Maths- A Mastery Curriculum

KS1

High Aims • High Challenge • High Standards

Aims

- To get an insight into how maths is taught at Highcliffe
- To gain an understanding of Mastery and what it means in maths
- To take part in a variety of maths activities
- To take away knowledge and ideas to support your child at home

How do you feel about maths?

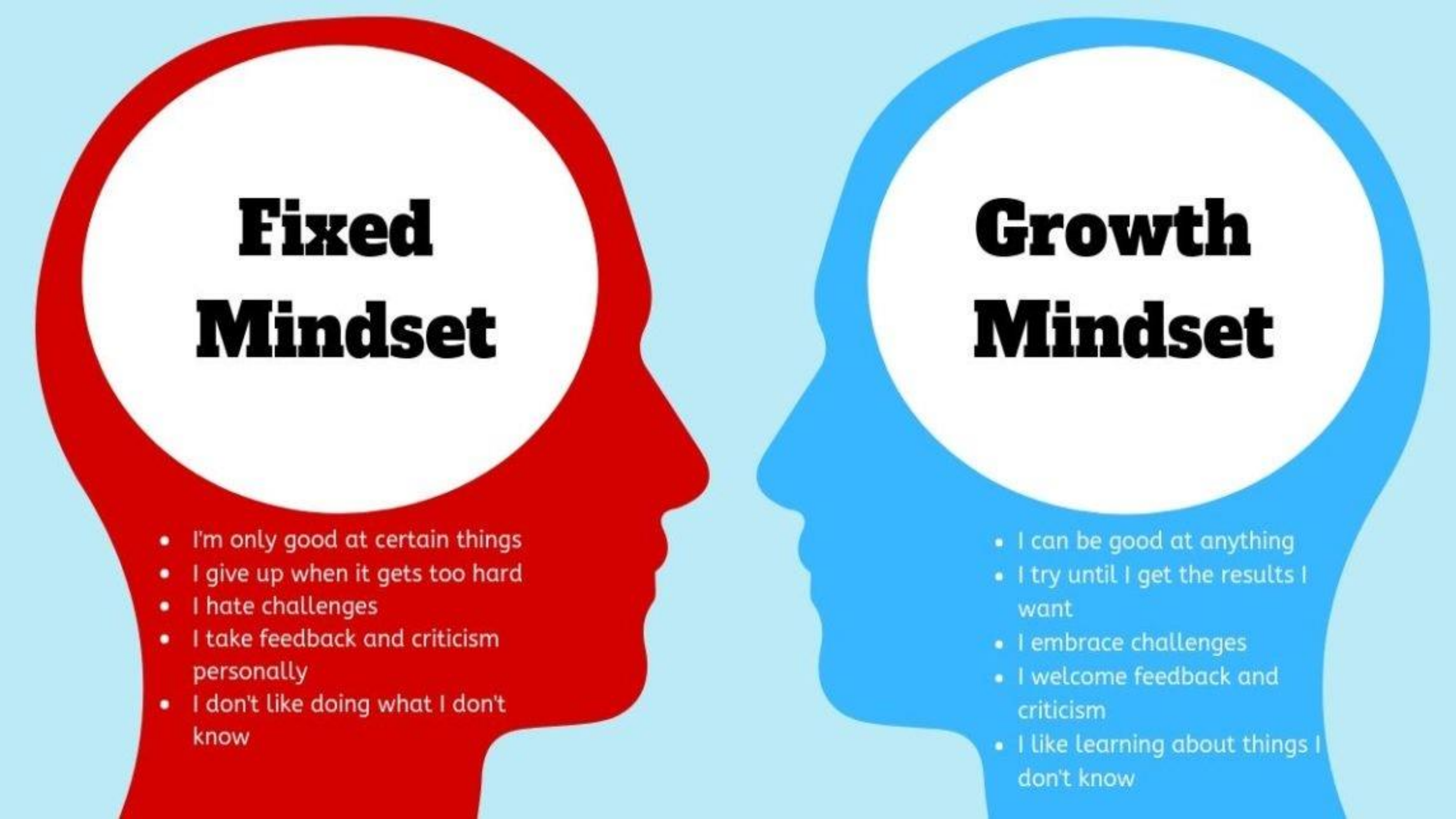
Research suggests that as many as 60% of adults would rather clean the toilet than work out a maths problem!

