Teaching in Year 6 – part two

Addressing the raised expectations in the Key Stage 2 SATs for English and mathematics with strategies for moderating the quality of children's writing at the end of Key Stage 2

The Primary Team

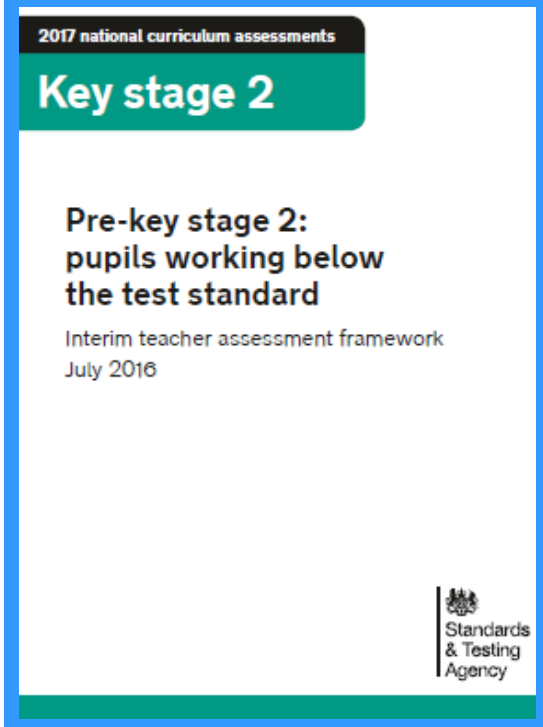
Nottingham City Council

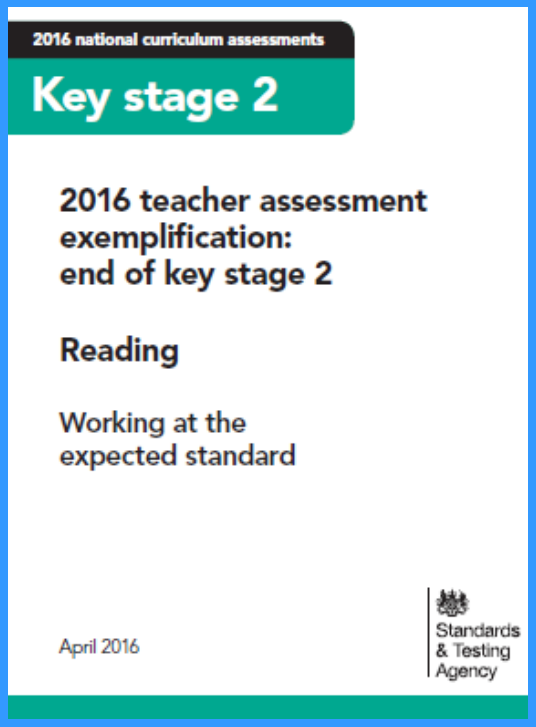
7.3 What teachers must assess

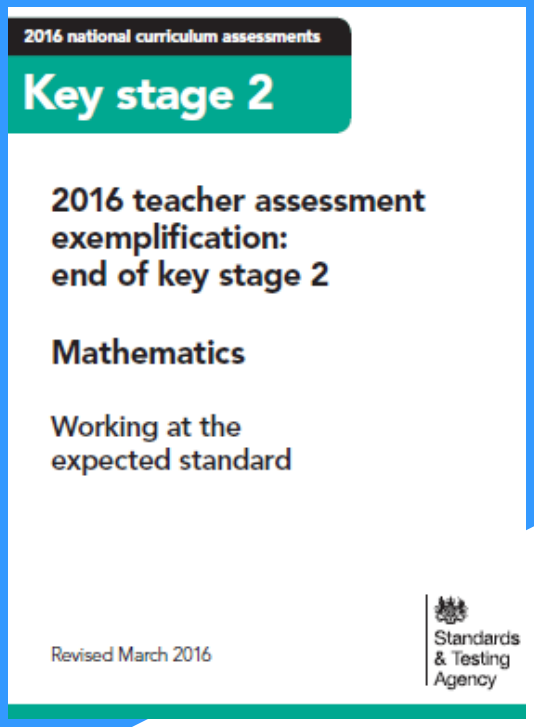
ARA

In 2017, teachers must make judgements for each eligible pupil against the standards set out in the interim teacher assessment frameworks[32] or the interim pre-key stage standards[33]. Exemplification material[34] is also available to help teachers make their judgements where they want additional guidance.

Teachers must use their knowledge of a pupil's work over time, taking into account their written, practical and oral classwork.







Children working below the test standard

For pupils working below the standard of the tests the pre-key stage standards contain statements which define appropriate expectations reflecting core knowledge and skills these pupils need to progress.

Some of the statements are based on the elements of the KS1 curriculum that remain relevant for these pupils.

Pre-key stage standards for KS2 reading, writing & mathematics:

Foundations for the expected standard

Early development of the expected standard

Growing development of the expected standard

Code	Description	Notes
BLW	Below the standard of the interim pre-key stage standards	Pupils submitted as BLW for English reading, English writing and mathematics must also have either P scales or NOTSEN submitted. If interim pre-key stage standards are submitted when a test result exists the test result will be used in performance tables.
PKF	Pre-key stage - foundations for the expected standard	
PKE	Pre-key stage - early development of the expected standard	
PKG	Pre-key stage - growing development of the expected standard	
HNM	Has not met the expected standard	**English writing** HNM **cannot** be used for writing as there is no test. **English reading, and mathematics** The HNM code should be used instead of the interim pre-key stage standard codes if the pupil has a test result. **Science** The HNM code is used where pupils have not met the criteria for working at the expected standard. There are no interim pre-key stage standard codes for science.
WTS	Working towards the expected standard	To be used for English writing only.
EXS	Working at the expected standard	To be used for English reading, English writing, mathematics and science.
GDS	Working at a greater depth within the expected standard	To be used for English writing only.

Standards & Testing Agency

Key stage 2: submitting teacher assessment data

May 2016

ARA

March	• KS2 test administration guidance[6], including the 'Test administrators' guide', published for 2017.
Friday 17 March	• Deadline for schools to complete pupil registration.
Monday 10 April	• All schools that have applied for early opening or compensatory marks will have been notified of the outcome of their application on NCA tools.
Monday 24 April	• Deadline for schools to submit applications for additional time.
Monday 24 April to Friday 28 April	• Schools receive all KS2 test materials (standard and modified versions) and stationery items.
Monday 8 May to Thursday 11 May	• Schools administer the KS2 tests (see section 3.3).
Thursday 11 May	• 'Access arrangements' section of NCA tools opens for special consideration applications. • The KS2 headteacher's declaration form (HDF) is available to schools on NCA tools at 5pm.
Thursday 18 May	• Deadline for schools to apply for timetable variations on NCA tools.

Friday 19 May	• Deadline for schools to submit any notifications that pupils have used a scribe, transcript, word processor or electronic or technical aid in a test. • Deadline for schools to submit any notifications that they have administered the tests at another location or to notify STA of a pupil cheating. • Deadline for schools to submit special consideration applications. • Deadline for schools to submit the KS2 HDF on NCA tools. • Schools informed by the LA on, or after, this date if they are going to receive an external moderation visit for TA.
Monday 22 May	• Test materials and mark schemes available to download from GOV.UK[7]. • 'Teacher assessment' section of NCA tools opens.
Monday 5 June to Thursday 29 June	• LAs undertake external moderation of KS2 English writing TA.
Thursday 29 June	• Deadline to submit TA data on NCA tools. Data submitted late will not be used in the DfE's performance tables data checking exercise.
Tuesday 4 July	• Pupil results (raw scores and scaled scores) and marked script images available on NCA tools. • Raw score to scaled score conversion tables available on GOV.UK.
Friday 14 July	• Deadline for schools to submit review of marking applications.
Monday 4 September	• Review outcomes returned to schools.

The scaled scores

The raw score on the tests is converted into a scaled score ensuring performance can be reported on a consistent scale for all children. Scaled scores retain the same meaning from one year to the next.

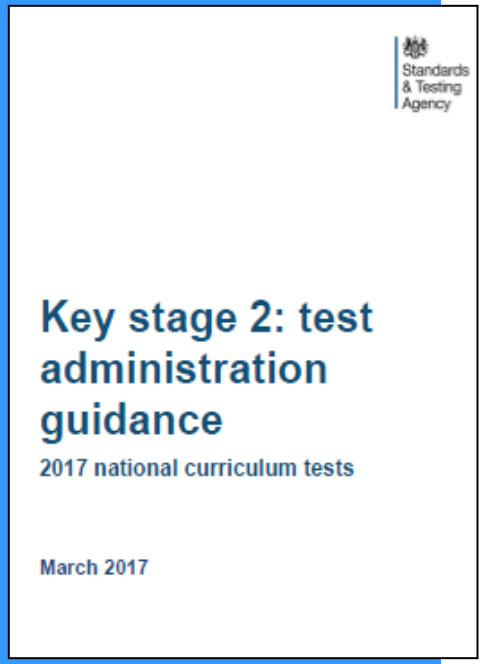
A scaled score of 100 is the expected standard. Last year, to gain a scaled score of 100 children needed to score:
60 out of 110 in maths (55%)
21 out of 50 in reading (42%)
43 out of 70 in grammar, punctuation and spelling (61%)

Steps should be taken to protect staff involved in administering the tests against allegations of maladministration.

Allegations of maladministration can come from misunderstandings about correct test administration.

To avoid this, make sure all staff, pupils and parents understand:

- **how the tests will be administered**
- **the date that each test should be administered**
- **what assistance is allowed in the tests**
- **how any access arrangements will be used**



https://www.gov.uk/government/collections/national-curriculum-assessments-key-stage-2-tests

6.6 Equipment

TAG

It is important to make sure all equipment is ready and working in advance of the tests.

Pupils will require the following for one or more of the tests:

- blue/black pens, pencils, pencil sharpeners and rubbers (optional)
- rulers (showing centimetres and millimetres)
- angle measurers or protractors
- mirrors

A specific list of equipment needed for each of the tests is detailed in sections 8 to 11.

Mathematics test papers include space for working, with gridlines included where these are useful to pupils. We therefore discourage the use of additional squared paper, as pupils may lose marks if they make an error or omission when they transfer their working to the test paper. However, if using squared paper is part of normal classroom practice, then it can be used as a specific access arrangement, as described in section 6.1.

Pupils must not use glitter pens or coloured pens, in particular red. These are illegible when scanned for on-screen marking. Pupils may use highlighter pens, for example to highlight sections of the reading booklet, if this is normal classroom practice.

Every room where the tests will take place should have a clock visible to help pupils pace themselves.

Teaching in Year 6 – part two Mathematics

Jane Gill

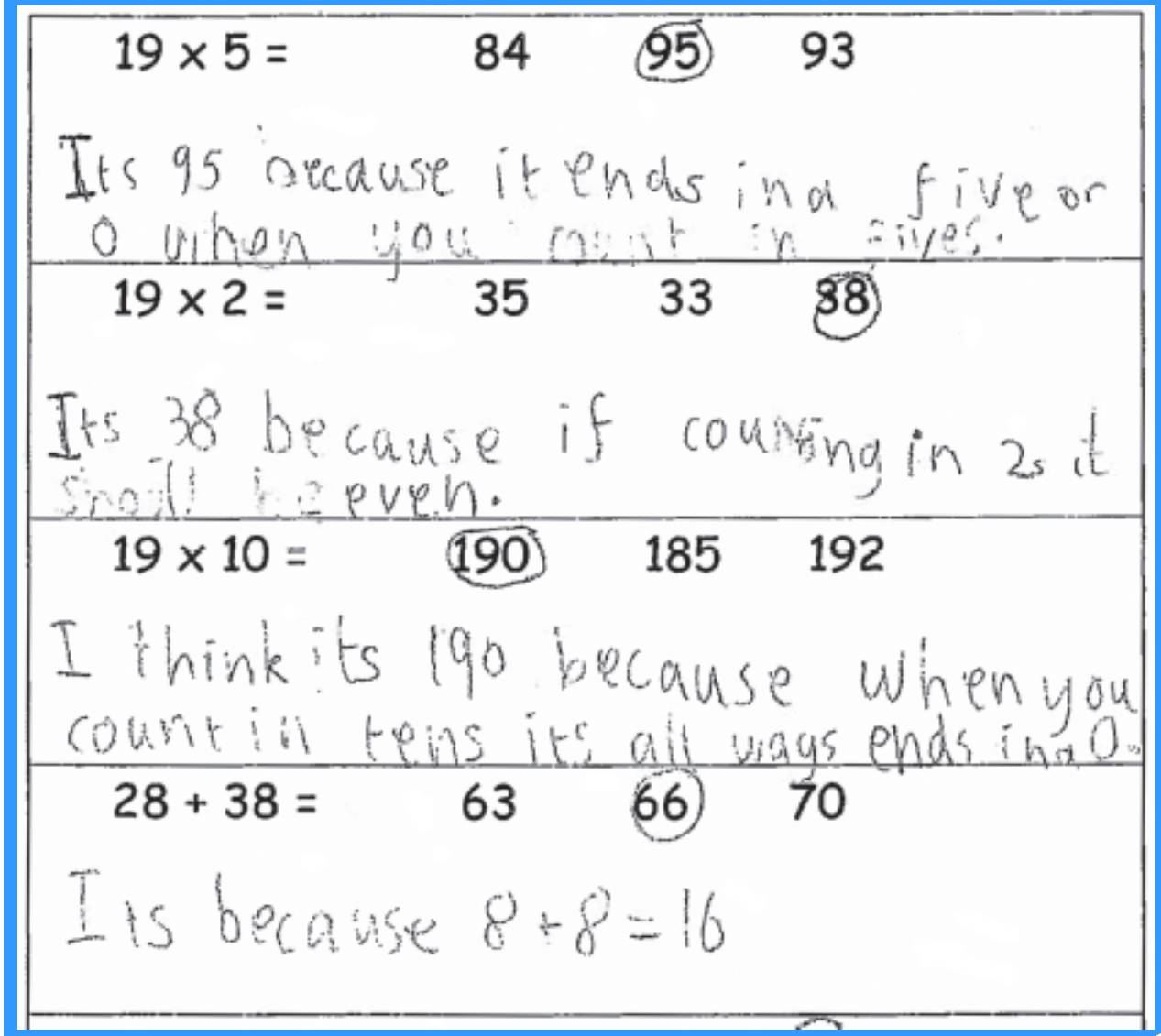
Professional Development Accredited Lead

