

Problem Solving

Level C

Pages 28 - 47

Strategies

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'Unit' refers to the Programme of Study

'Acting out' at level C

Problem Solving
act out the situation
(Level C) page 28

Numbers in order

You need cards, each with a number from 1 to 1000, and some pupils (the whole class can be chosen). The numbers on each card should be written large enough so they can be easily read by all the pupils in the class.

Mix up the cards and give one each to the chosen pupils who will now have their own number. It doesn't matter if there are numbers missing.

Get these pupils to line up either in ascending or descending order - they will have to sort themselves out according to their numbers.

The cards should be visible to the rest so that the class can decide whether the order is correct.

Numbers from 1 to 10000, or decimals to 1 dp, can also be used for ordering.

Extensions can also include sorting into groups according to other criteria, eg -

- * odd or even
- * divisible by 5 or not divisible by 5
- * less than or more than a given number
- * numbers greater than 150 but less than 250
- * numbers between 5.5 and 7.5

Spot the criterion

You as the teacher select a criterion for sorting the pupils without telling the pupils what it is.

For example a simple criteria would be 'girls', and by reading out all the girl names in the class the pupils would spot that the criterion was 'they are all girls'. Other criteria for sorting could include pupils

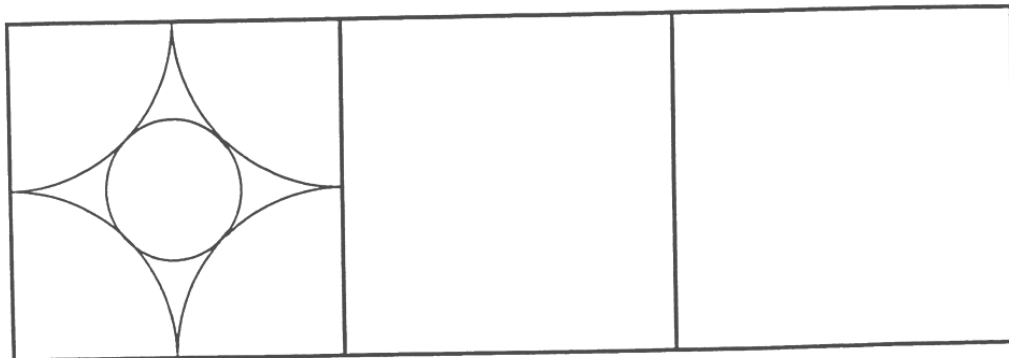
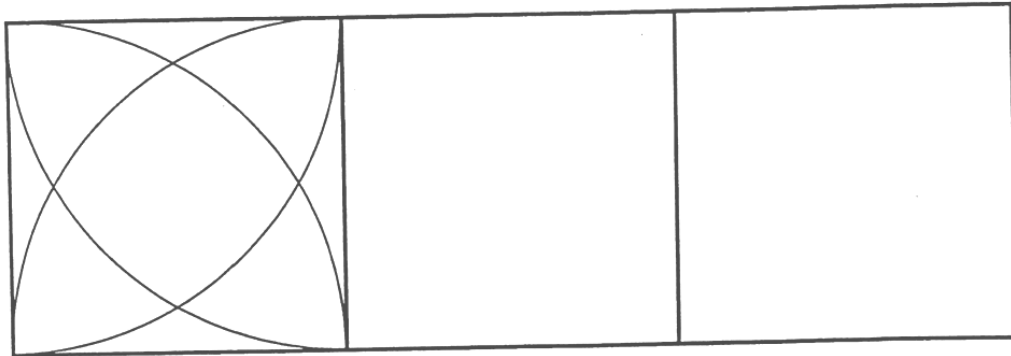
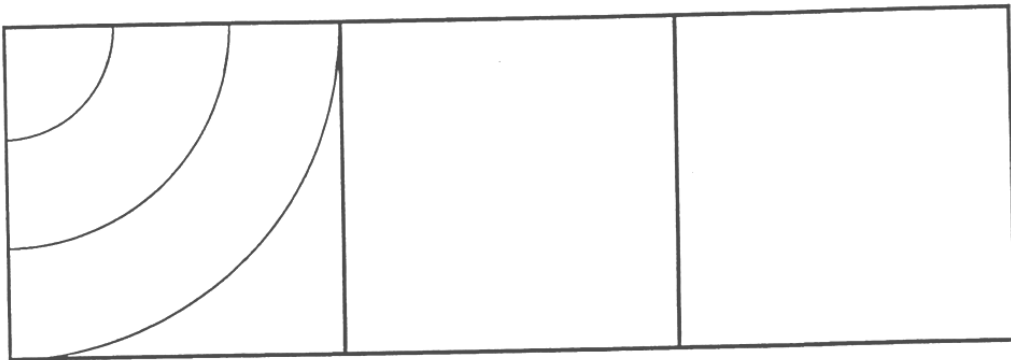
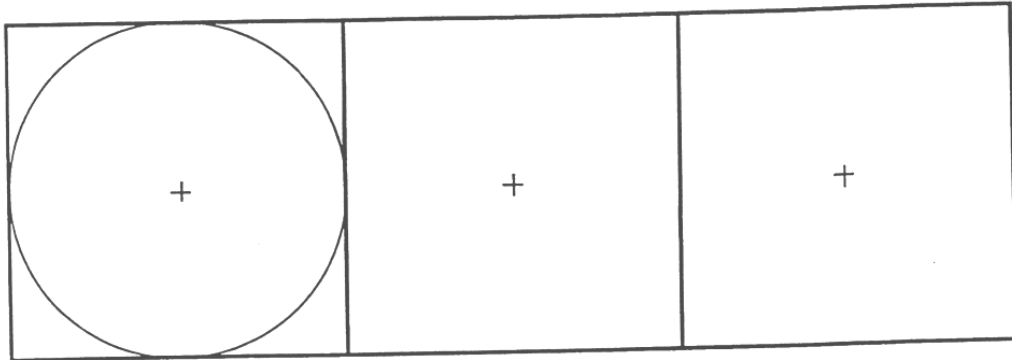
- * wearing a tie
- * with brown eyes
- * with dark hair
- * with a white shirt
- * in the green group for language
- * taller than 150cm
- * wearing trainers

