1$$

$$3 + 4$$

7





Doubling and halving

- A basic maths function.
- Learning doubles and halves to 20 gives a child fluency in number.
- The basis for multiplication and division.



Visual models and images

- Maths is abstract. Good mathematicians have a model in their head.
- We use the same models and resources across the school.
- A systematic and developmental approach.



Our approach

Do I need
objects to
help me work
it out?

Could I use
jottings to
help me?

Can I do it in
my head using
facts I already
know?

Should I
use a
written
method?



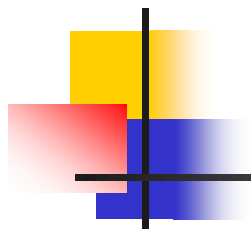
Telford Infant School

Calculation policy

March 2017

Contents

Introduction.....	2
Number and calculation.....	3
	6
	8
	10
	11



Addition and subtraction: Sapphire Class
Multiplication and division: Indigo Class
Fractions: Turquoise Class

Each session will last 15 minutes and will be repeated 3 times.

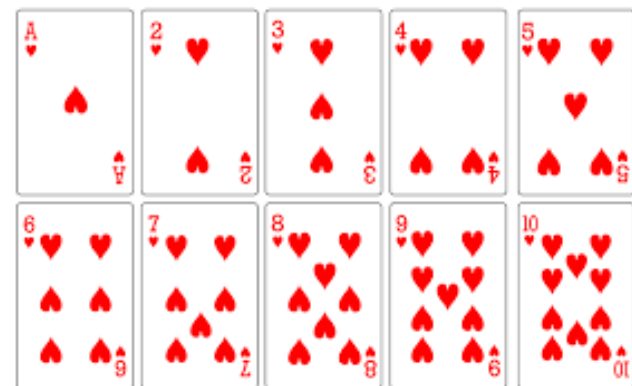


Addition and subtraction

- Strategies we teach to add and subtract:
 - 3 one-digit numbers
 - a two-digit number and ones
 - a two-digit number and tens
 - 2 two-digit numbers.
- Missing number questions.
- Ideas and activities to use at home.

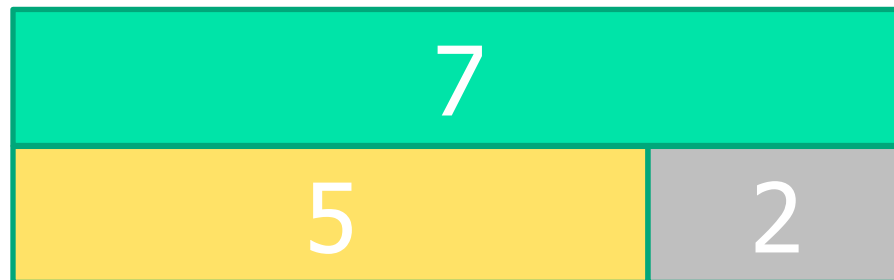
Addition $7 + 7 + 6 =$

- What fact can you see?
- Double 7
- Then add on 6
- Fact $14 + 6 = 20$
- Learning 'bonds' is key



Subtraction $7 - 2 =$

- Learning 'bonds' is key
- If I know $5 + 2 = 7$
- I know $7 - 5 = 2$
- I know $7 - 2 = 5$



'Bar' method

Addition $15 + 3 + 3 =$

- Start counting **on** from 15
- $+ 3$
- $+ 3$
- Use a number line
- Or draw a blank number line



Subtraction $15 - 3 - 3 =$

- Start counting **back** from 15
- - 3
- - 3
- Use a number line
- Or draw a blank number line



Addition

$$37 + 20 =$$

- Know that the ones will not change because there is a 7 and a 0
- I know 3 and 2 is 5, so I know that 30 and 20 must be 50
- Putting the 50 and 7 together to make 57 (place value knowledge)

Subtraction

$$37 - 20 =$$

- Know that the ones will not change because there is a 7 and a 0
- I know 3 subtract 2 is 1, so I know that 30 subtract 20 must be 10
- Putting the 10 and 7 together to make 17 (place value knowledge)

Before we can solve this...

$$43 + 38 =$$

we need to understand and apply

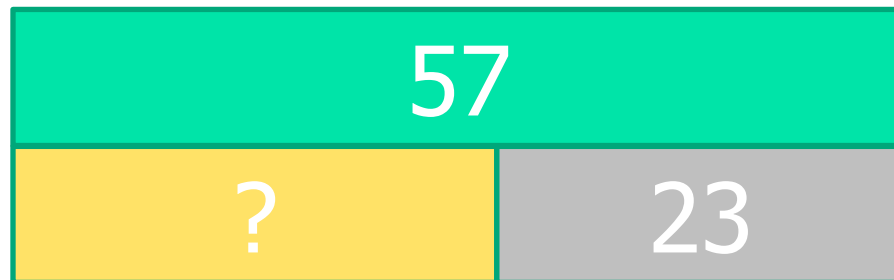
- 1) accurate number reading
- 2) mathematical symbols
- 3) knowing the answer will be larger than the given numbers
- 4) knowing addition is communicative (can be done in any order)
- 5) partitioning a number into tens and ones
- 6) counting on in tens
- 7) counting on in ones

Let's look at the blank number line method for addition and subtraction.