National Centre for Excellence in the Teaching of Mathematics

The Primary Team

Nottingham City Council

Evidence for teacher assessment: multiplicative reasoning



19 x 5 = 84 **95** 93

Its 95 because it ends in a five or 0 when you count in fives.

19 x 2 = 35 33 **38**

Its 38 because if counting in 2s it shall be even.

19 x 10 = **190** 185 192

I think its 190 because when you count in tens its all ways ends in a 0.

28 + 38 = 63 **66** 70

Its because 8+8=16

Children need opportunities to write their mathematical explanations.

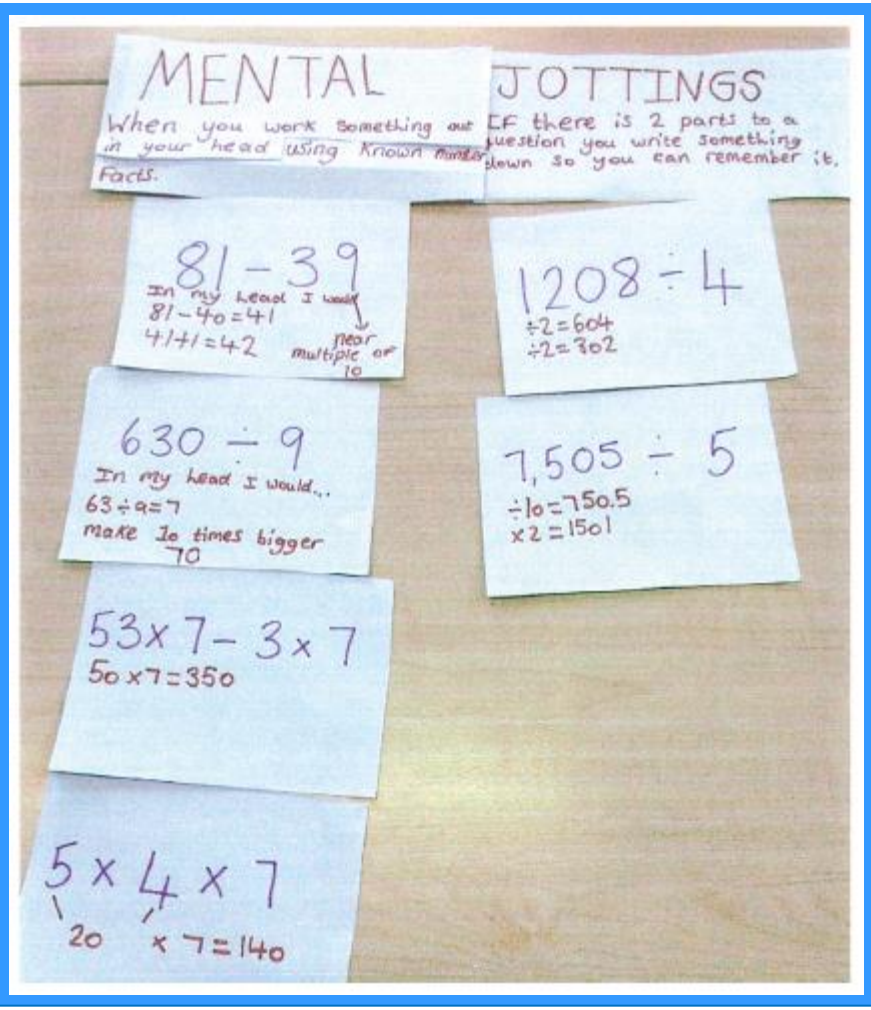
2017 national curriculum assessments

Working at the expected standard

- The pupil can demonstrate an understanding of place value, including large numbers and decimals
  (e.g. what is the value of the '7' in 276,541?;
  find the difference between the largest and smallest whole numbers that can be made from using three digits;
  $8.09 = 8 + \frac{9}{?}$;
  $28.13 = 28 + \square + 0.03$).
- The pupil can calculate mentally, using efficient strategies such as manipulating expressions using commutative and distributive properties to simplify the calculation
  (e.g. $53 - 82 + 47 = 53 + 47 - 82 = 100 - 82 = 18$;
  $20 \times 7 \times 5 = 20 \times 5 \times 7 = 100 \times 7 = 700$;
  $53 \div 7 + 3 \div 7 = (53 + 3) \div 7 = 56 \div 7 = 8$).
- The pupil can use formal methods to solve multi-step problems
  (e.g. find the change from £20 for three items that cost £1.24, £7.92 and £2.55;
  a roll of material is 6m long: how much is left when 5 pieces of 1.15m are cut from the roll?;
  a bottle of drink is 1.5 litres, how many cups of 175ml can be filled from the bottle, and how much drink is left?).
- The pupil can recognise the relationship between fractions, decimals and percentages and can express them as equivalent quantities
  (e.g. one piece of cake that has been cut into 5 equal slices can be expressed as $\frac{1}{5}$ or 0.2 or 20% of the whole cake).
- The pupil can calculate using fractions, decimals or percentages
  (e.g. knowing that 7 divided by 21 is the same as $\frac{7}{21}$ and that this is equal to $\frac{1}{3}$;
  15% of 60;
  $1\frac{1}{2} + \frac{3}{4}$; $\frac{7}{9}$ of 108;
  0.8 x 70).
- The pupil can substitute values into a simple formula to solve problems
  (e.g. perimeter of a rectangle or area of a triangle).
- The pupil can calculate with measures
  (e.g. calculate length of a bus journey given start and end times; convert 0.05km into m and then into cm).
- The pupil can use mathematical reasoning to find missing angles
  (e.g. the missing angle in an isosceles triangle when one of the angles is given;
  the missing angle in a more complex diagram using knowledge about angles at a point and vertically opposite angles).

Teacher Assessment

To demonstrate that pupils have met the standard, teachers will need to have evidence that a pupil demonstrates consistent attainment of **all** the statements within the standard.



2016 national curriculum assessments

Key stage 2

2016 teacher assessment exemplification: end of key stage 2

Mathematics

Working at the expected standard

January 2016

Standards & Testing Agency

- The pupil can calculate mentally, using efficient strategies such as manipulating expressions using commutative and distributive properties to simplify the calculation (e.g. 53 – 82 + 47 = 53 + 47 – 82 = 100 – 82 = 18;
20 × 7 × 5 = 20 × 5 × 7 = 100 × 7 = 700; 53 ÷ 7 + 3 ÷ 7 = (53 +3) ÷ 7 = 56 ÷ 7 = 8).

Paper 1: arithmetic	
Qu.	Content domain reference
1	3N2b
2	3C2
3	4C6b
4	3C1
5	3C2
6	3C7
7	5C2
8	3C1
9	3C7
10	4C7
11	3C7
12	5C6a
13	5C6b
14	5F8
15	5C7b
16	5F8
17	5F8
18	5C2
19	6C9
20	6F9a
21	4F8
22	4C6b
23	5C7a
24	4F4
25	6R2
26	6F9b
27	5F4
28	6C7b
29	6R2
30	6C7a
31	6F4
32	6C7b
33	6F5b
34	5F5
35	6F4
36	6C9

Paper 2: reasoning	
Qu.	Content domain reference
1a	3N2a
1b	3N2a
2	5N2
3	3C2
4a	4S1
4b	5S1
5	5C5c
6	4G2c
7a	6F2
7b	6F2
8	5F10
9	3M9a
10	3F2
11	5M9c
12a	6A2
12b	6A2
13	6R1
14	6C5
15	5M5
16a	6N2
16b	6N2
17a	6G4b
17b	6G4a
18	6C8
19	6C8
20	6P2

Paper 3: reasoning	
Qu.	Content domain reference
1	3C1
2a	6N5
2b	6N5
3	4M4b
4a	6A2
4b	6A2
5	5F8
6	4F10b
7a	4G4
7b	4G4
8	6C8
9a	5S1
9b	5S1
10	5M8
11	6C7a
12	4P2
13	5F10
14a	6M5
14b	6M5
15	5N4
16	6R4
17	6M7b
18	6G2a
19	6N6
20	5F10
21	6C8

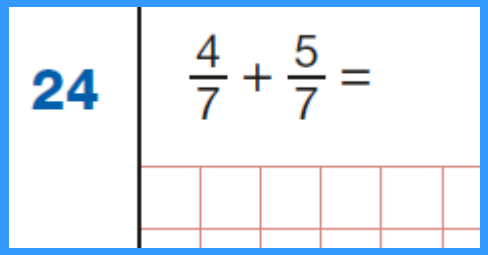
2016 content domain coverage

Last year 50 questions were from Y3, 4 & 5 (which amounted to 62 marks).

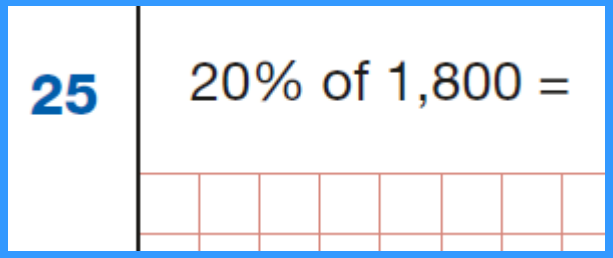
60 marks were needed for a scaled score of 100: the expected standard.

The tests are generally presented in order of difficulty, but there will always be some later questions that children will be able to do.

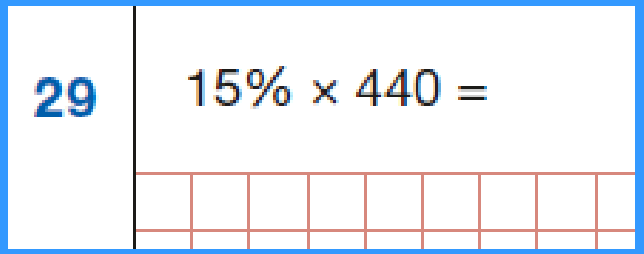
Paper 1: arithmetic (36 questions, 40 marks)



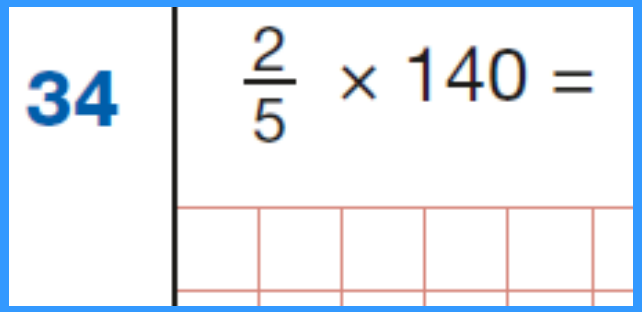
92% of children got this right.



74% got this right.



But only 36% got this right!



And only 27% got this right.

Teaching tips:

Make sure children read the x sign as ‘of’.

15% of 440 is quite easy to do mentally.

Ensure children can connect key fractions to their decimal and percentage equivalents.

e.g. $\frac{1}{5}$ = 20% = 0.2 = ÷ 5

Two fifths of 140… divide by 5 then double the answer.

New content but not too difficult:

33	$\frac{3}{5} \div 3 =$

36	$60 - 42 \div 6 =$

Treat the fifths as the ‘noun’ or the ‘thing’…
3 ‘things’ shared between 3…
How many of the ‘thing’ do they each get?