You have to identify the pupils who meet the specific criterion, read out their names and get them to stand in a group.

An open ended activity would be to get the pupils to decide on criteria, get them to read out names and see if the rest of the class can identify the criterion for sorting.

Draw these pictures;

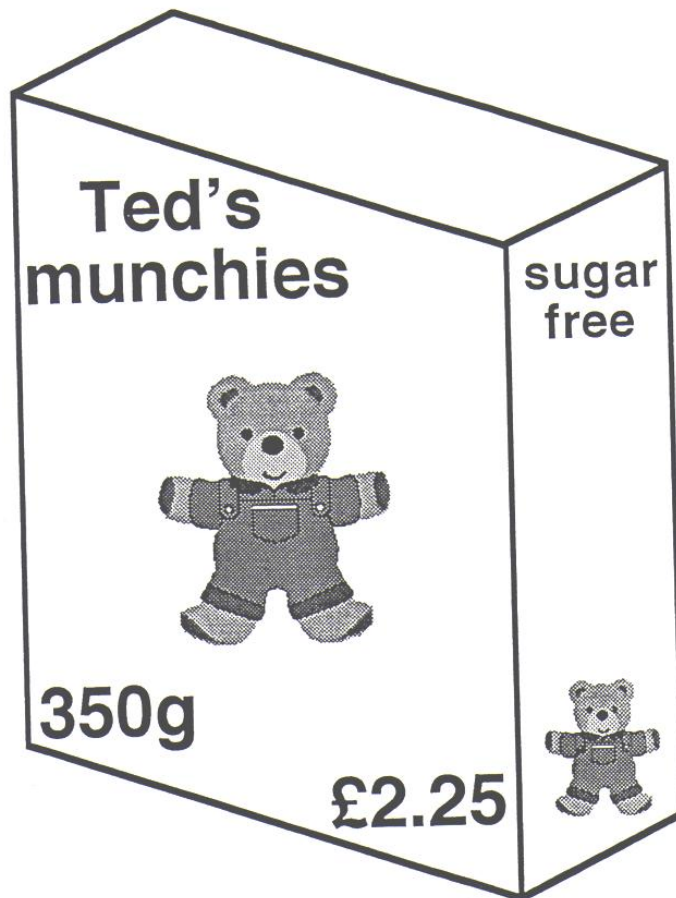
Problem Solving
draw a picture, make a model
(Level C) page 29



Make a cereal box

Get a cereal box, some card, scissors, a ruler, and glue or sellotape.

Make a real size model of your cereal box.



Give your cereal box a name, a weight in grams, and a price.