An even larger percentage say:
“I was never any good at maths.”

Research also suggests that adults wouldn’t openly admit to being poor at reading.

The biggest myth about maths is that it is something that you either can or cannot do.

- This is definitely not true!
- Maths is about investigating and discovering.
- It is about making mistakes and then learning from them.


Fixed Mindset
I'm only good at certain things
I give up when it gets too hard
I hate challenges
I take feedback and criticism personally
I don't like doing what I don't know
Growth Mindset
I can be good at anything
I try until I get the results I want
I embrace challenges
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Which one is the odd one out?

5 4 20

Explain your reasoning.

Which one is the odd one out?

Explain your reasoning.

What does mastery mean?

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Dr Helen Drury, Director of Mathematics Mastery.

A pupil really understands a mathematical concept, idea or technique if he/she can:

- Describe it in his/her own words
- Represent it in a variety of ways
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- Make up his/her own examples
- Make connections
- Recognise and use it in new situations and contexts

The National Curriculum

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.

Maths HUBS

Guided practise table

Some children will need a little additional support along the way.

We all start the journey **together**.

Some children who feel confident, will be let loose. They'll be able to explore deeper into the woods, before returning to the group to continue on with the journey.

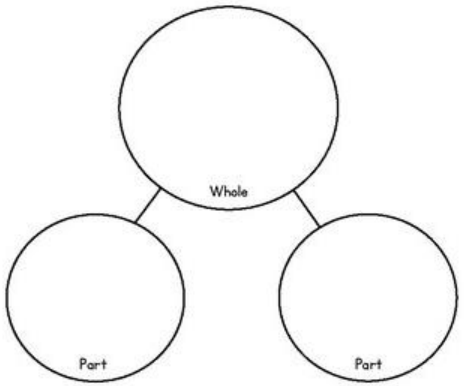
★ ★★ ★★★ Go Deeper!

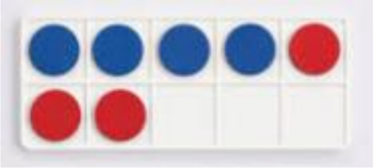
We're going on a **Maths Hunt**

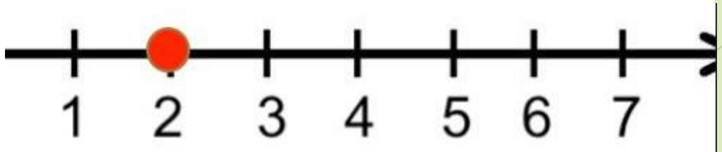
Children will not be racing off ahead on a different journey.

Children will not be left behind alone or isolated.

Resources to support learning

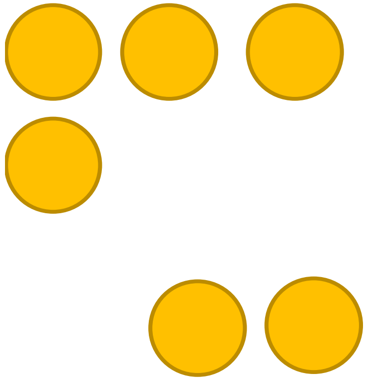






Concrete - physical resources

Use physical objects, counters, cubes etc to show how objects can be taken away.



Pictorial - representations

Cross out drawn objects to show what has been taken away.

Abstract

6 -2 = 4

Deeper learning

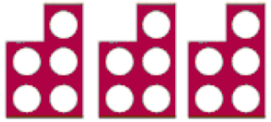
6 -___ = 4

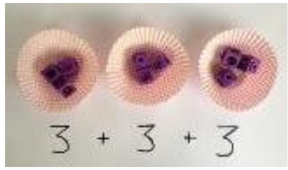
4 = ___ - 2

There are 6 cars in the car park. Some are red and some are blue. How many could be blue?
How many possible answers are there?