Remember BODMAS for question 36 and then the calculation is quite straightforward.

$7 + 3 \times 5 =$

Encourage children to explain why the answer to this is 22 and not 50.

Ensure your year 6 children have had experience of:

459 x 0 =

□ = 6853 - 684

1 000 x 30.7 =

10 000 000 - 101 =

Write the number that is **300,000 less 8 million**

Gary took part in a quiz show and won a **million pounds**.

He spent **£20 000** on a holiday.

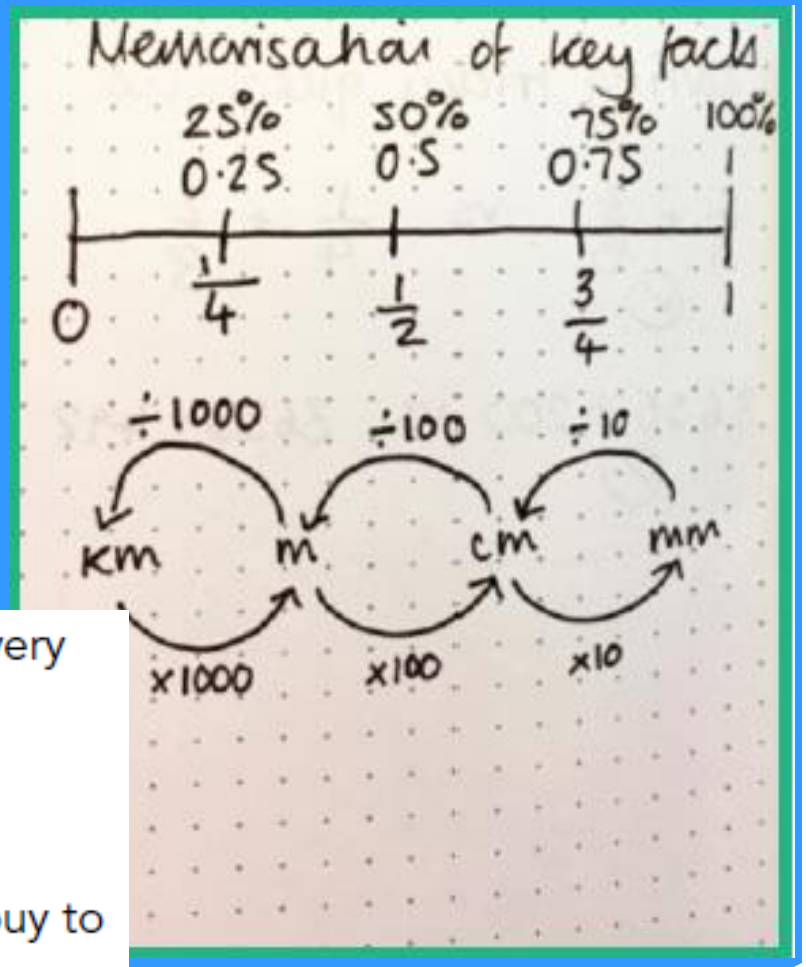
Then he spent **half** of the **money left** on a house.

How much did Gary's house cost?

Spend time helping children to memorise useful key facts

Fractions-decimals-percentages (on a number line)

Different unit conversions



On average a lion in a zoo eats 4950**g** of meat every day.

The meat comes in 6**kg** packs.

How many packs of meat does the zoo need to buy to feed the lion for one week?

Show your method.

Papers 2 and 3: reasoning
Finding a starting point in a problem

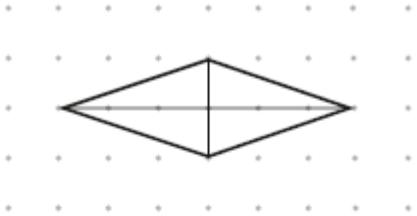
6 pencils cost **£1.68**

3 pencils and 1 rubber cost **£1.09**

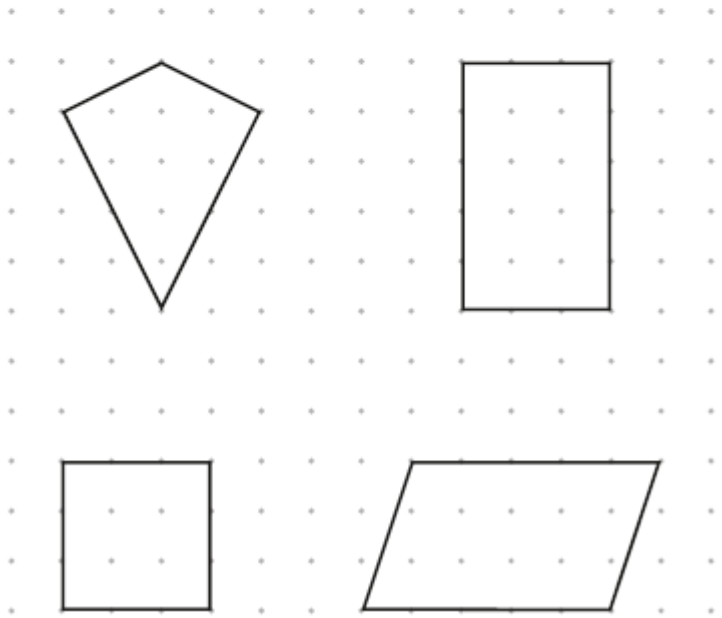
What is the cost of **1 rubber**?

Children can use the pictures to help them understand the problem. Encourage them to annotate the picture or to draw a new model.

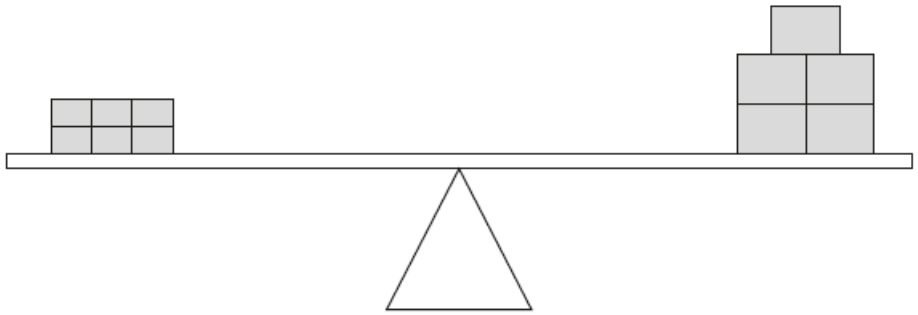
18 The diagonals of this quadrilateral cross at right angles.



Tick **all** the quadrilaterals that have diagonals which cross at right angles.



6 small bricks have the same mass as 5 large bricks.



The mass of one small brick is 2.5 kg.

What is the mass of one large brick?

Annotating the drawings will help children to see solutions.

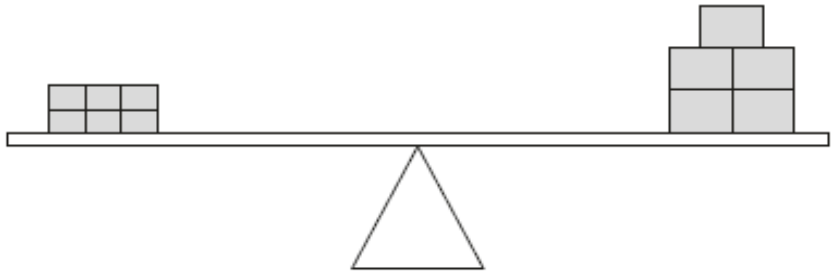
Use reasoning prompts to help children articulate what they can see and work out.

The thing I noticed was .....

I already knew ..... so this helped me work out .....

I know this is true because .....

16 6 small bricks have the same mass as 5 large bricks.



The mass of one small brick is 2.5 kg.

What is the mass of one large brick?

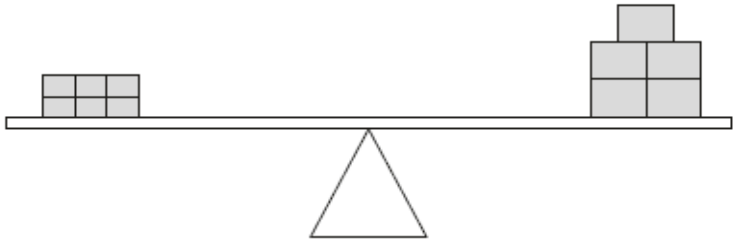
Show your method

kg

2 marks

KS2 SATs 2016 paper 3: reasoning

16 6 small bricks have the same mass as 5 large bricks.



The mass of one small brick is 2.5 kg.

What is the mass of one large brick?

Show your method

kg

2 marks

The thing I noticed was .....

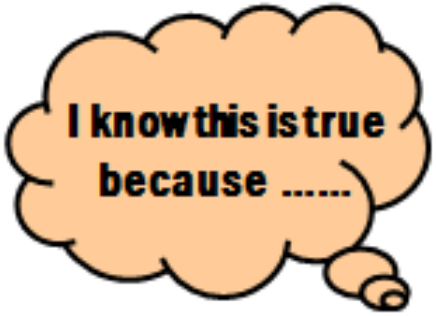
I already knew ..... so this helped me work out .....

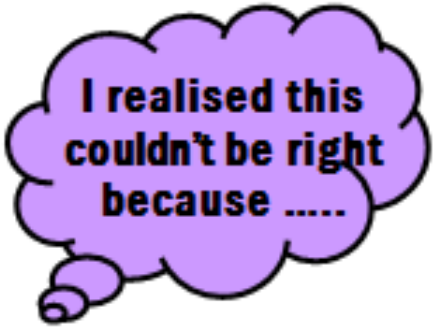
I know this is true because .....

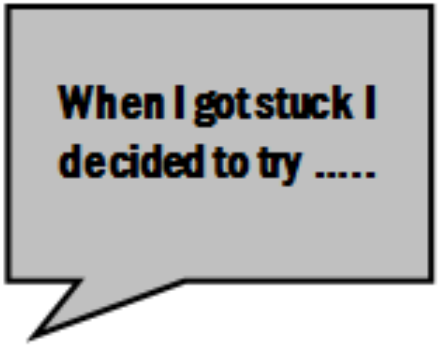
I already knew that the mass of 2 small bricks would be 5kg so this helped me work out the mass of 6 small bricks.
6 small bricks weigh 15kg and 5 large bricks weigh 15kg.
I know this is true because the scales balance.


The thing I noticed was .....

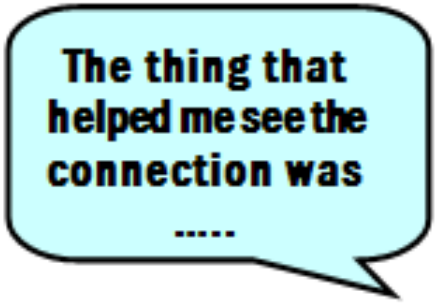

When I saw this it made me think about .....

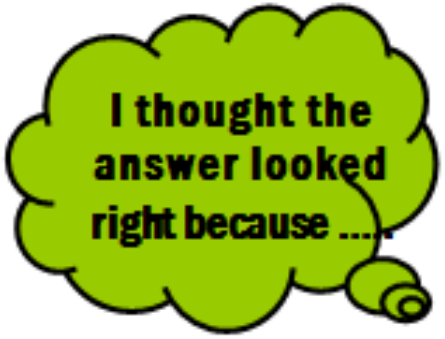

I know this is true because .....

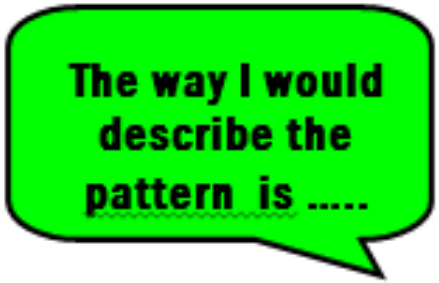

I realised this couldn't be right because .....

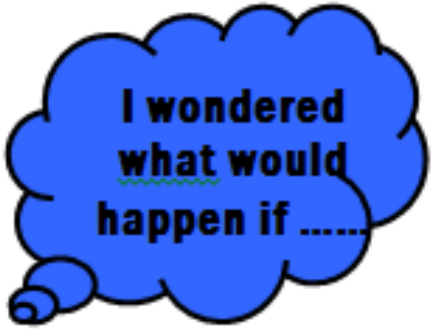

When I got stuck I decided to try .....


The connection I think is important is .....

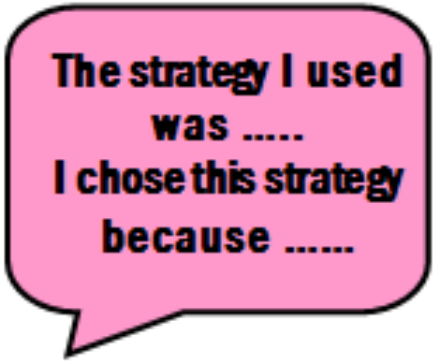

The thing that helped me see the connection was .....