Missing number

$$57 - ? = 23$$

- Helping children to 'see' the problem



'Bar' method



On our website

- Part / whole templates
- Numberlines
- Hundred squares
- Squared paper
- Maths leaflet for parents – more ideas to try at home
- Telford Infant School Calculation Policy



Multiplication and division

- Strategies we teach to:
 - count in 2s, 3s, 5s and 10s
 - recall and use 2, 5 and 10 x tables facts
 - calculate multiplication and division questions when you don't know the answer.
- Reasoning questions
- Ideas and activities to use at home.

- Need to know how to count in groups bigger than 1.
- Knowledge of doubling and halving really important, eg:
 - double to multiply by 2
 - double, double to multiply by 4
 - half to divide by 2
 - half, half to divide by 4
 - etc

Everyday objects lend themselves to counting in equal groups



We then relate counting in equal groups to jumps on a numberline



We can describe equal 'jumps' with a repeated addition number sentence:

$$5 + 5 + 5 + 5 + 5 + 5 = 30$$



Then we link it to the vocabulary 6 jumps of 5 6 hops of 5
6 groups of 5 6 lots of 5 etc.

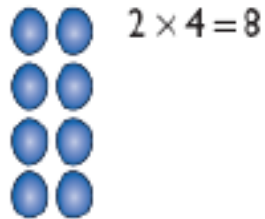
Jumps, hops, lots, groups is represented mathematically with X

Solve 4×5 using this method

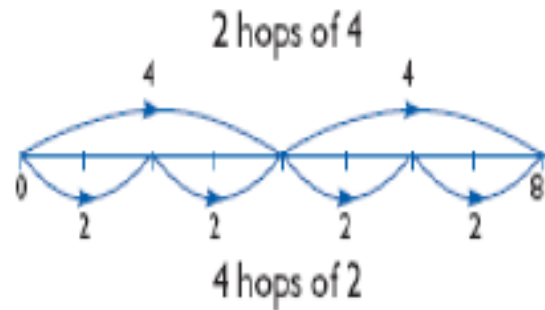
An array is the key model we use in Year 2 for multiplication



$2 \times 4 = 8$



$4 \times 2 = 8$

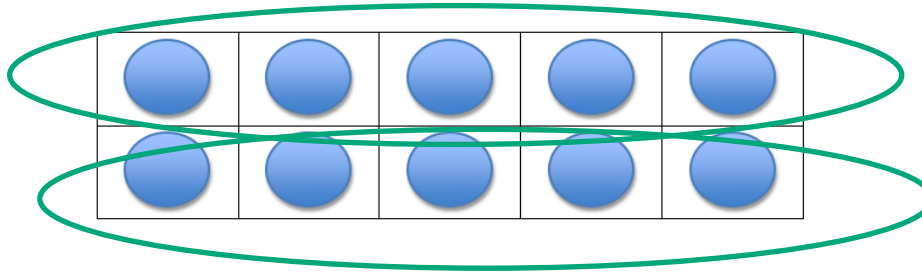


Solve 3×5 using this method

Division is more complex because the operation represents two types of mathematical problems

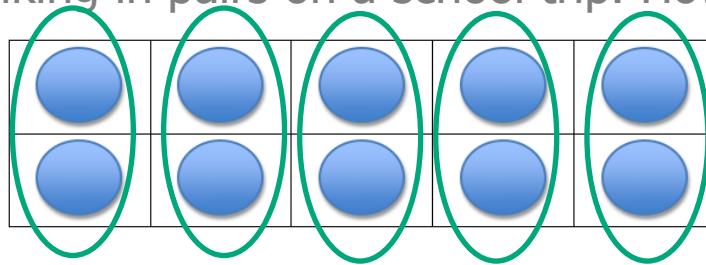
Sharing:

10 stickers are shared between two children; how many will they have each?



Grouping:

10 children are walking in pairs on a school trip. How many pairs will there be?



Children need to understand both and have experience of both. Eventually, they will be able to use this experience to deal with both types of division using the same numerical procedure.

