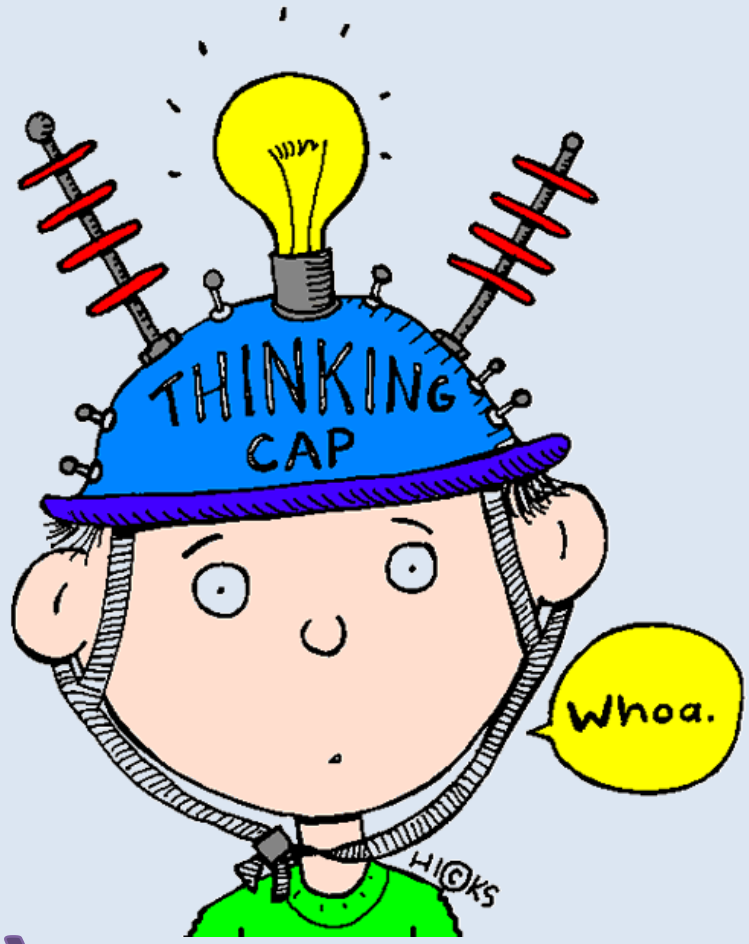


Mathematical Reasoning
(developing mastery)

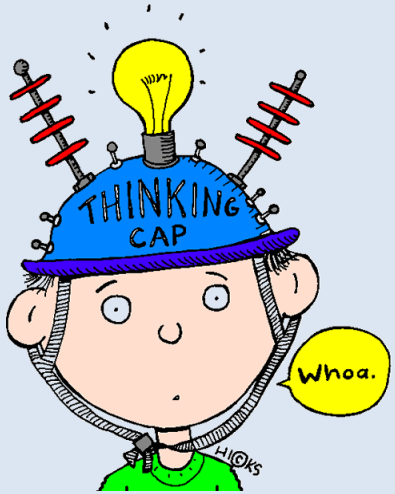
Why is it important?

Why is it important?

The national curriculum requires that children are taught to 'solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions'.

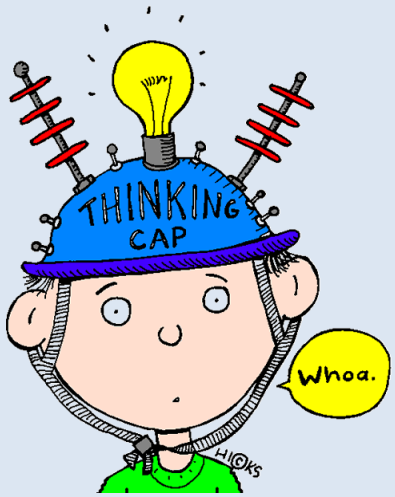
Why is it important?

Good, rich, problem solving activities should allow children to work at different levels with further challenges and extensions. The activities build on the knowledge children bring and the different methods they might use. They should deepen and broaden problem solving skills, which include thinking skills and also mathematical knowledge.



The thinking skills that we need to encourage are:

- Information processing: for example, identifying relevant information, sorting, classifying and sequencing, analysing results and relationships.
- Reasoning: for example, giving reasons for their opinions, making deductions, using precise language to explain what they think, making judgements and decisions informed by reasons and evidence.