I thought the answer looked right because .....


The way I would describe the pattern is .....

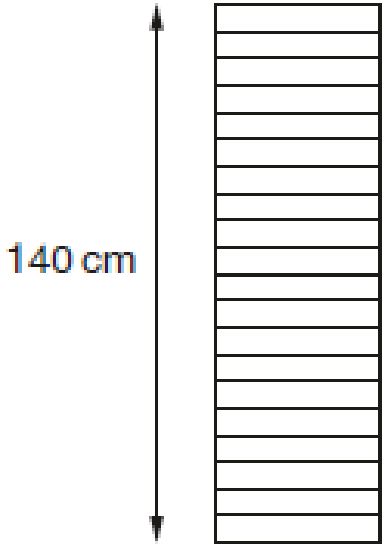

I wondered what would happen if .....


I already knew ..... so this helped me work out .....


The strategy I used was .....
I chose this strategy because .....

Using the drawings

A stack of 20 identical boxes is 140 cm tall.



Not actual size

Stefan takes **three** boxes off the top.

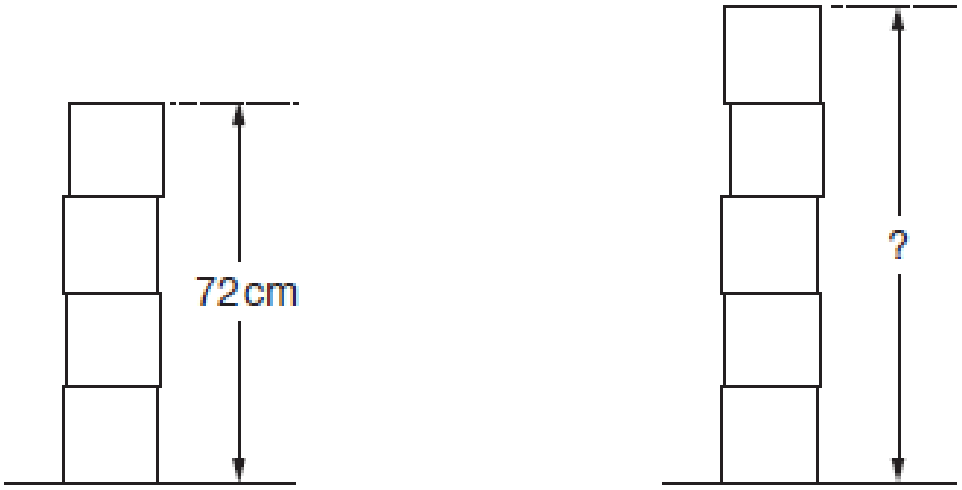
How tall is the stack now?

What do you know?
What can you find out?

Lisa has some boxes that are all cubes of the same size.

She uses four of the boxes to make a pile with a height of **72cm**.

She puts one more box on top of the pile.

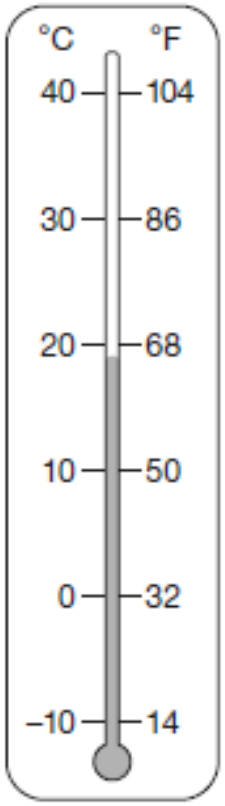


Work out the height of the pile of **five** boxes.

Y7 2009 L5-7

Using the drawings

This thermometer shows temperatures in both °C and °F.



Work out what **25 °C** is in °F.

What do you know?

What can you find out?

Look for easy ways.

A shape is made up of a square and rectangle.

The perimeter of the shape is 70cm.

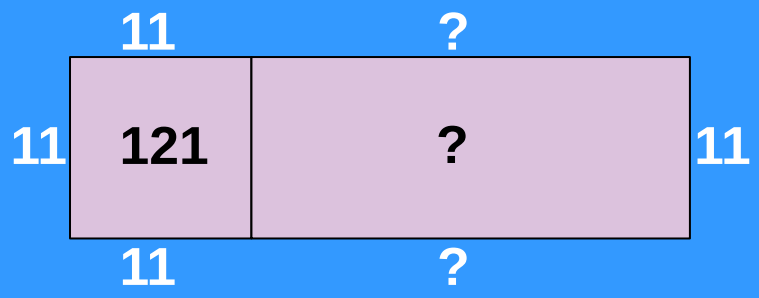
The area of the square is 121cm^2

What is the area of the rectangle?

What do you know?

Label what you know.

What can you find out?



What can you find out?

$70 - 44 = 26$

$26 \div 2 = 13$

$13 \times 11 = 143$

A shape is made up of a square and rectangle.

The perimeter of the shape is 70cm.

The area of the square is $121cm^2$

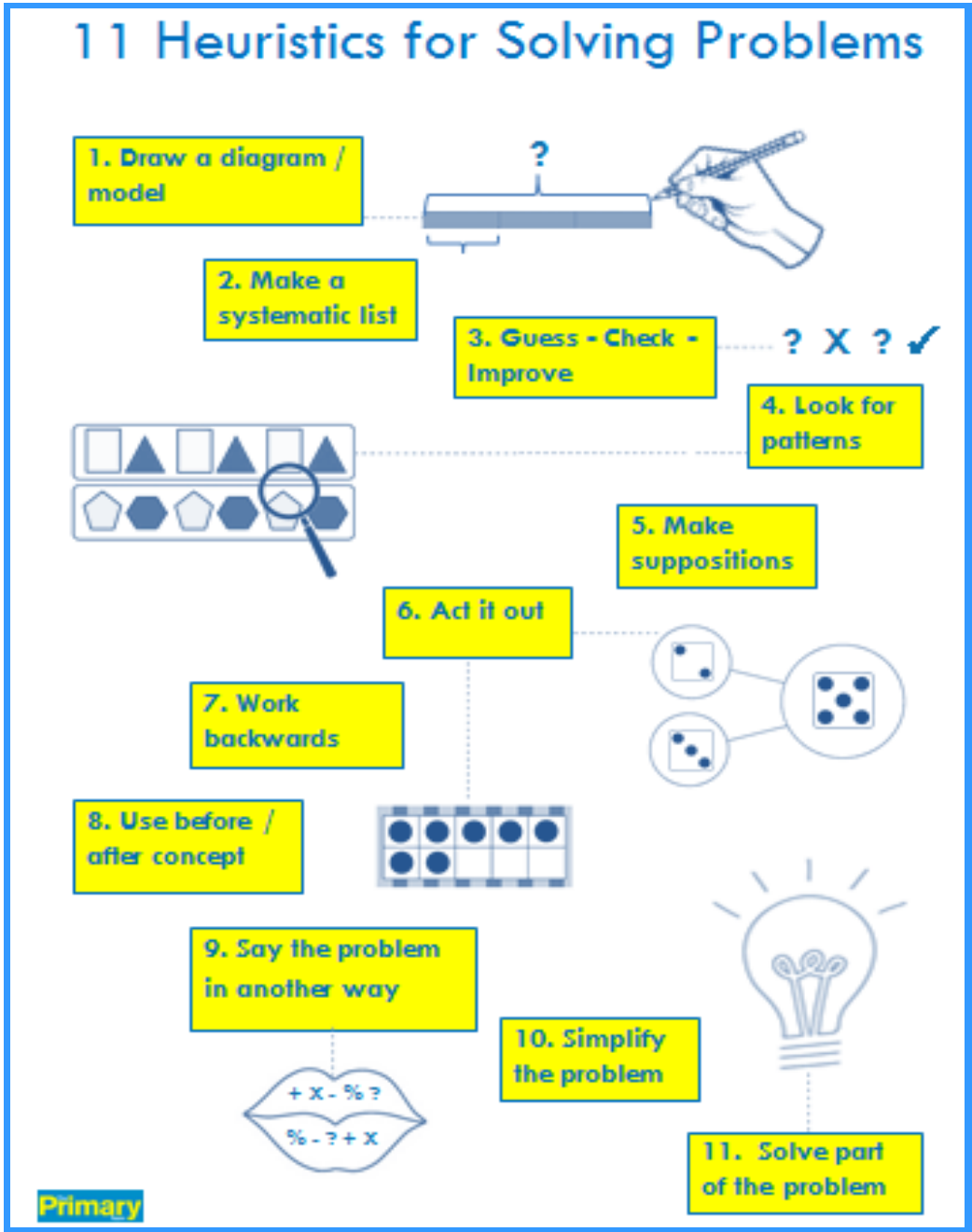
What is the area of the rectangle?

Teaching children heuristics to help them solve mathematical problems

The key to successful problem solving is finding the starting point, which requires flexible and logical thinking, not simply following a procedure.

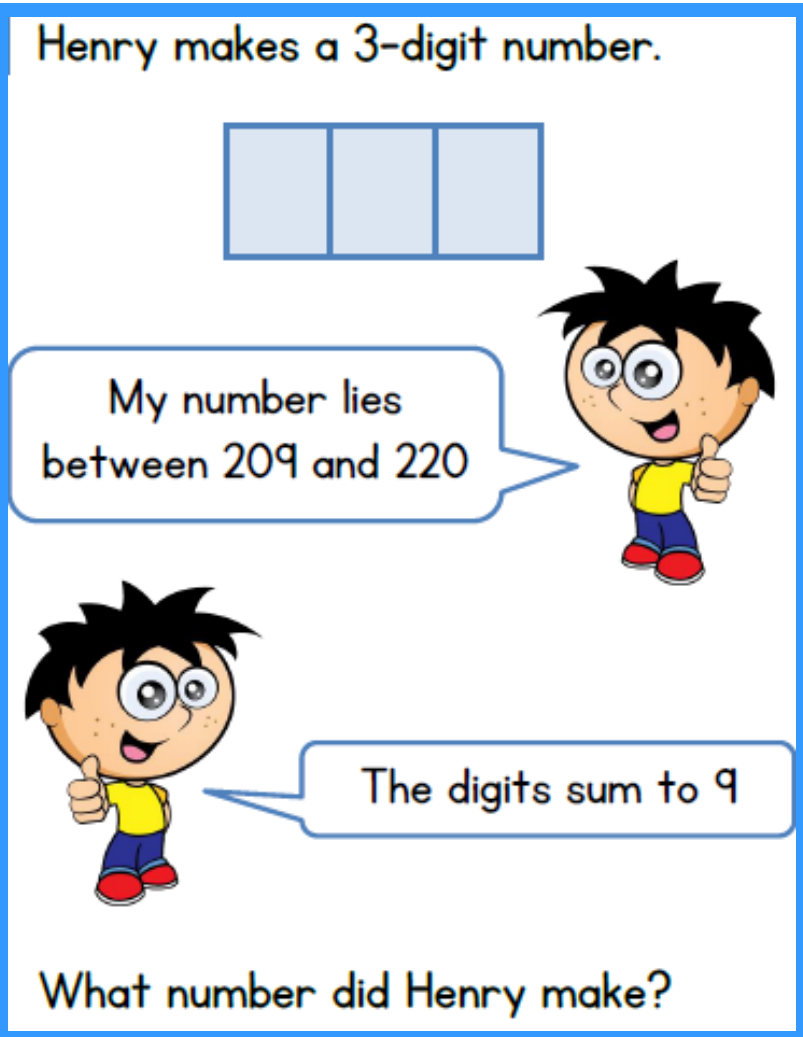
The use of heuristics (problem-solving rules) can help greatly to improve a child's problem solving performance.

The word heuristics originates from the Latin word *heuristicus*, which means to find out or to discover.



It is extensively recognised and accepted that heuristics should be and can be taught. The crucial point is that heuristics are about ideas, not routine steps.

Children will learn to choose the most suitable heuristics resulting in more efficient ways of solving a problem.