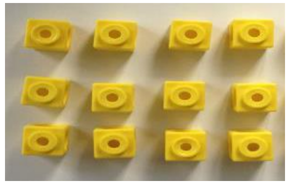
Concrete – physical resources

Repeated addition linked to multiplication

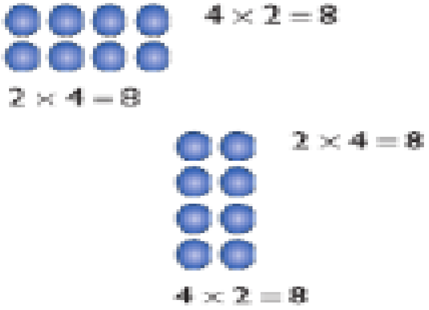




Use of arrays



Pictorial - representations



Abstract – mathematical symbols

5 + 5 + 5 = 15   **3 + 3 + 3 + 3 + 3 = 15**

3 x 5 = 15   **5 x 3 = 15**

Deeper learning

15 = __ x 3

3 = 15 ÷ ___

Strategies

- Collaborative work – talk about our learning, rehearse answers and justify your reasoning using full sentences
- Conceptual understanding – not just knowing how to do something but why it works
- Representing understanding in a variety of ways
- Make connections eg number bonds to 10 then number bonds to 20
- Explore and investigate real life and open-ended problems
- Tasks that facilitate thinking mathematically: sorting, classifying, pattern seeking, making generalisations
- Using knowledge in new contexts and in different areas of mathematics

Types of tasks

- True or false?
- Always Sometimes or Never True?
- Odd one out
- Find all possibilities
- Convince me …
- Show me in a different way
- Write a story
- Explain it to someone else

Home learning

- Play games that involve counting, calculating or strategy eg dominoes, cards, snakes and ladders …
- Practical tasks linked to measures eg compare tins, packets, bottles using mathematical vocabulary
- Find opportunities to use money in real life concepts
- Tell the time on analogue clocks and have quizzes including using earlier and later
- Do lots of counting – count forwards and backwards in different steps when out and about
- Spot numbers everywhere that you go