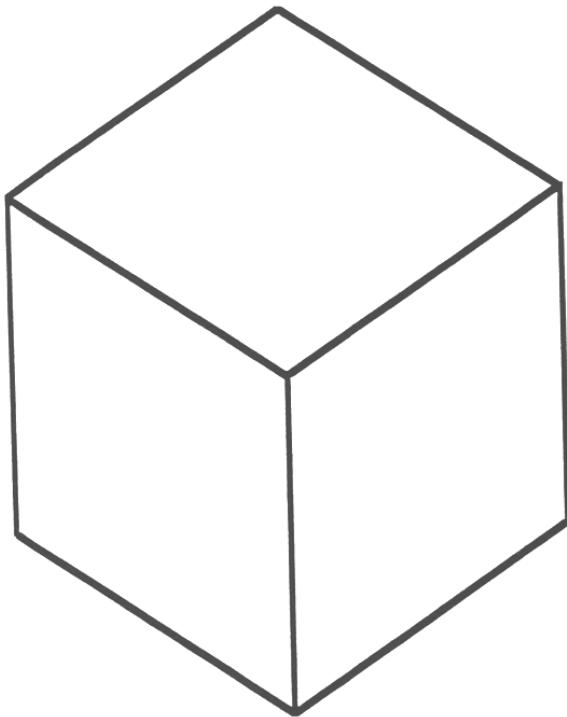
Design a picture, and give information about your cereal.

Cube it!

Get 100 cubes.

Use them to build the biggest possible cube you can.

There will be some cubes that you cannot use.

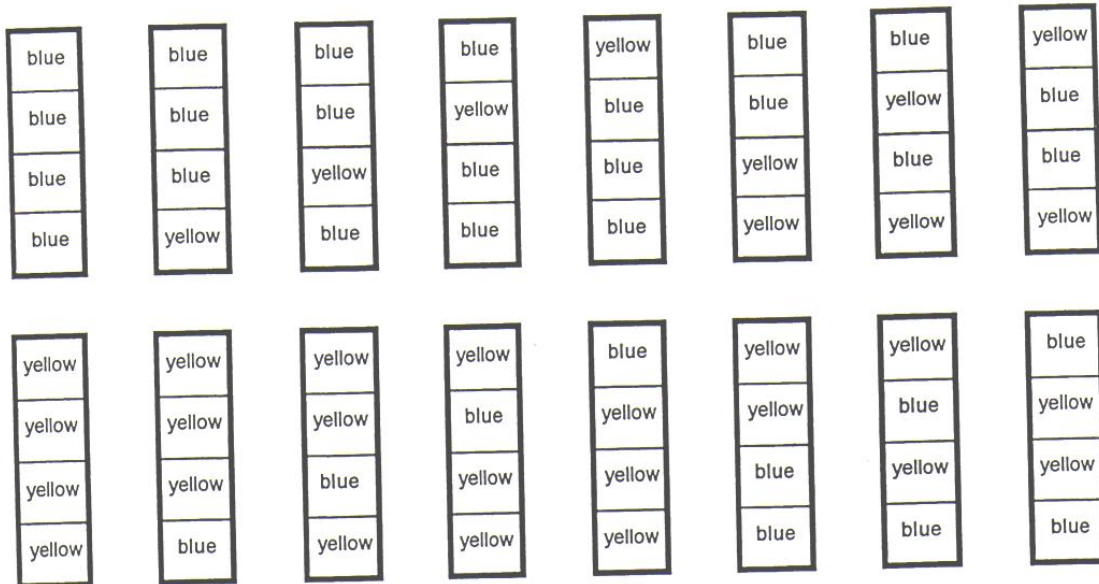
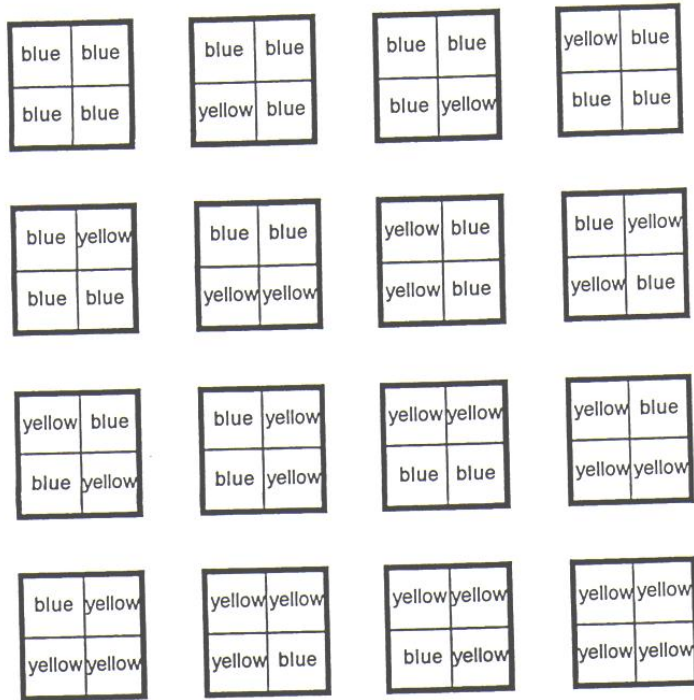


The biggest possible cube using up to 100 smaller cubes?