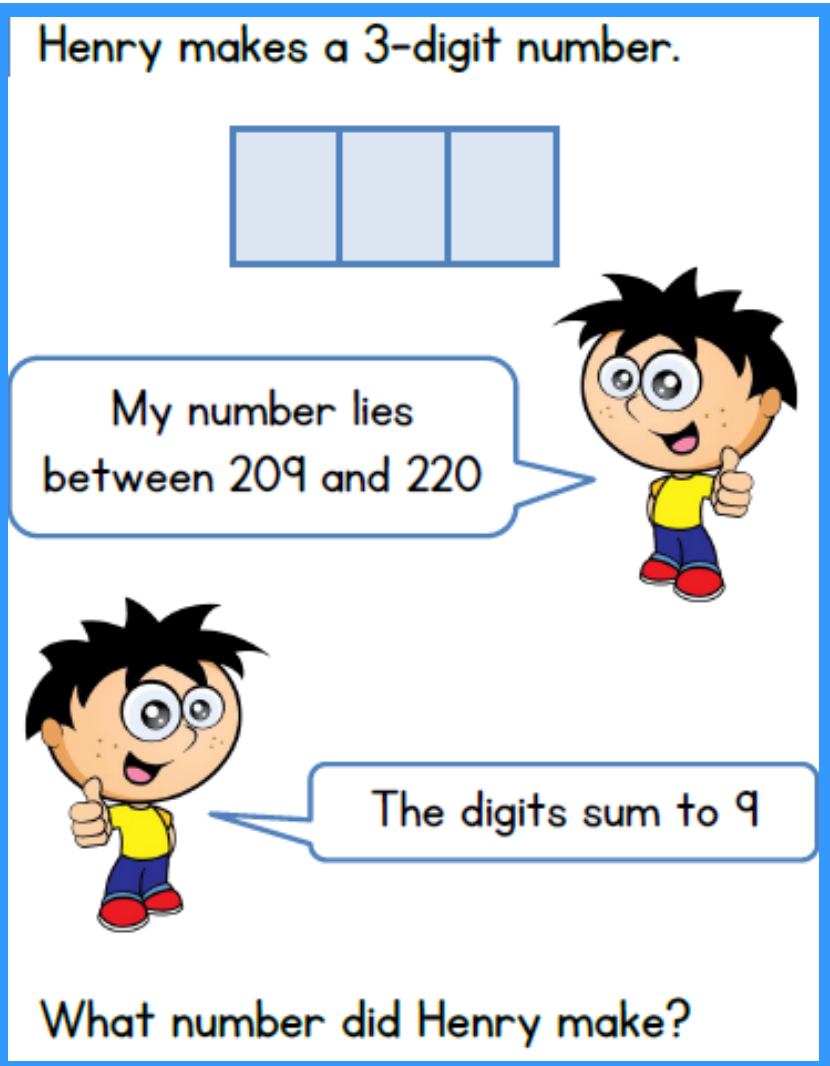
What heuristics could children use to help them solve this problem?

Guess and check

Make a supposition

Make a list

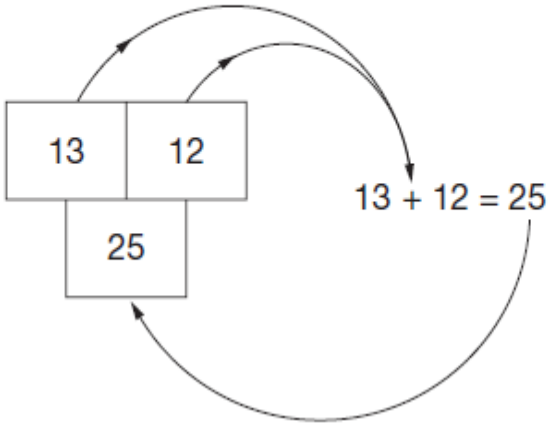
Look for patterns



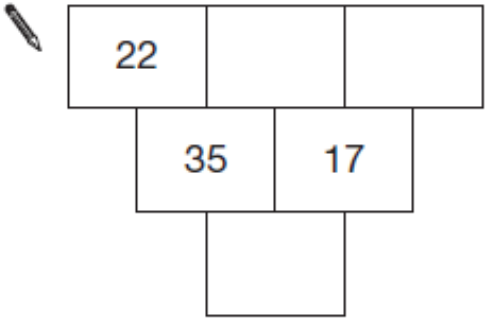
What heuristics could children use for this?

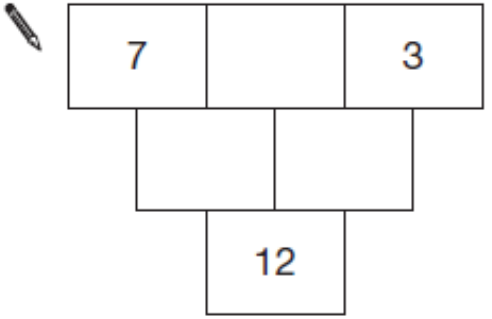
In these number grids, two numbers are added to give the number below.

Example:



Write numbers in the number grids below to make them correct.





Heuristic: guess - check – improve

Put the **same** number in each box to make the calculation correct.

140 + 10 - ☐ = ☐ - 30

Consider how children could use guess-check-improve to solve this problem…

140 + 10 – 100 = 50 **100 – 30 = 70**
140 + 10 – 110 = 40 **110 – 30 = 80**
140 + 10 – 90 = 60 **90 – 30 = 60**

Guess and check (or trial and improvement) is perhaps an undervalued skill as children may feel they are only using it because they do not know the 'right' way to solve the problem.

Show children that trying something out will always give more insight into the context which will give the solver a better idea of what to try next. Trial and improvement is often the start of working systematically.

Find the two **square numbers** that add together to make 100.

_____ and _____

Heuristic: guess and check

Use 4 **different** digits to complete this multiplication calculation:

□ x □ x □ x □ = 168

How many different solutions can you find?
Have you found them all? Explain your reasoning.

Support children to think logically in order to make a calculated guess…
Why can't 5 be one of the digits?
Why can't 9 be one of the digits?

Heuristic: guess and check

Use 4 **different** digits to complete this multiplication calculation:

☐ x ☐ x ☐ x ☐ = 168

~~6 x 4 x 3 x 2 = 144~~

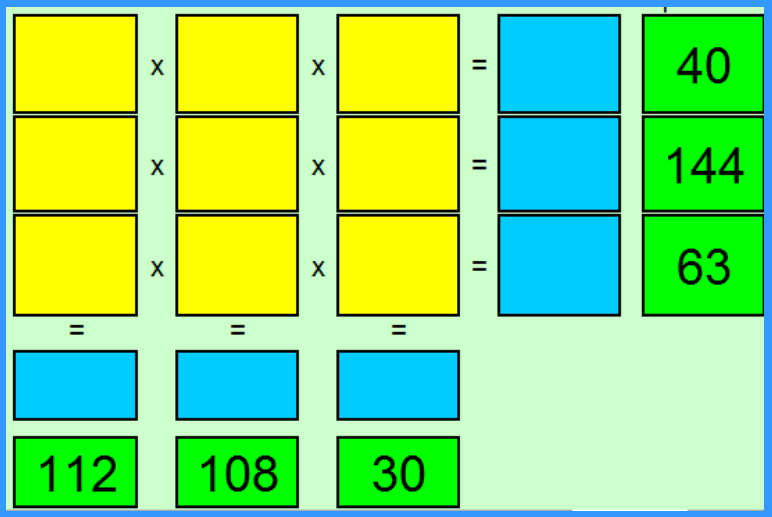
7 x 6 x 4 x 1 = 168

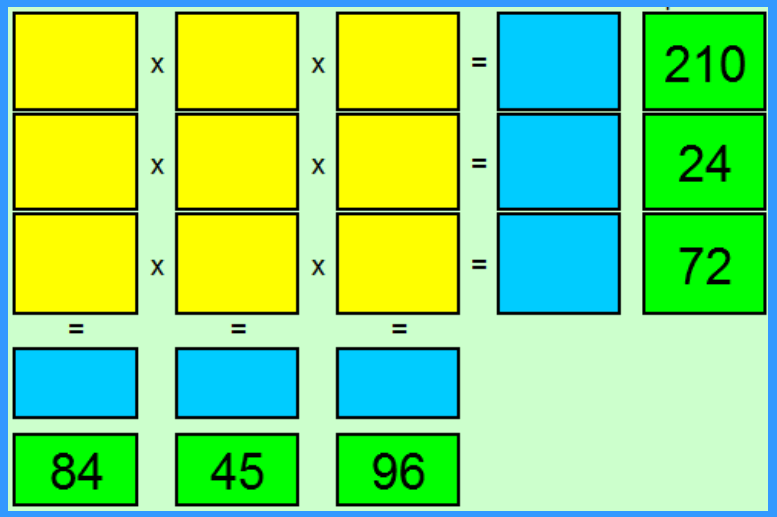
3 x 7 x 8 x 1 = 168

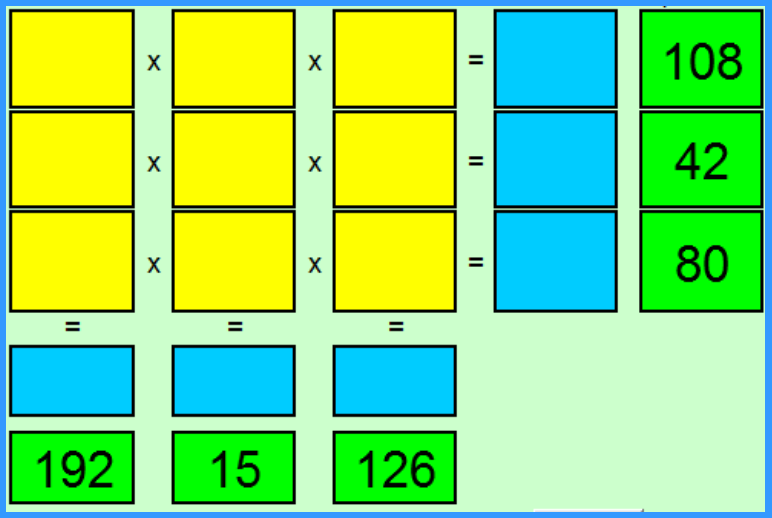
3 x 7 x 4 x 2 = 168

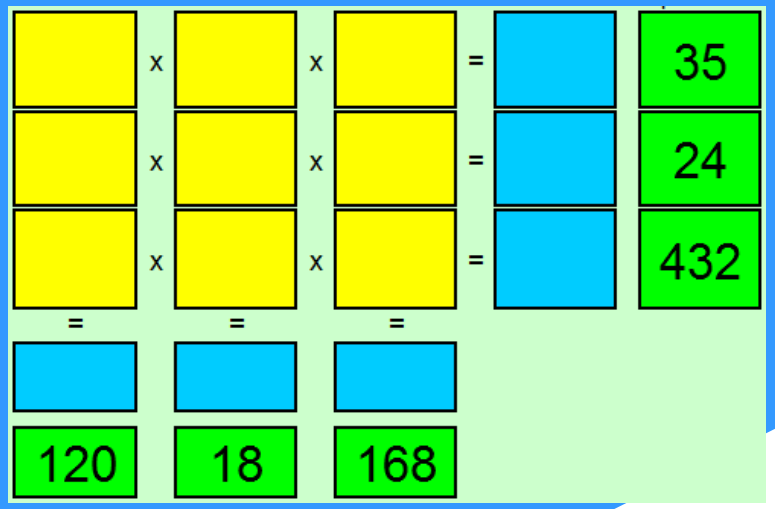
What do you notice?

Which number where?









Divisibility Rules

Dividing by 1: If you divide any whole number by 1, you always get a whole number.

Dividing by 2: Even numbers "evenly" divide into 2. Odd numbers divide into 2 with an "odd one out".

Dividing by 3: Add up the digits (twice, if necessary); if the sum is divisible by 3, then the number is too. Let's say you need to divide 123: 1 + 2 + 3 = 6, which is divisible by 3, so 123 is divisible by 3. Another example: 678678. Add 6 + 7 + 8 + 6 + 7 + 8 = 42; 4 + 2 = 6, which is divisible by 3. That means 678678 is divisible by 3.

Dividing by 4: Look at the last two digits. If they are divisible by 4, the number is as well. For example, the last two digits of 2357924 are 24, which is divisible by 4. Therefore, 2357924 is divisible by 4.

Dividing by 5: If the last digit is a 5 or a 0, then the number is divisible by 5. For example, 2357925 is divisible by 5, because the last digit is a 5.

Dividing by 6: If the number is divisible by both 3 and 2, it is divisible by 6 as well. For example, 2157924 is divisible by 6 because it is even (divisible by 2) and the digits add up to 30, which is divisible by 3.

Dividing by 7: To find out if a number is divisible by 7, take the last digit, double it, and subtract it from the rest of the number without the last digit. If you get an answer divisible by 7 (including 0), then the original number is divisible by 7. If you don't know the new number's divisibility, you can apply the rule again. For example, 161 is divisible by 7 because 2 x 1 (the last digit) = 2 and 16 – 2 = 14, which is divisible by 7.

Dividing by 8: If the last three digits of a number are divisible by 8, then so is the whole number. How do you check the last three digits? If the first digit is even, and the last two digits are divisible by 8, the number is divisible by 8. If the first digit is odd, subject 4 from the last two digits; the number will be divisible by 8 if the resulting last two digits are. For example:

- **2448:** Check the last three digits, 448. Here, 4 is even and 48 is divisible by 8, so 2448 is also divisible by 8.
- **192:** Here, 1 is odd, so you need to subtract 4 from the last two digits: 92 – 4 = 88; 88 is divisible by 8, so 192 is as well.