Questions

Maths- A Mastery Curriculum

KS2

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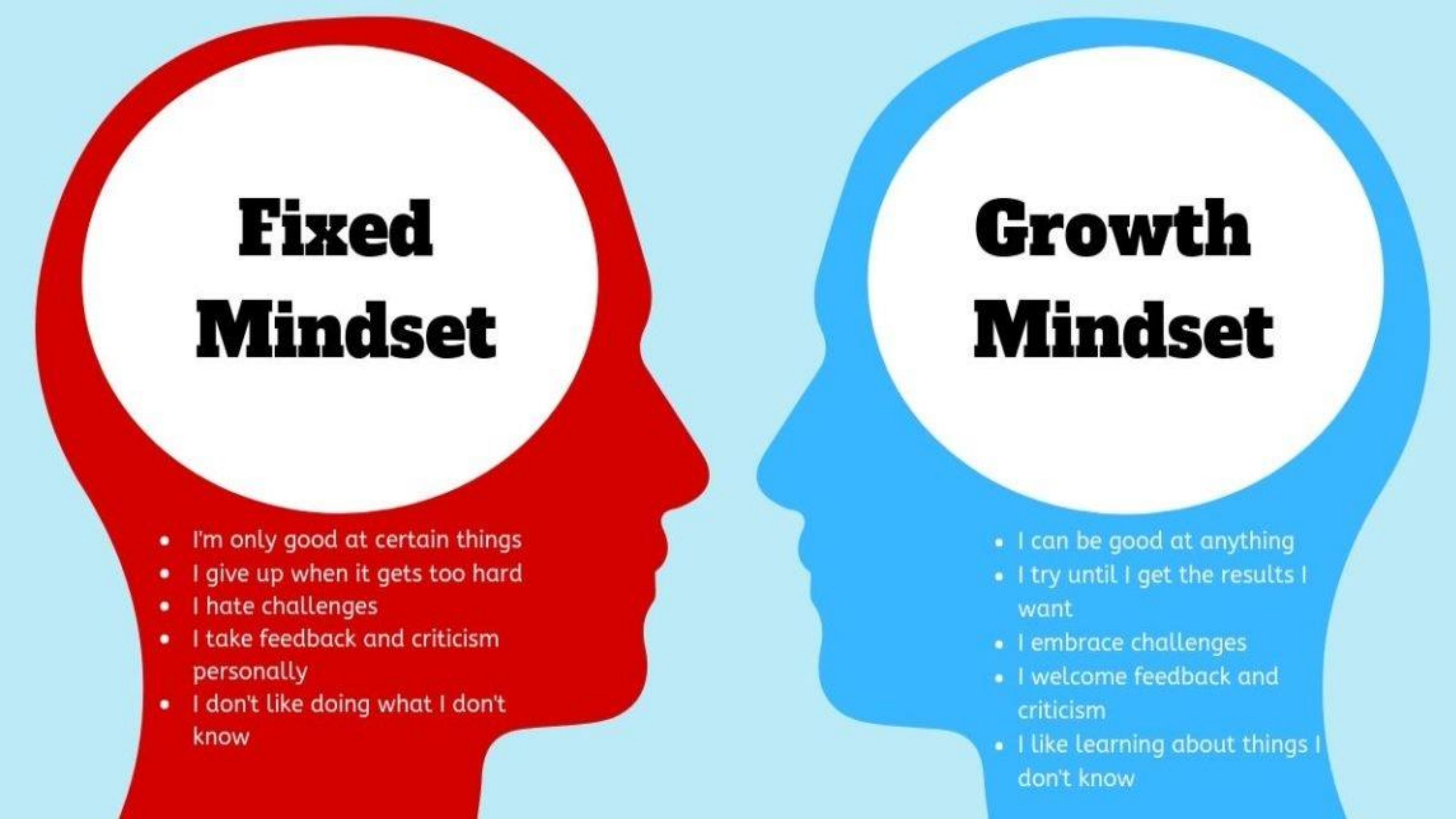
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Always, Sometimes or Never True?

When you multiply one number by another the answer will be larger.

Find all possibilities

Some Tripods and Bipods have landed on planet Earth.
There is more than one of each type.
Bipods have 2 legs.
Tripods have 3 legs.

If there are 35 legs altogether how many of each creature could there be?
How many solutions can you find?

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Progression with addition

- Formal addition begins by partitioning numbers and adding them using place value knowledge – no re-grouping is needed.