An array helps to show the links between both.

$$4 \times 5 =$$

$$35 \div 5 =$$

$$8 \times 10 =$$

$$12 \div 2 =$$

$$2 \times 0 =$$

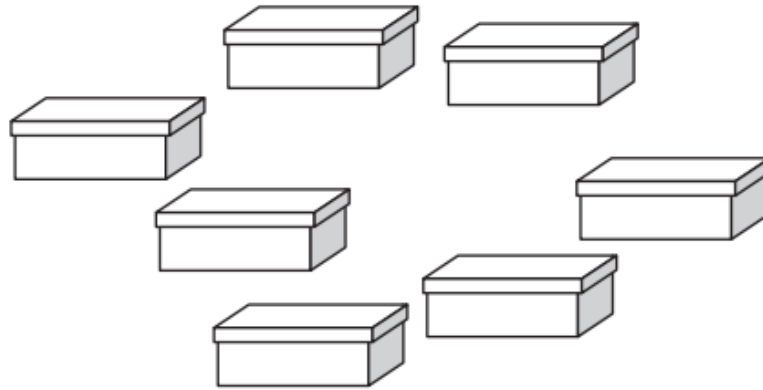
$$? \div 10 = 3$$

$$3 \times 3 =$$

$$25 \div ? = 5$$

Reasoning about multiplication and division

7



Sita puts **2** shoes in each of these boxes.

How many shoes are there altogether?



Do I need
objects to
help me work
it out?

Could I use
jottings to
help me?

Can I do it in
my head using
facts I already
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Should I
use a
written
method?

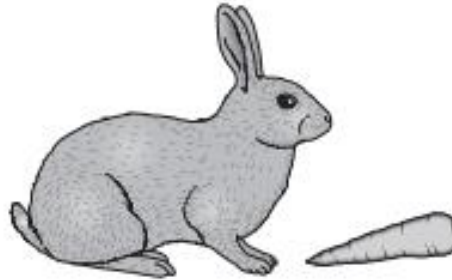
Reasoning about multiplication and division

22

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?

Show
your
working

carrots

Do I need
objects to
help me work
it out?

Could I use
jottings to
help me?

Can I do it in
my head using
facts I already
know?

Should I
use a
written
method?



2 marks



Ideas for at home

- Decide if you are counting in 1s, 2s, 5s or 10s. Roll a dice – that is how many groups. Say the total.
- Count arrays around the house. Make arrays with Connect 4.
- Share cake decorations onto fairy cakes.
- Split bars of chocolate into equal groups.



On our website

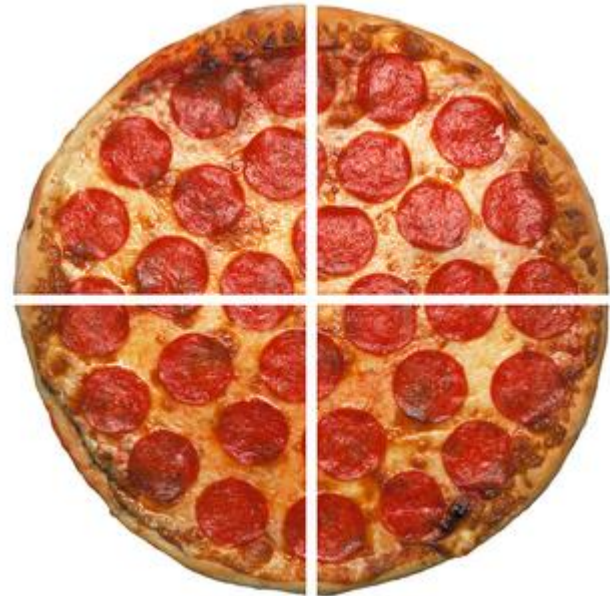
- Numberlines
 - for counting in jumps of the same size
- Squared paper templates
 - for drawing arrays
- Maths leaflet for parents – more ideas to try at home
- Telford Infant School Calculation Policy



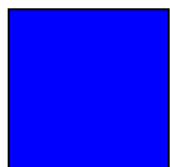
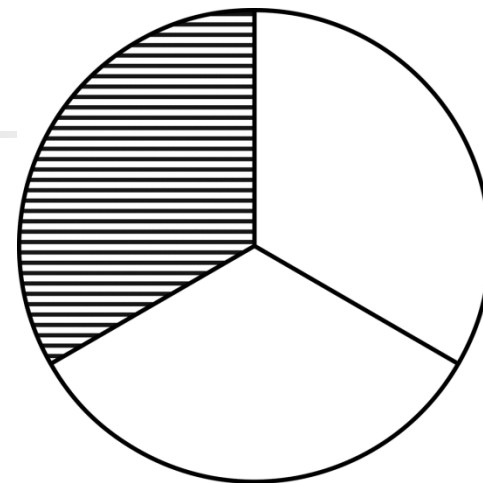
Fractions

- Strategies we teach to:
 - find $\frac{1}{4}$, $\frac{1}{2}$, $\frac{2}{4}$, $\frac{1}{3}$ and $\frac{3}{4}$ of a number.
- Reasoning and problem solving.
- Ideas and activities to use at home.