Pictures with blue and/or yellow

Take Problem Solving
draw a picture, make a model
(Level C) page 32

Make sure that each of the 16 flags are different when you use blue and/or yellow.

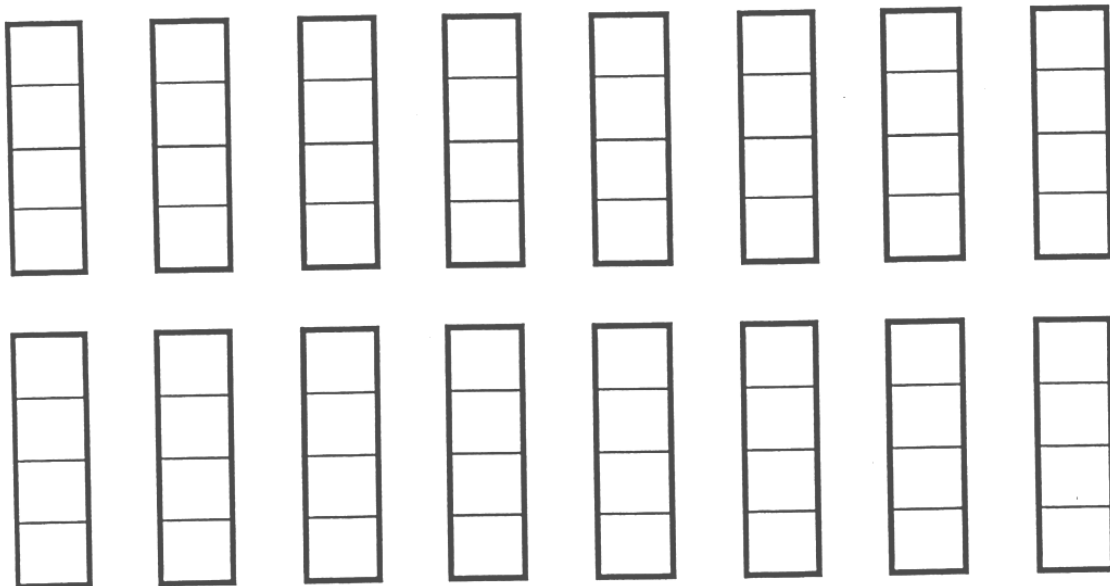
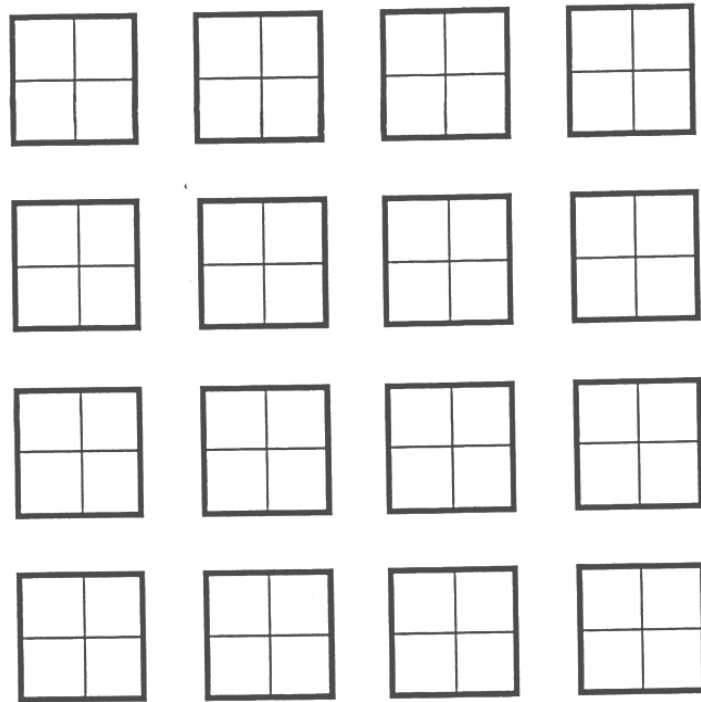


Make sure each of the 16 towers are different when you use blue and/or yellow.

Pictures with green and/or black

Take Problem Solving
draw a picture, make a model
(Level C) page 33

Make sure
that each of
the 16 flags
are different
when you use
green and/or
black.



Make sure each of the 16 towers are different
when you use green and/or black.