53 + 24 = 77   50 + 20 = 70

3 + 4 = 7   then recombine   **70 + 7 = 77**

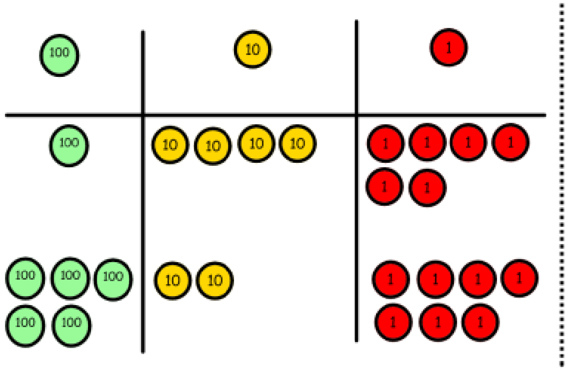
- This can then be written in columns

	T	O
	5	**3**
+	**2**	**4**
	7	**7**

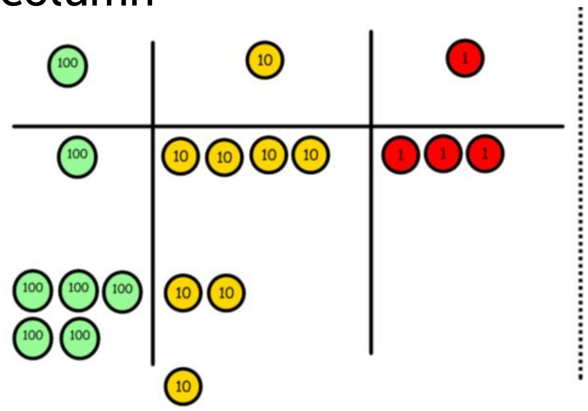
Progression with addition

- Once the total of a column is more than 9 we need to re-group

Always begin adding with the smallest column



146
+ 527



146
+ 527

600 70 3

100 40 6
+ 500 20 7
600 60 13

100 40 6
500 20 7
600 70 3
10

1 4 6
5 2 7
6 7 3
1

Progression with addition

- This follows the same process for larger numbers and also for decimal numbers

Th	H	T	O	
3000	800	40	7	
2000	300	20	5	
6000	100	70	2	= 6,172
1000		10		

	Th	H	T	O
	3	8	4	7
+	2	3	2	5
	6	1	7	2
	1		1	

```
  £ 2 3 . 5 9
+ £   7 . 5 5
  £ 3 1 . 1 4
      1 1   1
```

13.86 + 9.481

```
   1 3 . 8 6 0
+    9 . 4 8 1
   2 3 . 3 4 1
   1   1   1
```

Progression with subtraction

- Subtraction, like addition, begins by partitioning numbers and subtracting them using place value knowledge – no re-grouping is needed. Begin in the smallest column.

34 – 13 = ____

34
30 4
–10 –3
20 1

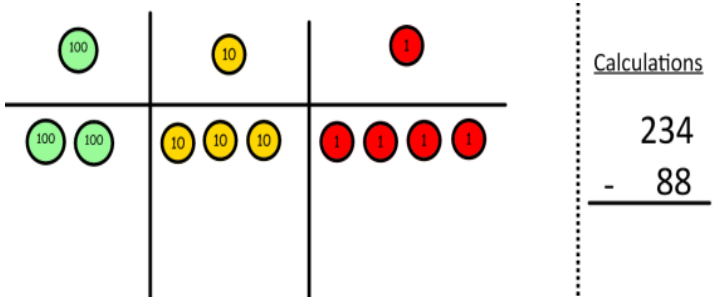
- Pupils should recognise when subtraction of one number from another isn’t possible and partition numbers in a different way.