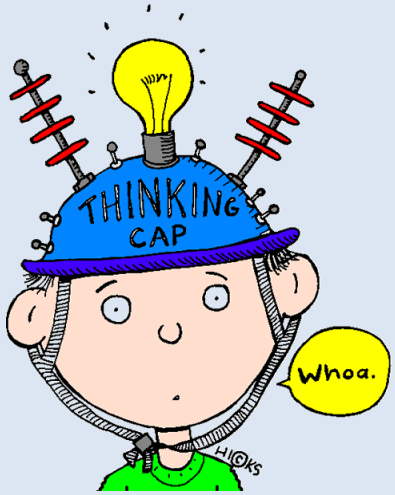


The thinking skills that we need to encourage are:

Enquiry: for example, asking relevant questions, planning what to do, predicting outcomes

Creativity: for example, generating and extending ideas, applying imagination, looking for alternative outcomes

Evaluation: for example, evaluating information, judging the value of what they hear, read and do

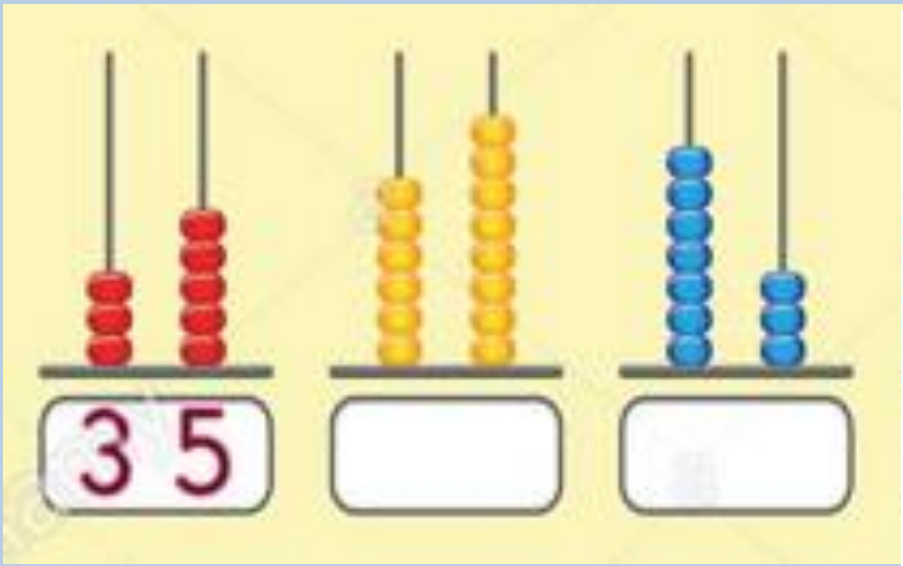


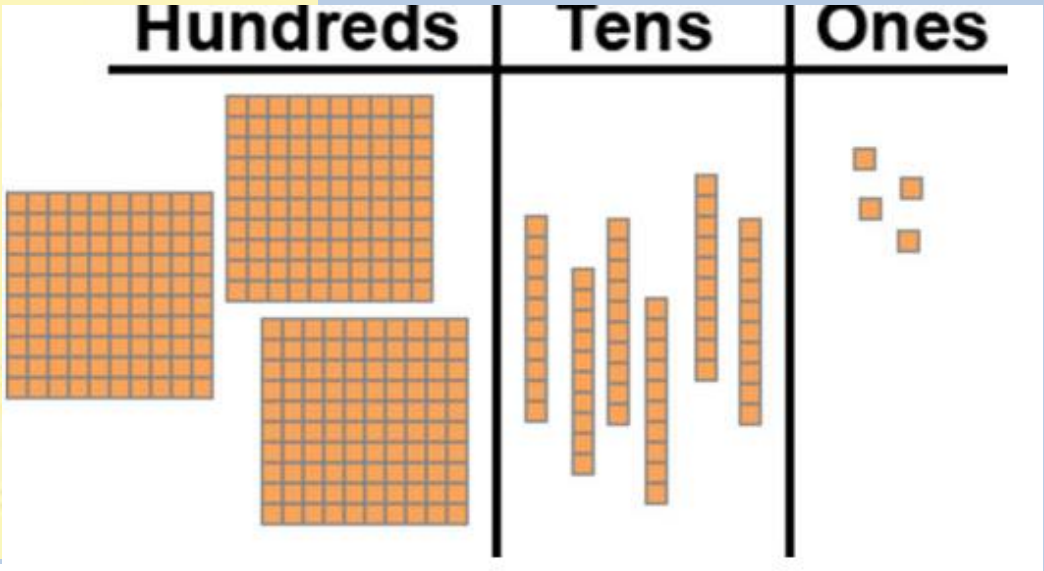
In essence:

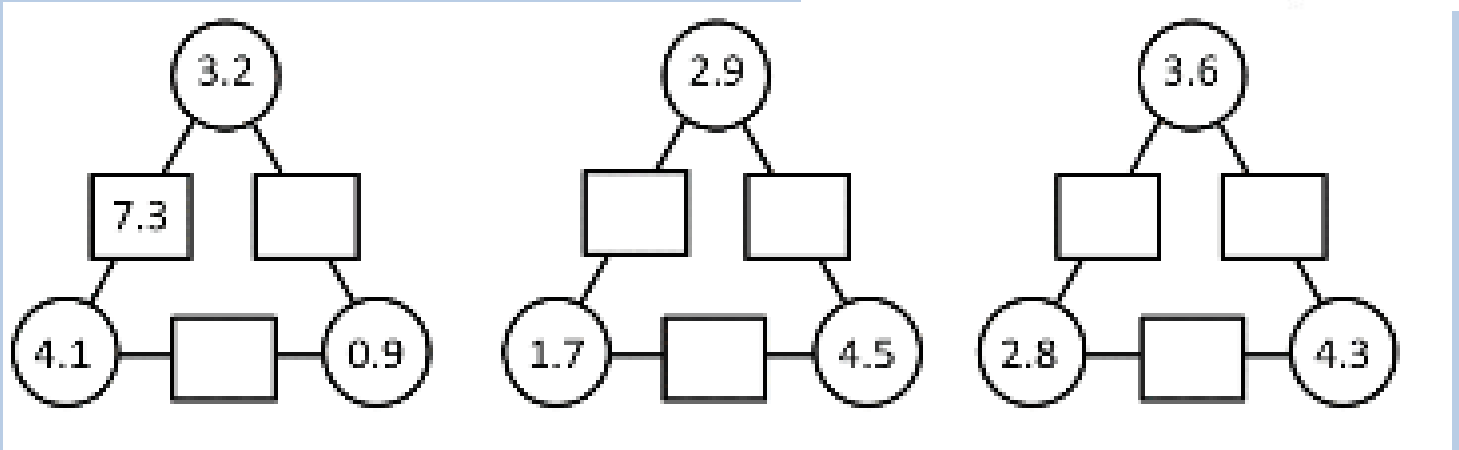
Reasoning is fundamental to knowing and doing mathematics. We wonder how you would define the term? Some would call it systematic thinking. Reasoning enables children to make use of all their other mathematical skills and so reasoning could be thought of as the 'glue' which helps mathematics makes sense.

Variation

10,000	1,000	100	10	1
● ●	● ●	● ● ●		● ● ●

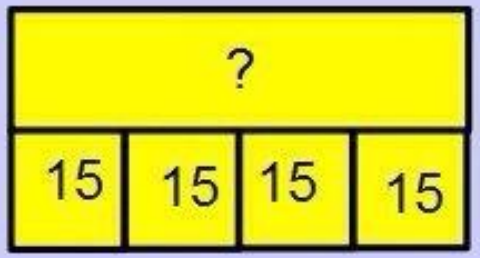






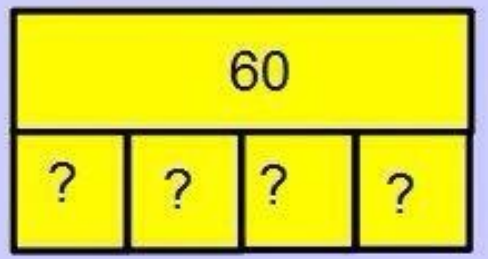
Bar Models

Whole unknown...



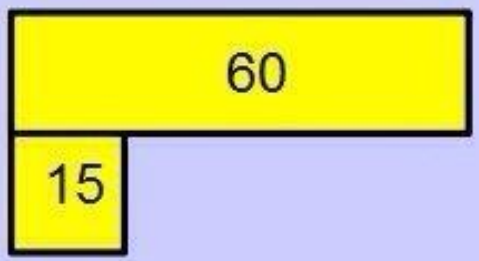
4 children go to the cinema. They each pay £15. How much do they spend altogether?

Size of groups unknown...