Dividing by 9: Add the digits. If they are divisible by 9, then the number is as well. For example 52866 is divisible by 9 because 5 + 2 + 8 + 6 + 6 = 27, and 27 is divisible by 9.

Dividing by 10: If the number ends in 0, it is divisible by 10.

Dividing by 11: Keep subtracting the last digit from the previous digits until you can tell if the resulting number is divisible by 11. For example: 645634 is divisible by 11 because 64563 – 4 = 64559; 6455 – 9 = 6446; 644 – 6 = 638, 63 - 8 = 55, and 55 is divisible by 11.

Dividing by 12: Check for divisibility by 3 and 4.

A jar contains 30 sweets.

The weight of the jar and sweets is 620g.

David eats 12 sweets.

The weight of the jar and sweets is now 440g.

How much does the jar weigh?

What heuristics could children use to help them solve this problem?

Solve part of the problem

Work backwards

Draw a model

Before-after concept

A jar contains 30 sweets.

The weight of the jar and sweets is 620g.

David eats 12 sweets.

The weight of the jar and sweets is now 440g.

How much does the jar weigh?

Heuristic: draw a model

Algebra

$2q + 4 = 100$

Work out the value of q.

$q =$ ☐

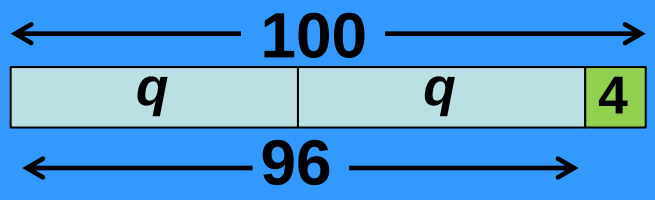
$2q + 4 = 100$

Work out the value of q.

$q =$ ☐

Word Problem Checklist

1. What do you know and what don't you know?
2. What is the whole and what are the parts?
3. Draw a model and label what you know.
4. Write the calculation.
5. Estimate then do the calculation.
6. Check the problem and your answer.



Encourage children to use a bar model to visualise algebra questions

Heuristic: draw a model

Algebra

One egg and one slice of toast costs £1.94

Three eggs and two slices of toast costs £5

How much does one slice of toast cost?

A football and toy train together weigh 360g.

Three footballs and two toy trains weigh 810g.

Find the weight of a toy train.

Heuristic: draw a model

Comparison

A florist stocks three types of roses; pink, white and red.

Half of all the roses are pink.
There are 28 red roses and there are twice as many white roses as red ones.
The florist sells all of the roses at 20p each.
How much money does she receive for the roses?

Heuristic: draw a model

Ratio

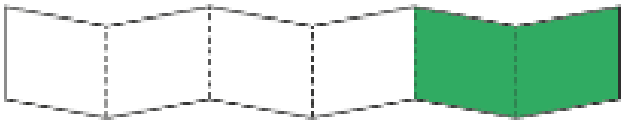
There are three 9 year olds to every five 10 year olds in Year 4. There are 88 children in Year 4.

How many are 10 years old?

Heuristic: draw a model

A tablet computer was reduced by 1/3 in a sale to £108. What was the original price?

Joe spent two thirds of his money on a game which cost £36. He then spent half of his remaining money on a book. How much money did he have left?



Heuristic: before-after concept

Mel, Martina and Pat have the **same** number of cards.

Mel and Martina each give Pat 4 cards.

Pat now has 17 cards.

How many cards do they have altogether?

Draw the ‘before’ model.

Then draw the ‘after’ model.

Label what you know.

Heuristic: before-after concept

Toby and Ada each have a pot containing the same number of counters.

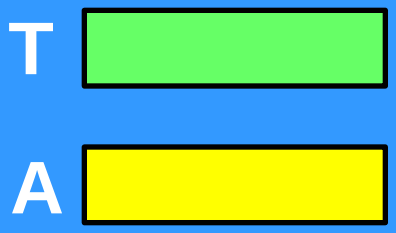
Ada puts half of her counters into Toby's pot.

Toby wants to make the number of counters in each pot equal again.

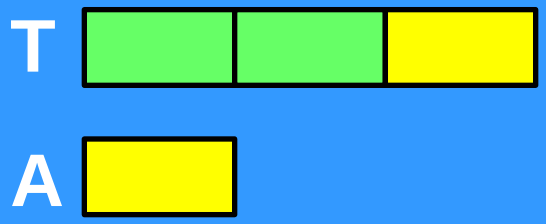
What fraction of the counters in his pot must Toby put into Ada's pot?

Heuristic: before-after concept

Before:



After:



Heuristic: work backwards

13 Lara chooses a number less than 20

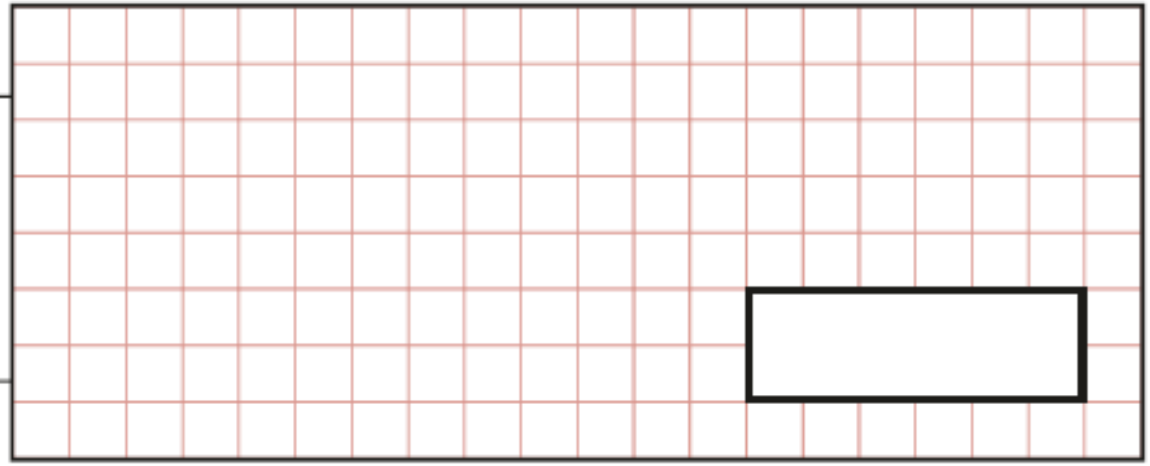
She divides it by 2 and then adds 6

She then divides this result by 3

Her answer is 4.5

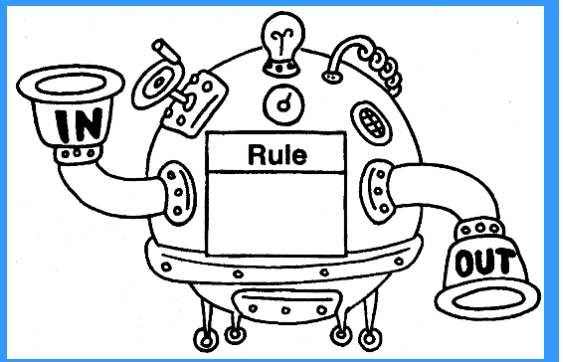
What was the number she started with?

Show your method



2 marks

Heuristic: work backwards



Function machines / mystery numbers…

If you add 5 to the number the answer is 36.

Halve the number then add 6 and the answer is 20.

Add 7 then double it, then subtract 2, and the answer is 22.

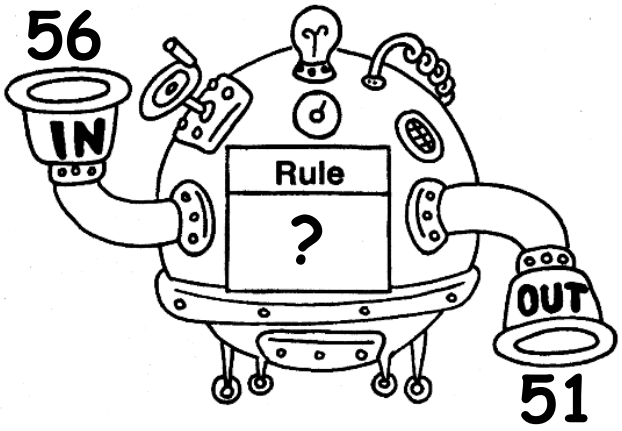
Multiply by 5, subtract 3 & divide by 8, and the answer is 4.

Choose any number, multiply it by 2, then multiply by 10, then divide by 100 and then multiply by 5.
What answer do you get? Why?

In	Rule	Out
50	?	80

In	Rule	Out
63	-10 -10	?

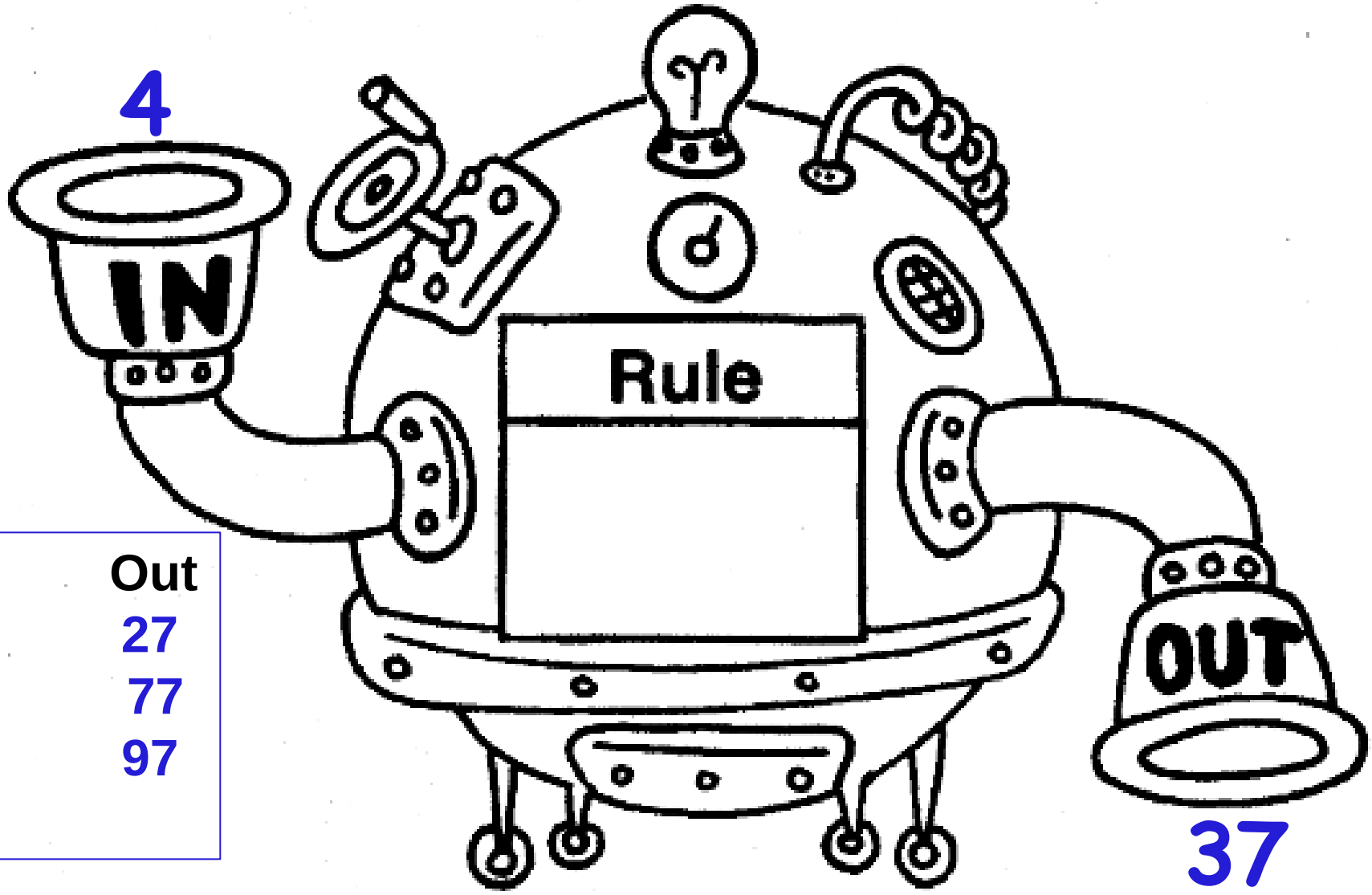
In	Rule	Out
?	+40 +20	70



Encourage children to create and use function machines and to write the related equations.