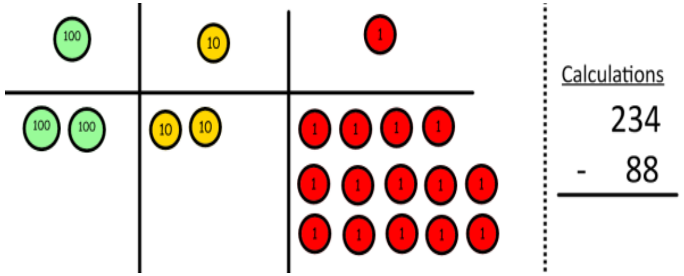
42 – 15 =

42
40 2
–10 –5

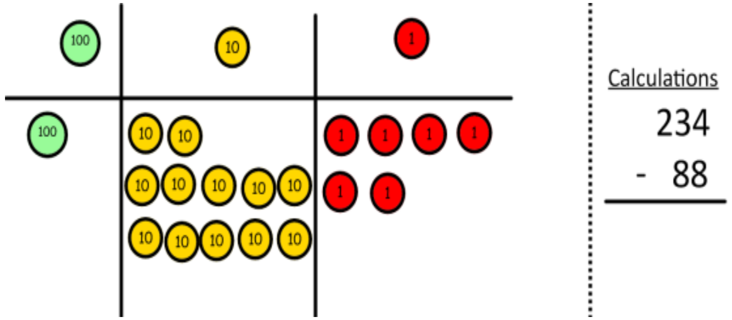
42
30 12
–10 –5
20 7

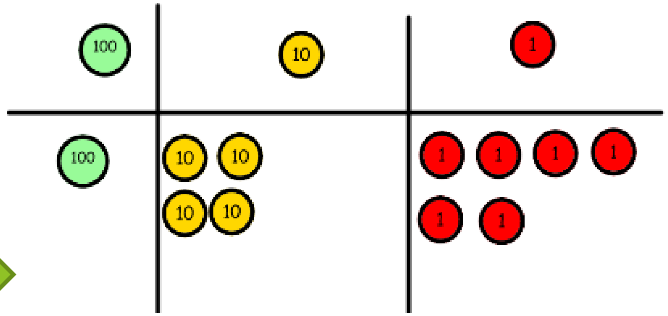
Progression with subtraction





Exchange one of the tens for 10 ones





Exchange one of the hundred for 10 tens

Now complete the calculation

Progression with subtraction

- $$\begin{array}{rrrl} 200 & {}^{30}\cancel{40} & {}^{1}7 & \\ -\ 100 & 20 & 9 & \\ \hline 100 & 10 & 8 & = 118 \end{array}$$

$$\begin{array}{rrrr} & 2 & {}^{3}\cancel{4} & {}^{1}7 \\ - & 1 & 2 & 9 \\ \hline & 1 & 1 & 8 \\ \hline \end{array}$$

$$\begin{array}{rrrrl} \textbf{Th} & \textbf{H} & \textbf{T} & \textbf{O} & \\ 3000 & {}^{200}\cancel{300} & {}^{1}60 & 7 & \\ -\ 1000 & 100 & 80 & 5 & \\ \hline 2000 & 100 & 80 & 2 & = 1182 \end{array}$$

$$\begin{array}{rrrrr} & 3 & {}^{2}\cancel{3} & {}^{1}6 & 7 \\ - & 1 & 1 & 8 & 5 \\ \hline & 1 & 1 & 8 & 2 \\ \hline \end{array}$$

Progression with subtraction

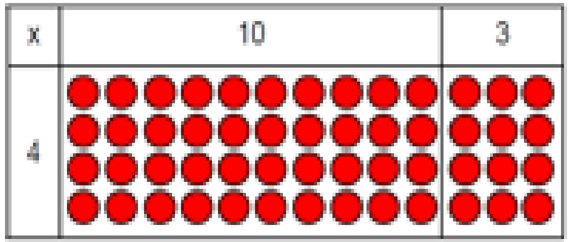
£64.81 - £25.62 =

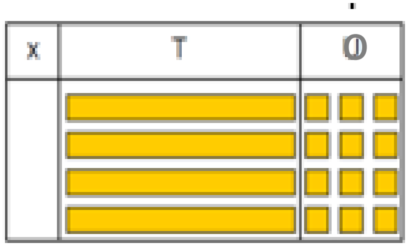
	£10	£1	.	10p	1p
	$^{5}\cancel{6}$	$^{1}\cancel{4}$	.	$^{7}\cancel{8}$	$^{1}1$
-	2	5	.	6	2
£	3	9	.	1	9

Progression with multiplication

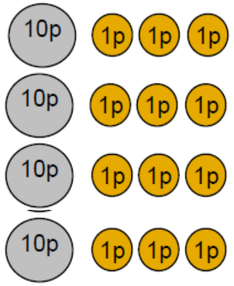
- As with addition and subtraction we begin by partitioning numbers and using knowledge of times tables to support with multiplication

eg 13 x 4





4 rows of 13



40p + 12p = 52p

X	10	3
4	40	12

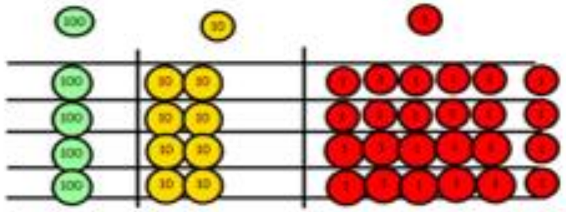
= 52

Progression with multiplication

- When numbers are larger, links to times tables are important

x	6
40	240
3	18
	258

126 x 4



x	100	20	6
4	400	80	24

= 524

	200	60	4
8	1600	480	32

$$\begin{array}{r} 1600 \\ 480 \\ \underline{32} \\ \underline{2112} \\ \scriptstyle 1\,1\,1 \end{array}$$