Keep these patterns going;

190, 192, 194, 196,,,,,,,

995, 996, 997, 998,,,,,,

7, 14, 21, 28,,,,,,

07:00, 07:20, 07:40, 08:00,,,,,

£6.50, £6.75, £7, £7.25,,,,,

3005, 3004, 3003, 3002,,,,,

642, 652, 662, 672,,,,,,

7m, 7.5m, 8m, 8.5m,,,,,

8, 16, 24, 32,,,,,,

10:54, 10:55, 10:56, 10:57,,,,,

£3.95, £3.96, £3.97,,,,,

2335, 2435, 2535,,,,,

430, 425, 420, 415,,,,,

£2.05, £2.04, £2.03,,,,,

Keep these patterns going;

Problem Solving
look for a pattern
(Level C) page 35

285, 288, 291, 294,,,,,,,

3995, 3996, 3997, 3998,,,,

6, 12, 18, 24,,,,,,,

08:35, 08:40, 08:45, 08:50,,,,

£6.24, £6.20, £6.16,,,,,

4005, 4004, 4003, 4002,,,,

153, 163, 173, 183,,,,,

7m, 6.5m, 6m, 5.5m,,,,,

9, 18, 27, 36,,,,,,

10:50, 10:52, 10:54,,,,,

£3.80, £3.84, £3.88,,,,,

2235, 2245, 2255,,,,,

461, 451, 441, 431,,,,,

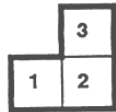
£2.65, £2.55, £2.45,,,,,

Stairways

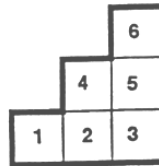
Problem Solving
look for a pattern
(Level C) page 36



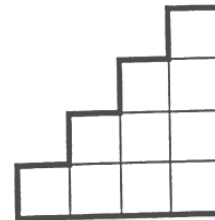
This stairway has
1 step and needs
1 cube



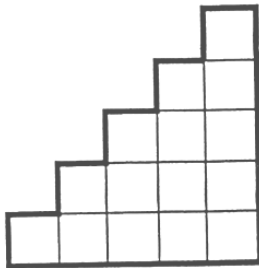
This stairway has
2 steps and needs
3 cubes



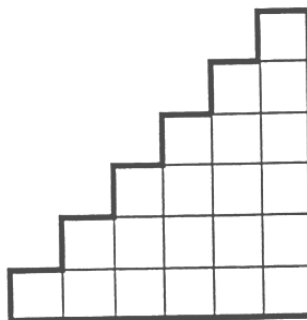
This stairway has
3 steps and needs
6 cubes



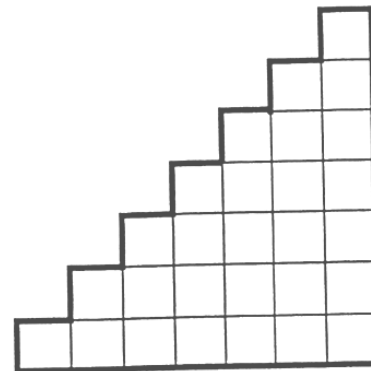
This stairway has
4 steps and needs
..... cubes



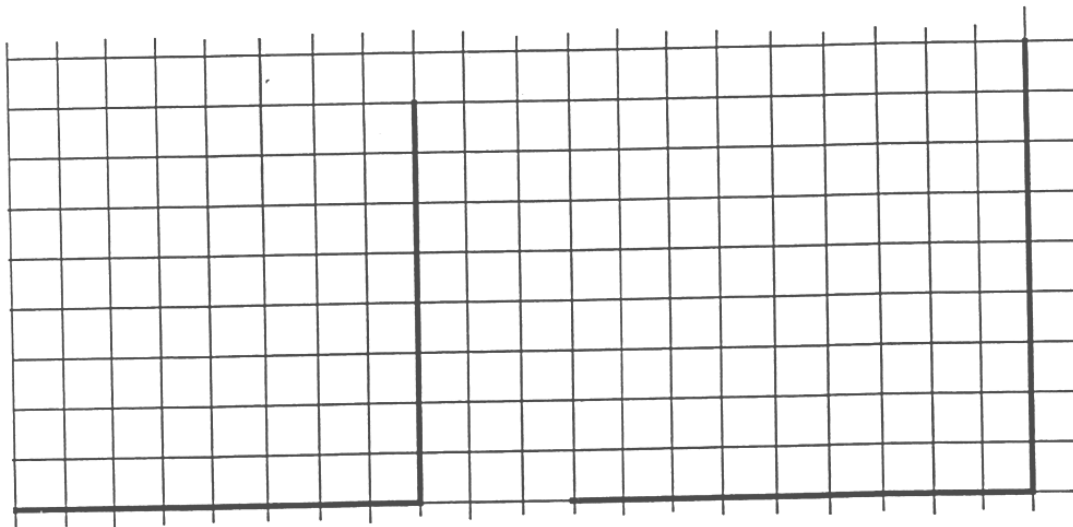
This stairway has
5 steps and needs
..... cubes



This stairway has
6 steps and needs
..... cubes



This stairway has
7 steps and needs
..... cubes



Draw a stairway with 8 steps.
How many cubes does it need?