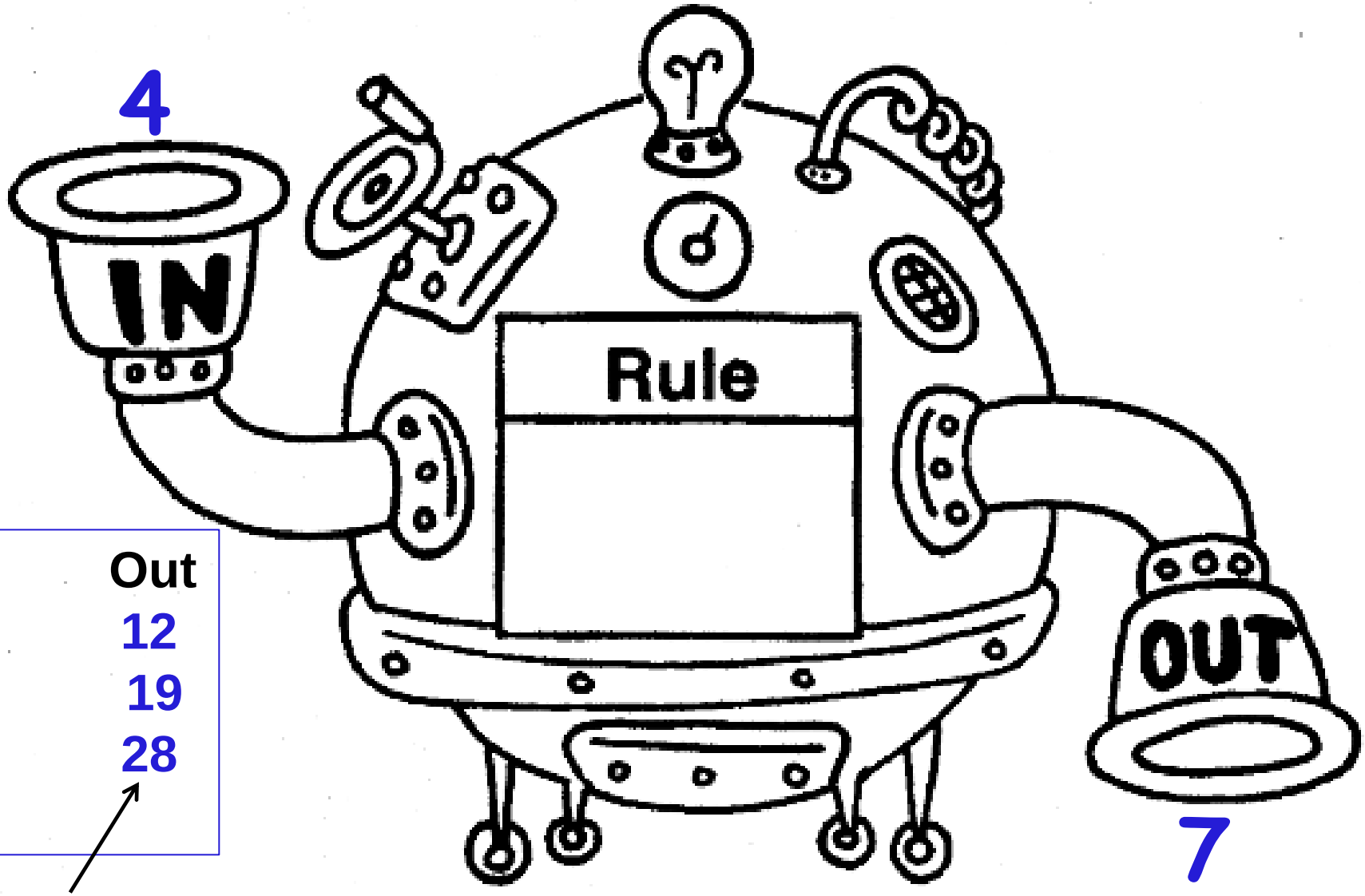
10 + 40 + 20 = 70 and 70 – 20 – 40 = 10

Guess my rule (2 steps or 3 steps)



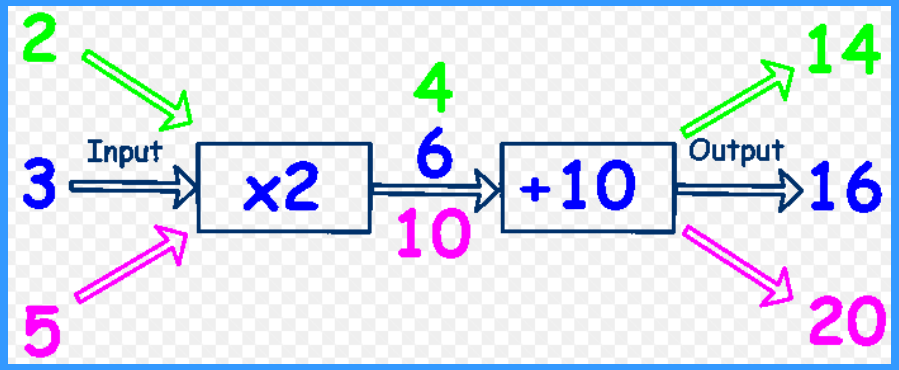
In	Out
3	27
8	77
10	97

Guess my rule (2 steps or 3 steps)

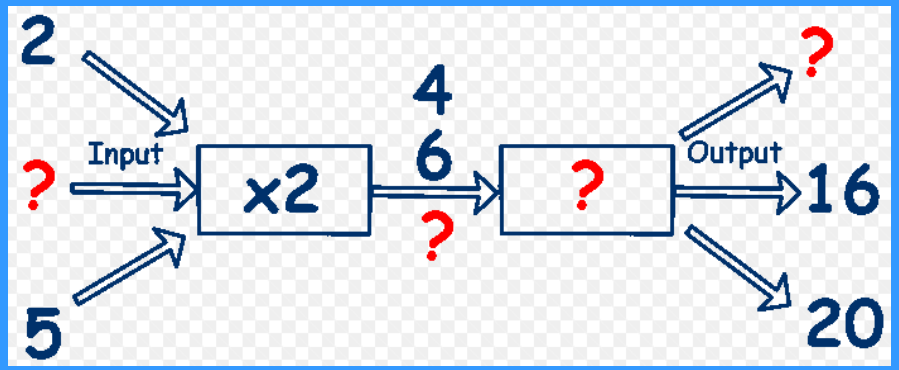


In	Out
6	12
8	19
10	28

What do you notice about these numbers?



Use function machines to help children with missing number problems:



What is my rule? Rule is x3 then +1

In	Out		In	Out
6	11		2	7
10	19		6	
12	23		11	
			5	

Heuristic: act it out

David and Anna have these cards.

1	2	3	5	6	7

David uses four of the cards to make a **pair of equivalent fractions.**

Write numbers in the boxes to show how David can do this.

$$\frac{\square}{\square} = \frac{\square}{\square}$$

Anna has the same cards.

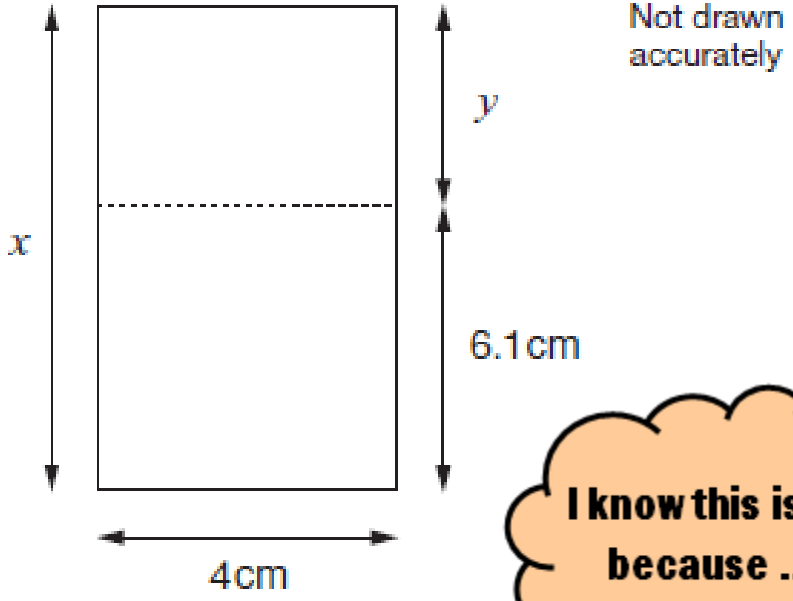
She uses four of the cards to make a **different pair of equivalent fractions.**

Write numbers in the boxes to show how Anna can do this.

$$\frac{\square}{\square} = \frac{\square}{\square}$$

Heuristic: solve part of the problem

Look at the rectangle.



The **total area** of the rectangle is **40 cm²**

Work out lengths x and y

I already knew ..... so this helped me work out .....

The thing I noticed was .....

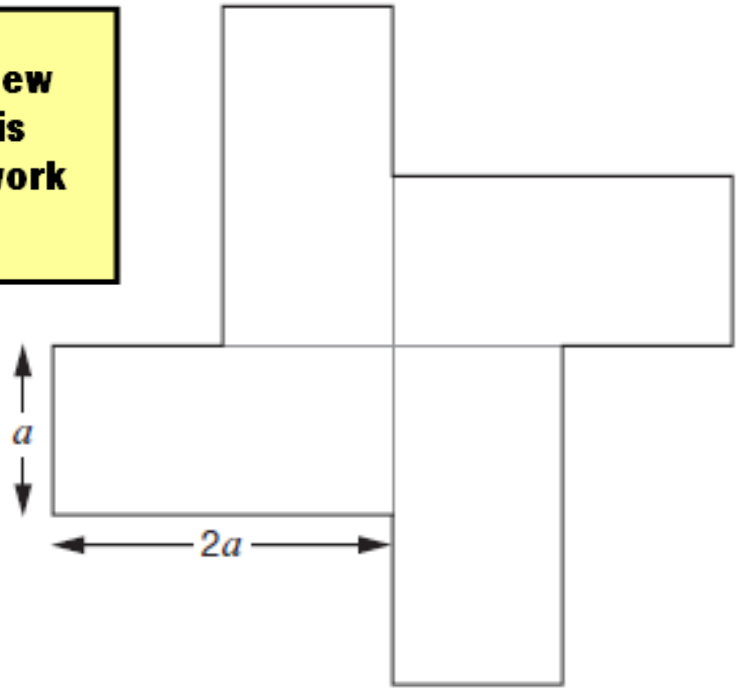
What do you know?

I know this is true because .....

Heuristic: solve part of the problem

This shape is made of four congruent rectangles.

Each rectangle has side lengths $2a$ and a



Not drawn accurately

The **perimeter** of the shape is **80 cm**.

Work out the **area** of the shape.

I already knew ..... so this helped me work out .....

The thing I noticed was .....

What do you know?

I know this is true because .....

Heuristics: say the problem in another way / simplify the problem

18 Write the missing number.

$70 \div \square = 3.5$

Say the problem in another way

70 divided by 3½ = ? ***or*** **3.5 times something is 70** ***or*** **How many 3½s in 70?**

Simplify the problem

Double each number in the problem (140 ÷ ☐ = 7)

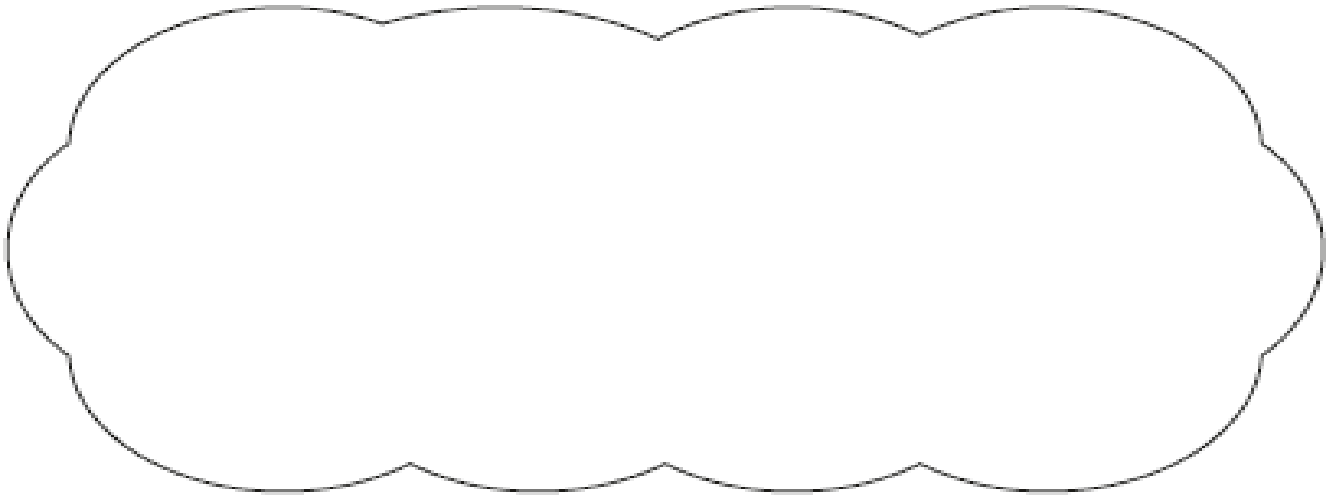
Half of 70 is 35 and 35 ÷ 3.5 = 10 so 70 ÷ 3.5 must be double that (20)