Progression with multiplication

- Once pupils are secure when partitioning numbers we move to a column method, using the same multiplication knowledge

```
   36
x   4
   24
  120
  144
```

compact method when secure

```
   3 6
x    4
 14 4
   2
```

```
  127
x   6
   42
  120
  600
  762
```

```
  127
x   6
  762
  1 4
```

```
  2 3 1
  1342
x   18
 10736
 13420
 24156
  1
```

Progression with multiplication

- The same process applies for larger numbers and also decimal numbers

15.76 x 3 =

Insert zeroes initially

X	3
10.00	30.00
5.00	15.00
0.70	2.10
0.06	0.18
	47.28

Expanded method

15.76 x 3

```
   1 5 . 7 6
x          3
     0 . 1 8  (3 x 0.06)
     2 . 1 0  (3 x 0.7)
   1 5 . 0 0  (3 x 5)
   3 0 . 0 0  (3 x 10)
```

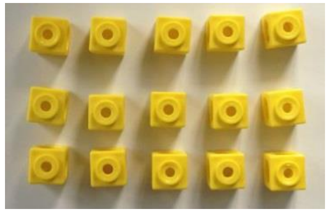
Compact method

```
   1 5 . 7 6
x          3
   4 7 . 2 8
   1 2   1
```

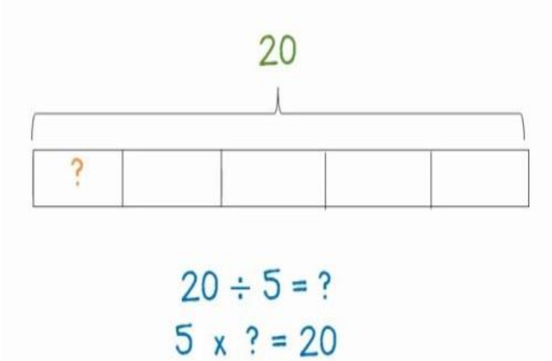
Progression with division

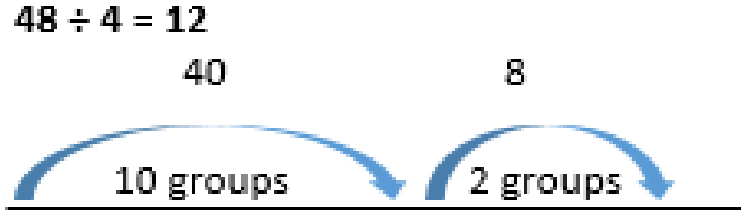
- Pupils have lots of exposure to division as grouping using different models and representations. Times tables knowledge is vital to division.

- Use of arrays supports links to multiplication



15 ÷ 3 = 5 – groups of 3
15 ÷ 5 = 3 – groups of 5

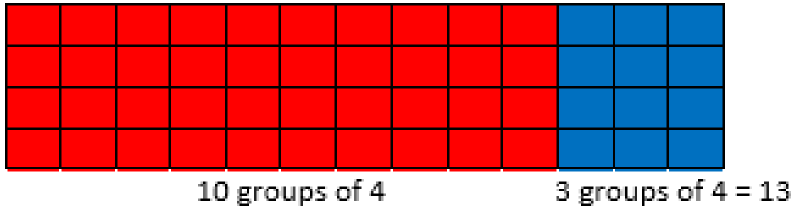




Progression with division

- When numbers are larger, pupils look at ways to split them into multiples to make it easier to divide. Again knowing times tables facts is crucial.