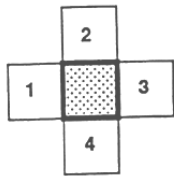
Draw a stairway with 9 steps.
How many cubes does it need?

Can you see a pattern for the size of stairway and number of cubes?

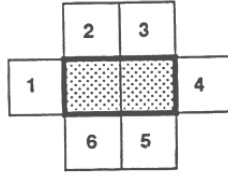
Can you predict how many cubes a stairway with 10 steps would need?

On squared paper draw a stairway with 10 steps, and count the cubes needed.

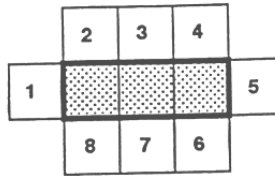
Tables and chairs



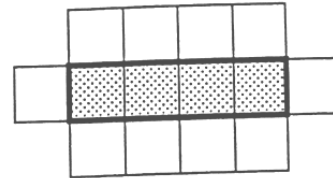
This table is
1 long and has
4 chairs



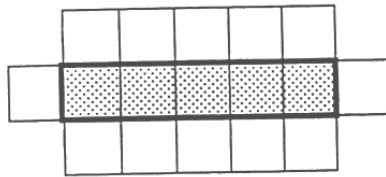
This table is
2 long and has
6 chairs



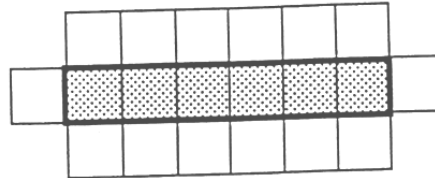
This table is
3 long and has
8 chairs



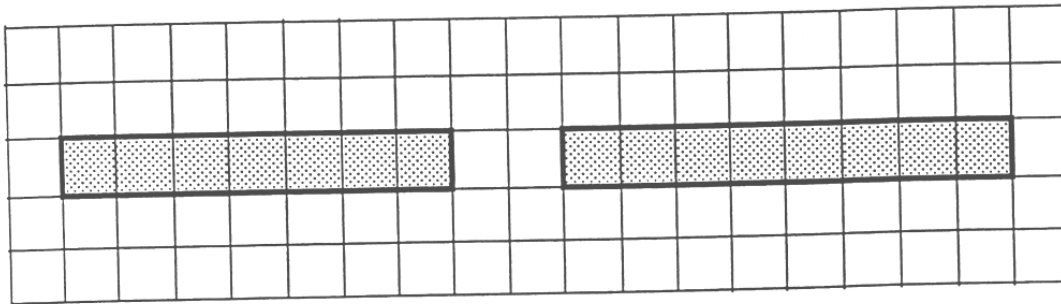
This table is
4 long and has
..... chairs



This table is
5 long and has
..... chairs



This table is
6 long and has
..... chairs



Draw the chairs round this 7 long table.
It has chairs

Draw the chairs round this 8 long table.
It has chairs

Can you see a pattern for the size of table and number of chairs?

Can you predict how many chairs a 10 long table would need?

On squared paper draw a table which is 10 long and count the chairs.

Can you predict how many chairs a 20 long table would need?

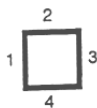
Can you predict how many chairs a 50 long table would need?

Can you predict how many chairs a 100 long table would need?

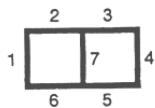
Can you predict how many chairs a 1000 long table would need?

Straws and squares

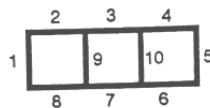
We can get lots of straws like this  and make squares with them