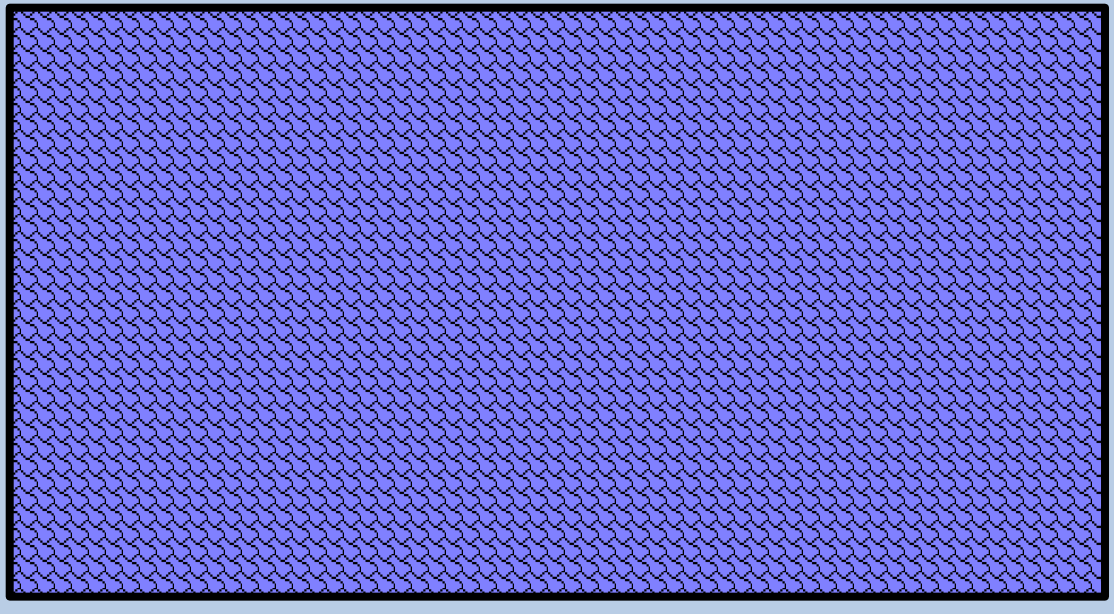
4 children go to the cinema. They pay £60 altogether. How much do they spend each?

Number of groups unknown...



Tickets to the cinema are £15. Some children buy tickets that cost £60. How many children bought tickets?

Perimeter of a rectangle



If the lengths of the sides of a rectangle are integers (whole numbers), can the perimeter be 25cm?

The answer is...

24

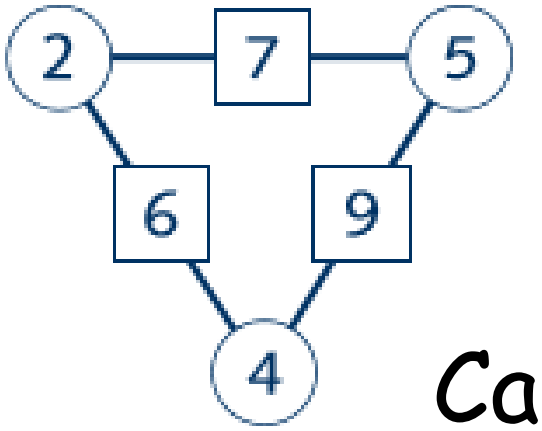
The answer is 24.

What was the question?

- How many different questions can you write with an answer of 24?
- What is the hardest question that you can write with an answer of 24?

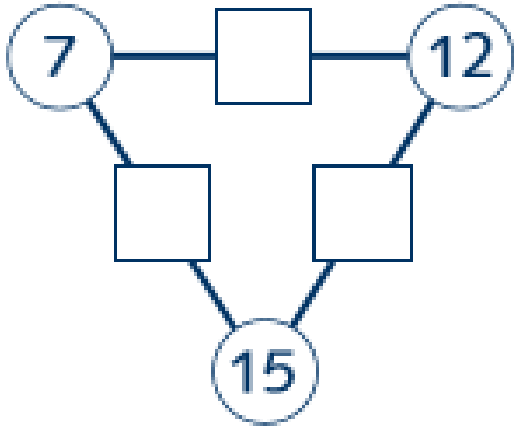
Arithmogons

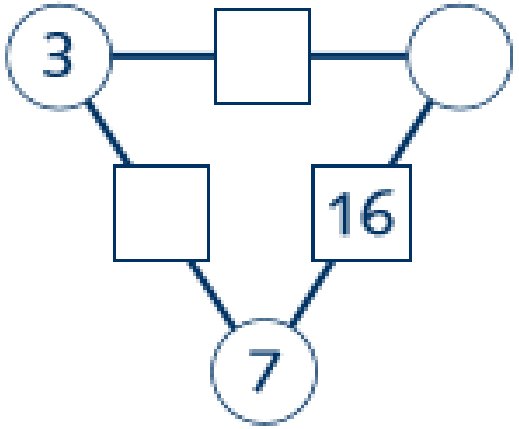
Look at the diagram below:

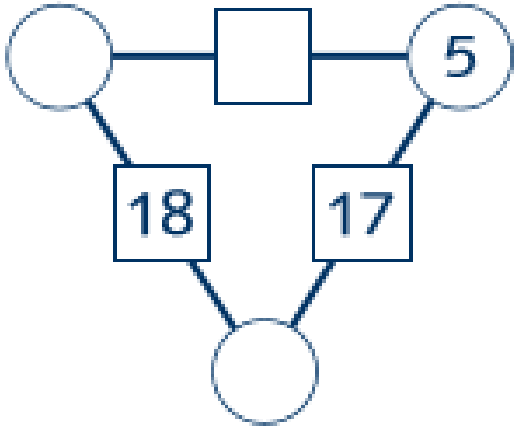


Can you work out what is happening?

- Complete the diagrams below:







Captain Conjecture says 'The number in the place value grid is the largest 3-digit number you can make using all 10 counters'.

100s	10s	1s
● ● ● ● ● ● ●	●	●

Do you agree?

Explain your reasoning.

Megan has made a 3-digit number with these cards.

6	7	5

What other 3-digit numbers can she make with these cards?

6	7	5			

What is the largest number she can make?

Consider whether or not children are working systematically.

Flo and Jim are answering a problem:

Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack?

Flo does the calculation 62 + 43. Jim does the calculation 62–43.

Who is correct?

Explain how you know.

Choose one of these symbols

$<$, $>$ or $=$

to make the number sentences correct.

$\frac{1}{5}$ ◯ $\frac{1}{7}$

$\frac{3}{5}$ ◯ $\frac{4}{7}$

You may use the fraction strips below to help you.

Mrs Jones has £20 to spend on presents

She buys 4 mugs and 3 teddy bears.

What is the greatest number of key-rings she can buy?

A tower is made of red and green cubes.

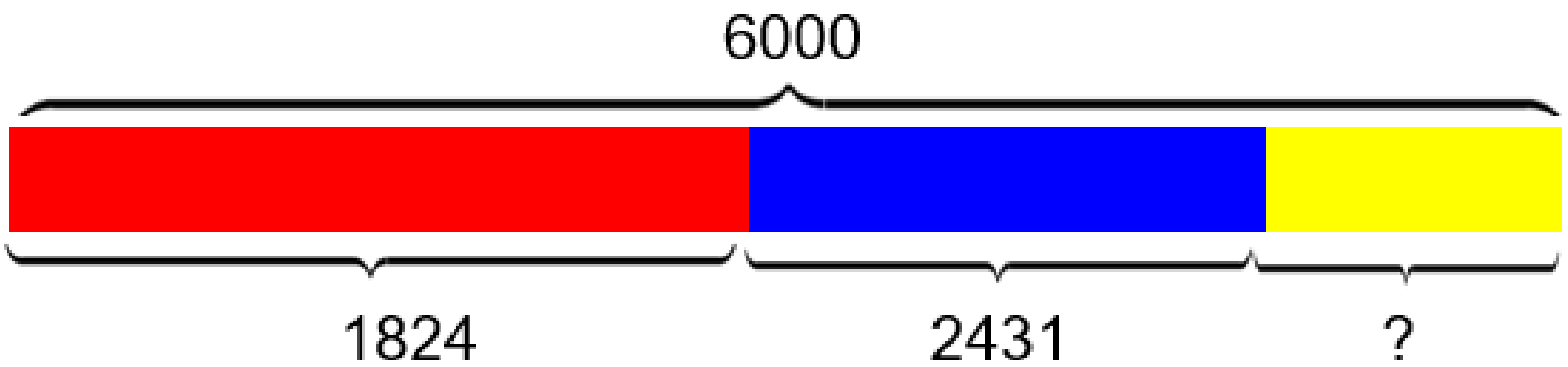
For every 1 red cube there are 2 green cubes.