52 ÷ 4 - recognise that 52 can be partitioned into 40 and 12 which then link to tables facts

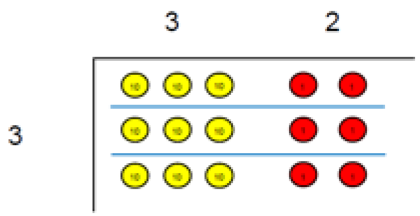


Progression with division

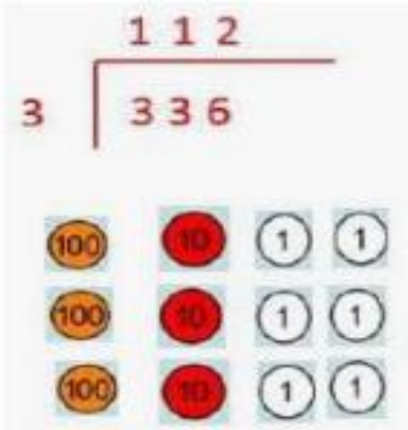
- We revert back to using equipment and representations when moving towards a formal method for division

96 ÷ 3

Tens Ones



112 ÷ 3



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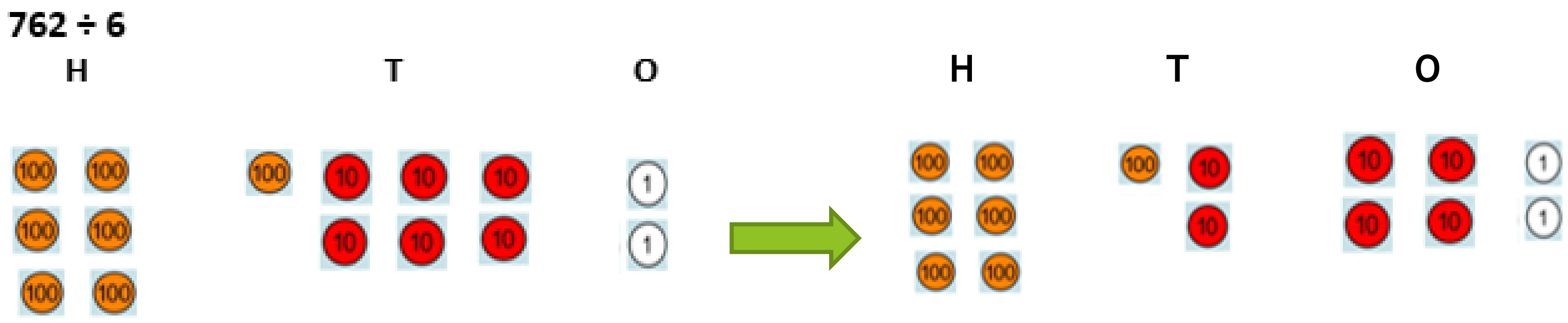

762

600 120 42

100 20 7 = 127

Progression with division

$$3 \overline{)\,65{}^{2}4} = 218$$

one exchange needed

$$3 \overline{)\,5{}^{2}8{}^{1}2} = 194$$

two exchanges needed

$$5 \overline{)\,7{}^{2}2{}^{2}6} = 145\text{r}1$$

remainder

Progression with division

- Remainders in context

I have £40. A potted plant costs £7. How many can I buy?

We need 1 adult for every 7 students on a field trip. How many adults are needed for 40 pupils?

A trip lasted 40 days. How many weeks is that?

I paid a gardener £40 for helping in my garden. She worked for 7 hours. How much did I pay her per hour?

Strategies

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- Conceptual understanding – not just knowing how to do something but why it works and what it looks like in various ways
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Home learning

- Play games that involve counting and strategy eg dominoes, cards, monopoly
- Practical tasks linked to measures eg ratio/proportion/converting measurements etc when cooking.
- Use fractions practically eg pizza.
- Opportunities to use money in real life concepts
- Telling the time on analogue clocks and reading and analysing timetables eg tv guide.
- Times Tables practise with associated division facts

Questions