This 1 square needs 4 straws



These 2 squares need 7 straws



These 3 squares need 10 straws



These 4 squares need straws



These 5 squares need straws

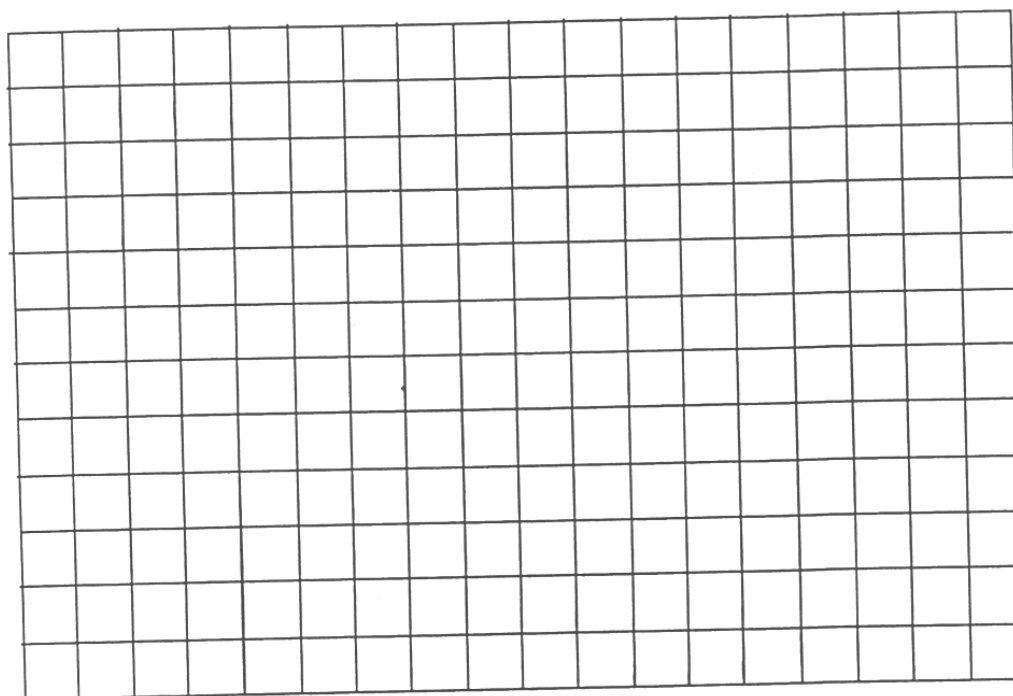


These 6 squares need straws



These 7 squares need straws

On the grid below; draw 8 squares to find how many straws are needed
draw 9 squares to find how many straws are needed



Can you see a pattern for the number of squares and number of straws?

Can you predict how many straws you would need for 10 squares?

Draw a 10 square to check your prediction.

Can you predict how many straws 100 squares would need?

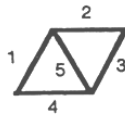
Can you predict how many straws 1000 squares would need?

Straws and triangles

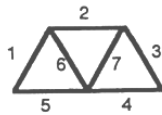
We can get lots of straws like this  and make triangles with them



This 1 triangle needs 3 straws



These 2 triangles need 5 straws



These 3 triangles need 7 straws



These 4 triangles need straws



These 5 triangles need straws



These 6 triangles need straws



These 7 triangles need straws



These 8 triangles need straws

~~On the grid below draw 9 triangles, and find how many straws, and draw 10 triangles, and find how many straws.~~

Can you see a pattern for the number of triangles and number of straws?

Can you predict how many straws you would need for 15 triangles?

Draw a 15 triangle to check your prediction.

Can you predict how many straws 100 triangles would need?

Can you predict how many straws 1000 triangles would need?

Make the sums correct

Problem Solving
guess, check and improve
(Level C) page 40

Make these sums correct by using only a 4, 6, 8, 24, 32 or 48.

$$\square + \square = 32$$

$$\square \times \square = 96$$

$$\square - \square = 8$$

$$\square \div \square = 6$$

$$\square \times \square = 48$$

$$\square + \square = 72$$

$$\square \div \square = 4$$

$$\square - \square = 26$$

$$\square + \square = 56$$

$$\square \times \square = 128$$

$$\square - \square = 18$$

$$\square \div \square = 12$$

Make these sums correct by using only a 2, 3, 6, 12, 18 or 36.