Each cube has a height of 2.5cm

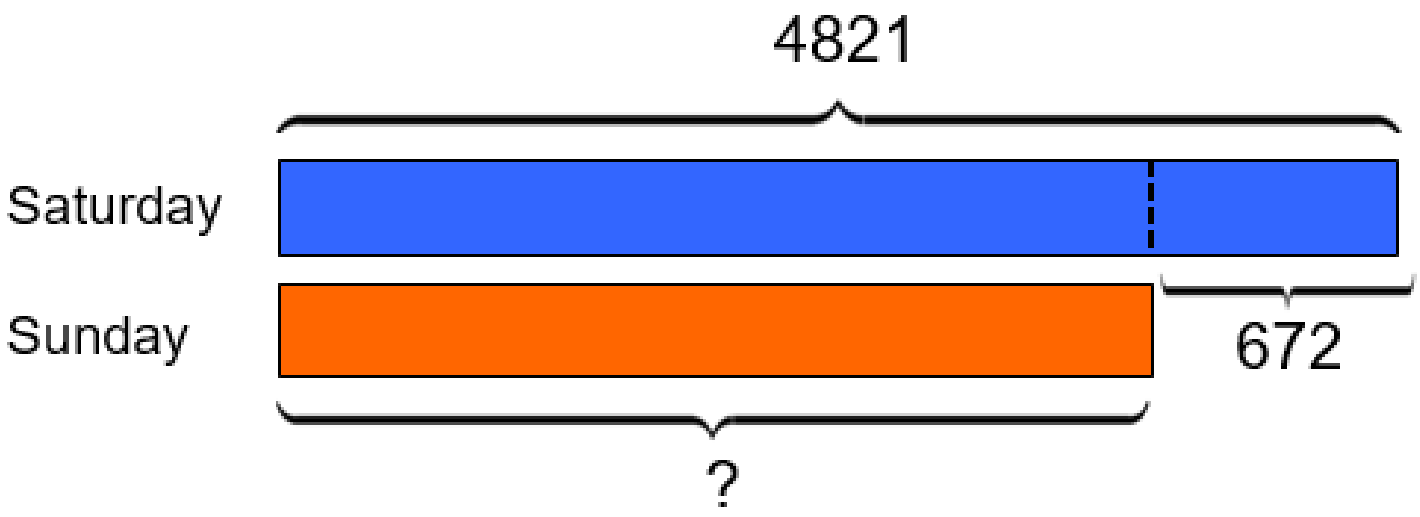
The tower is 30cm tall.

How many green cubes are in the tower?

A theatre has 6000 tickets available for sale for a performance of Mama Mia. 1824 tickets were sold on Monday and 2431 were sold on Tuesday. How many tickets were still left unsold at the end of Tuesday.



On Saturday, 4821 people visited a theme park. 672 more people visited the theme park on Saturday than visited on Sunday. Altogether, how many people visited the theme park over the two days.



Chilli Challenge A

Can you work out what the missing numbers are?

(is there more than one answer? How can you prove it?)

x	10	
	40	12

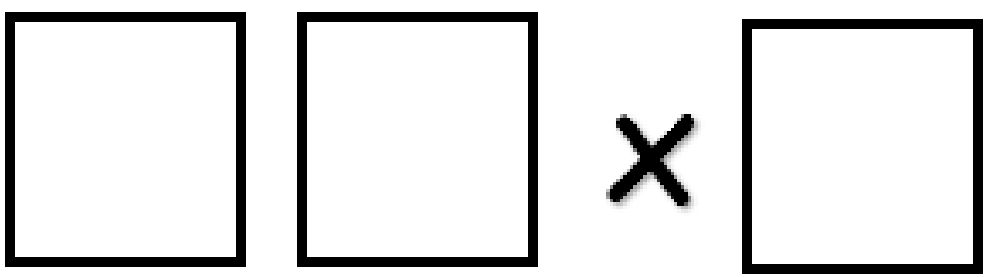
x	20	
		4

x	10	
		6

x		3
6	60	

Chilli Challenge B

Putting the digits 1, 2 or 3 in the boxes, how many different calculations can you make?



Which gives the largest number?

Which gives the smallest number?

Chilli Challenge C

John and Sarah both answered the question: 18 x 4

Were they right?

How do you know?

John's answer:

x	10	4
8	80	32

18 x 4 = 112

Sarah's answer:

x	10	8
4	40	24

18 x 4 = 64

Always,
Sometimes
or Never

Convince me!

Prove it!

How do you
know?

Is she/he
right?

Show me another
…an another

Any Questions?