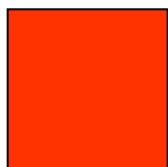
Fractions of objects



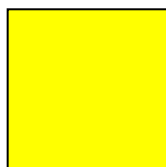
Fractions of shapes



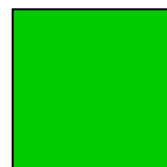
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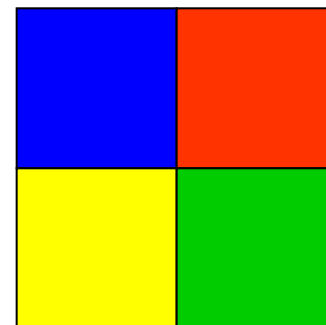
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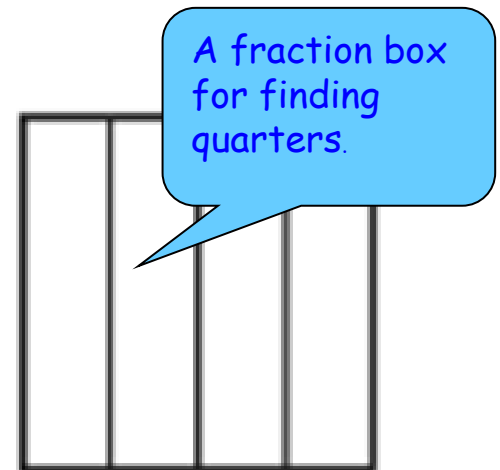
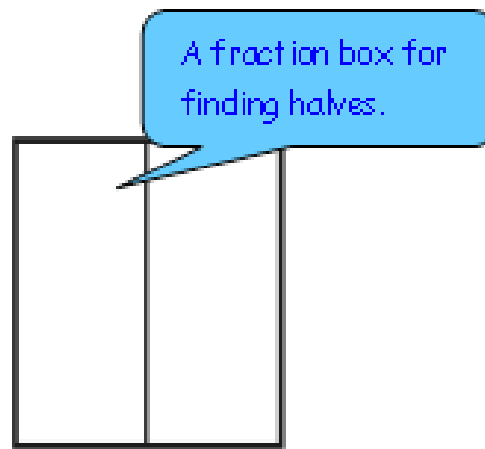
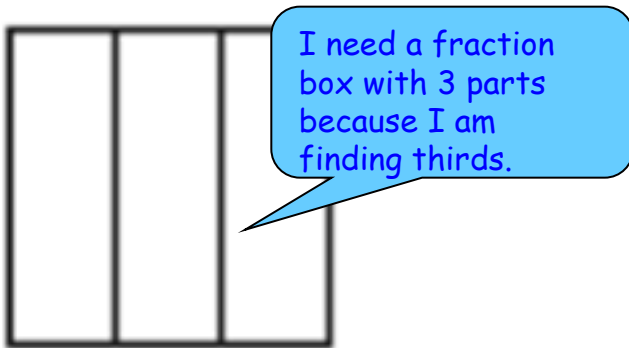
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Fractions of numbers and amounts

- Number on the bottom of a fraction (denominator) tells us the number or parts in the whole.
- Children draw a 'fraction box'.
- Then they share the number using tallies.
- Finally they look at the top number of the fraction (numerator) and add up the parts of the fraction.



$$\frac{1}{2} \text{ of } 16 =$$

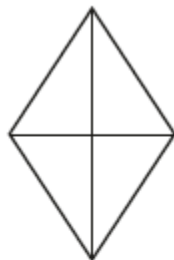
$$\frac{1}{3} \text{ of } 18 =$$

$$\frac{2}{3} \text{ of } 21 =$$

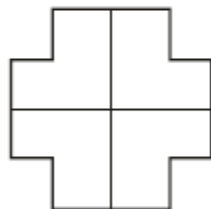
$$\frac{3}{4} \text{ of } 20 =$$

27 Shade the fractions of the shapes.

Shade $\frac{1}{2}$



Shade $\frac{3}{4}$



Shade $\frac{1}{3}$

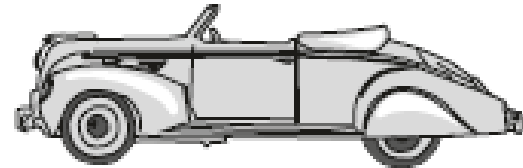


14

Abdul has some toy cars.

He gives half of them to Ben.

He has four toy cars left.



How many toy cars did Abdul start with?

toy cars



On our website

- Squared paper
- Maths leaflet for parents – more ideas to try at home
- Telford Infant School Calculation Policy