If 70 ÷ 10 = 7, 70 ÷ 20 = 3.5

21

$$5{,}542 \div 17 = 326$$

Explain how you can use this fact to find the answer to **18 × 326**



1 mark

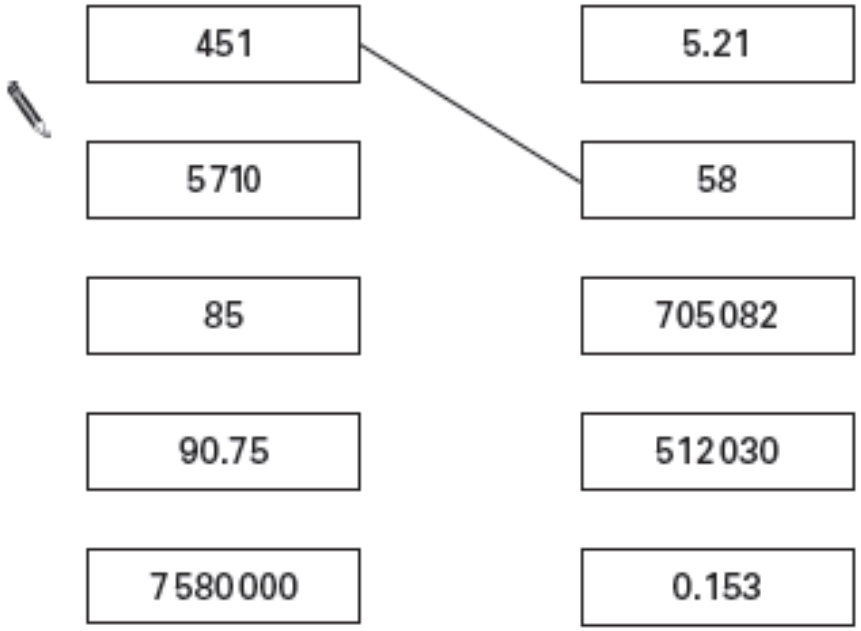
Say the problem in another way.
Explain in a clear, mathematically correct manner.

21	An explanation that shows that 5,868 can be made by adding 326 to 17 × 326, e.g. • '5542 + 326 = 18 × 326' • '18 × 326 is 326 more than 5,542' • 'Because this is the same as 17 × 326 = 5542 so add one more 326 to get the answer' • 'You add 326 to 5,542 and your answer will be correct' • 'Because you can add 326 to the answer of 17 × 326' • '5542 + 326'.	**1m**	**Do not** accept an explanation that simply calculates 326 × 18 = 5,868 **Do not** accept vague or incomplete, or incorrect explanations, e.g. • 'You could add another 326' • 'The difference between 17 and 18 is 1 so you add 326 and that is one more' • 'Because if you turn the question around you would see that 17 × 326 = 5542 so all you need to do is times the number one more time' • '5,542 + 326 because it is one more'. • 5868 – 326 = 5542

Question styles in the KS2 Mathematics test

Draw lines to match the numbers where the digit **5** represents the same value.

The first is done for you.



Matching/sorting in a variety of ways

$7 < \ldots\ldots 10 \ldots\ldots < 11$

$7 < \ldots\ldots\ldots\ldots < 8.5$

$7 < \ldots\ldots\ldots\ldots < 7.5$

$7 < \ldots\ldots\ldots\ldots < 7.05$

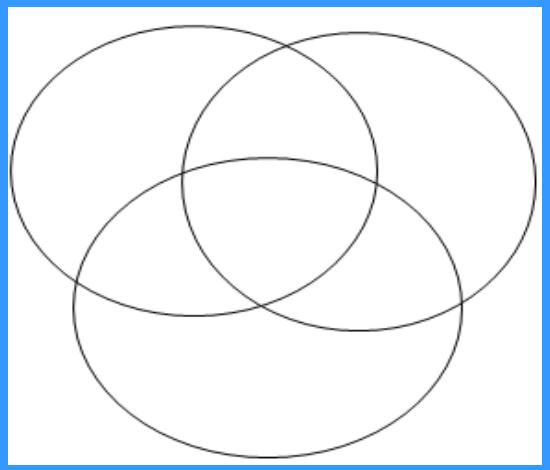
Completing statements / equations

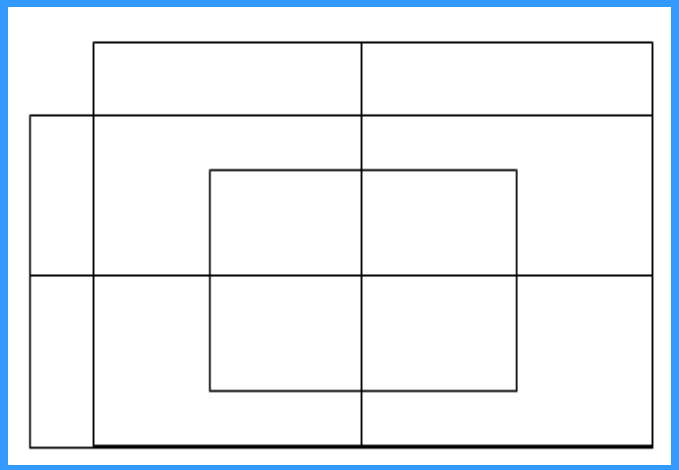
Using sorting activities to help children revise number properties and make connections

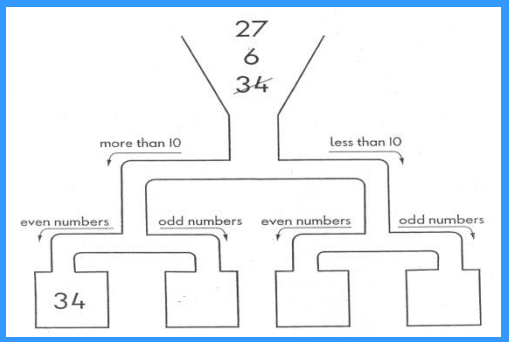
Create your own sorting diagram for multiples of 3 & multiples of 8 that are less than 50.

Three attribute sorting diagrams

You can use John Venn's diagram, Lewis Carroll's square with a subset, or you can design your own (and name it after yourself!)







Compare your sorting diagrams.

What do you notice?
What's the same? What's different?
What generalisations can you make?

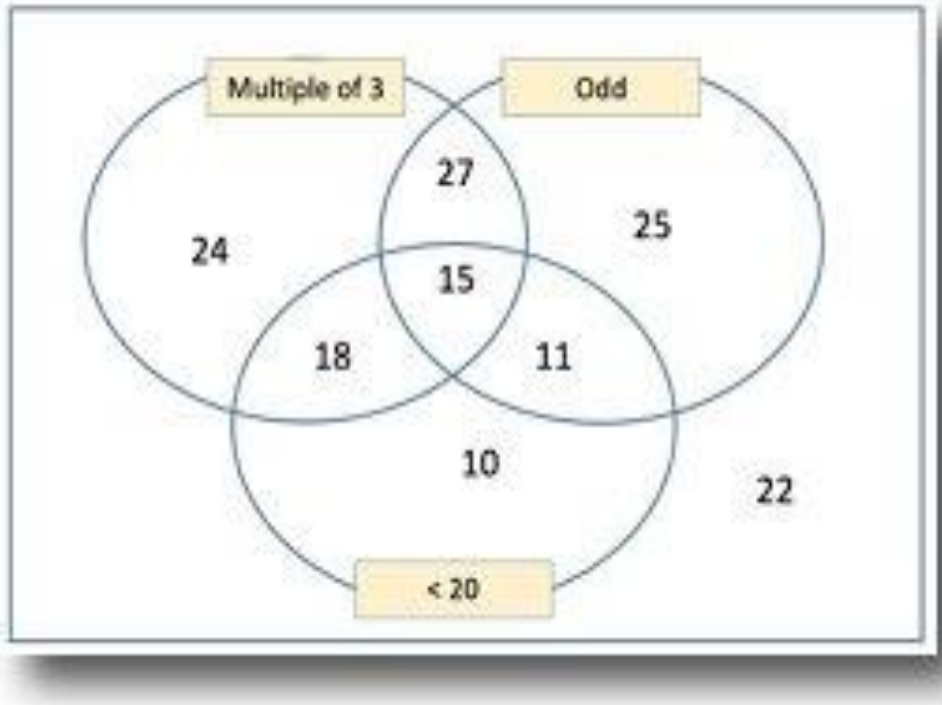
Use your diagram to answer this SAT question from last year:

Write **all** the common multiples of 3 and 8 that are **less than 50**

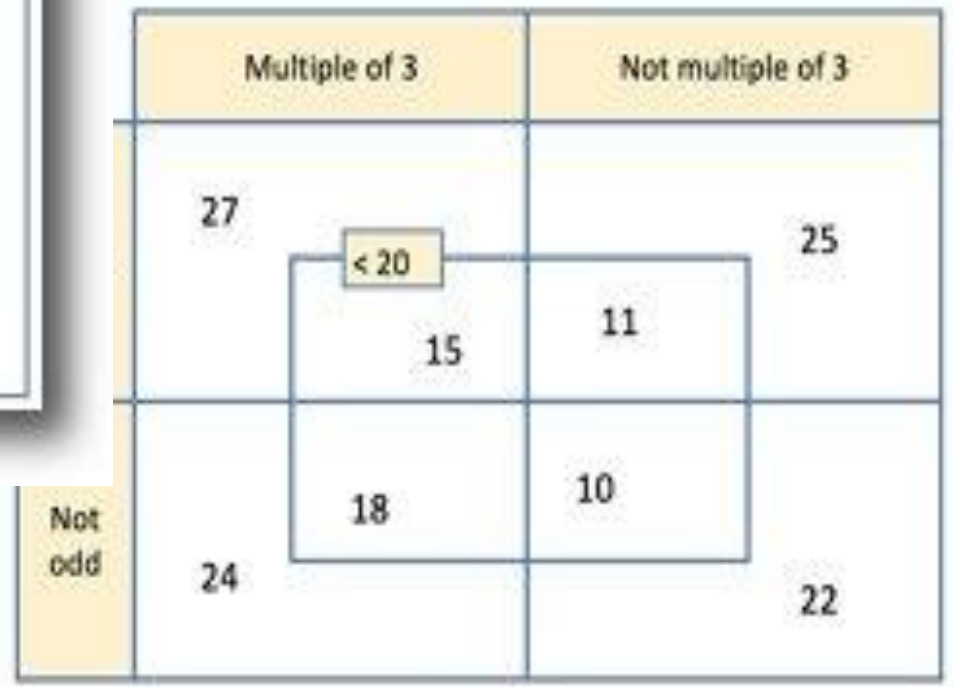
2016 KS2 SATs Paper 2 Question 14

Three attribute sorting diagrams

Encourage children to compare Venn and Carroll diagrams with the same data:



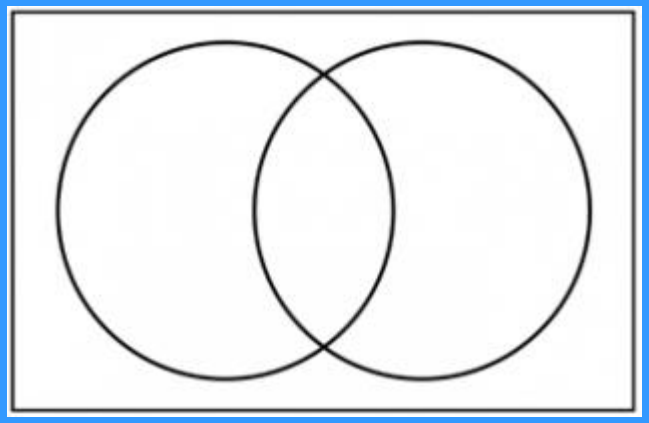
What is each region the set of?



What other numbers could go in each region?

Children should deconstruct a Carroll diagram and reconstruct it as a Venn diagram (& vice versa).

	7 56 35	140 490
	18 24 51	30 500



They could also work out the captions for a completed Venn diagram then recreate it as a Carroll diagram.

Link to useful resources from Nottingham's Primary Team:

goo.gl/Zwrj7I

External links to other useful resources:

https://www.tes.com/teaching-resource/reasoning-and-problem-solving-questions-collection-ks1-and-ks2-11249968

https://www.thirdspacelearning.com/

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