$$\square + \square = 30$$

$$\square \times \square = 72$$

$$\square - \square = 30$$

$$\square \div \square = 4$$

$$\square \times \square = 36$$

$$\square + \square = 48$$

$$\square \div \square = 3$$

$$\square - \square = 18$$

$$\square + \square = 54$$

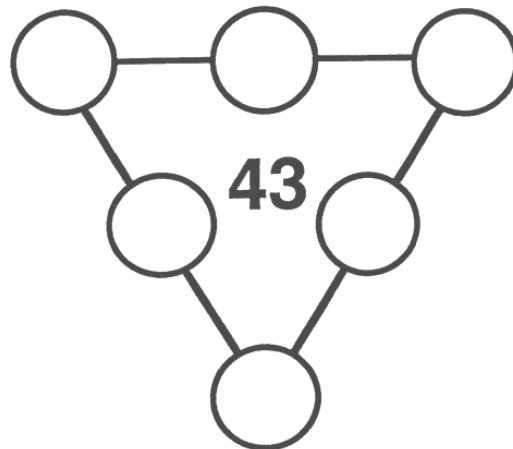
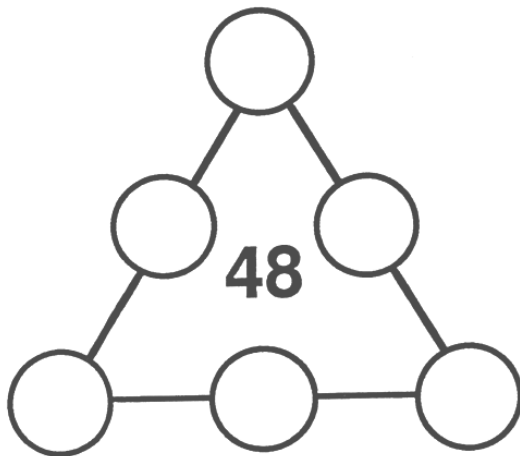
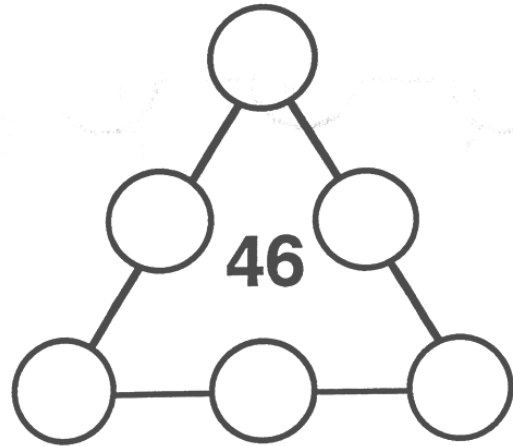
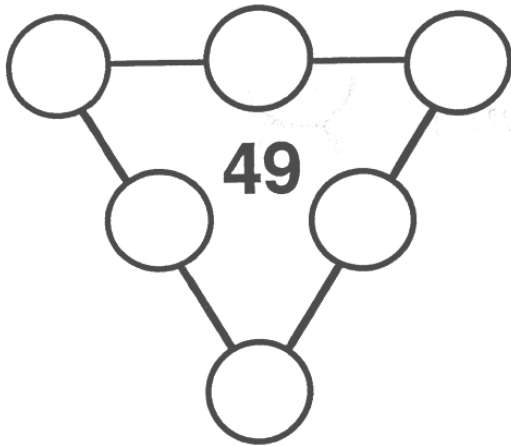
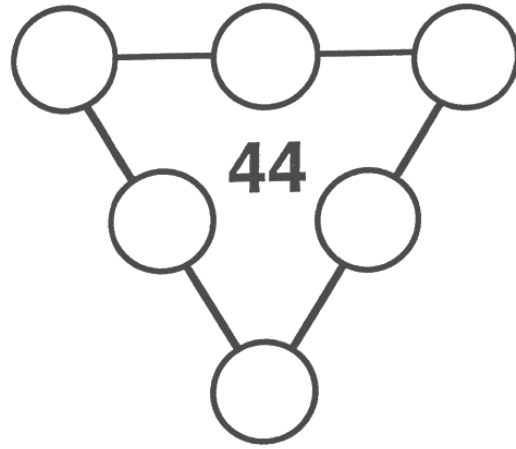
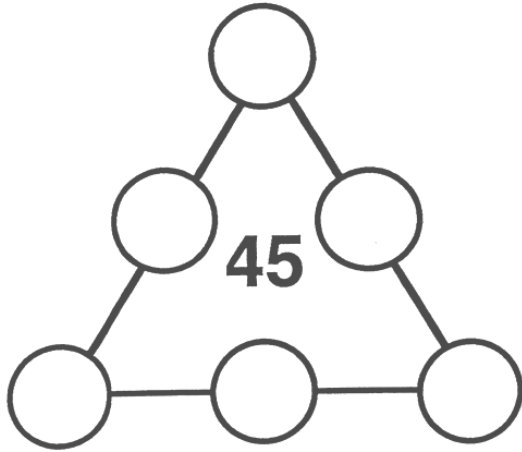
$$\square \times \square = 54$$

$$\square - \square = 24$$

$$\square \div \square = 6$$

Make the total;

Put any number from 11 to 19 into the circles
so that each line adds up to the number inside the triangle.



Make 100;

Pick 3 numbers from the grid so that they add up to 100 each time.

Use the strategy guess, check and improve, a pencil and a rubber.

19	44	23	37
21	17	31	35
46	33	48	50

Can you find different ways to make 100?

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

$$\square + \square + \square$$

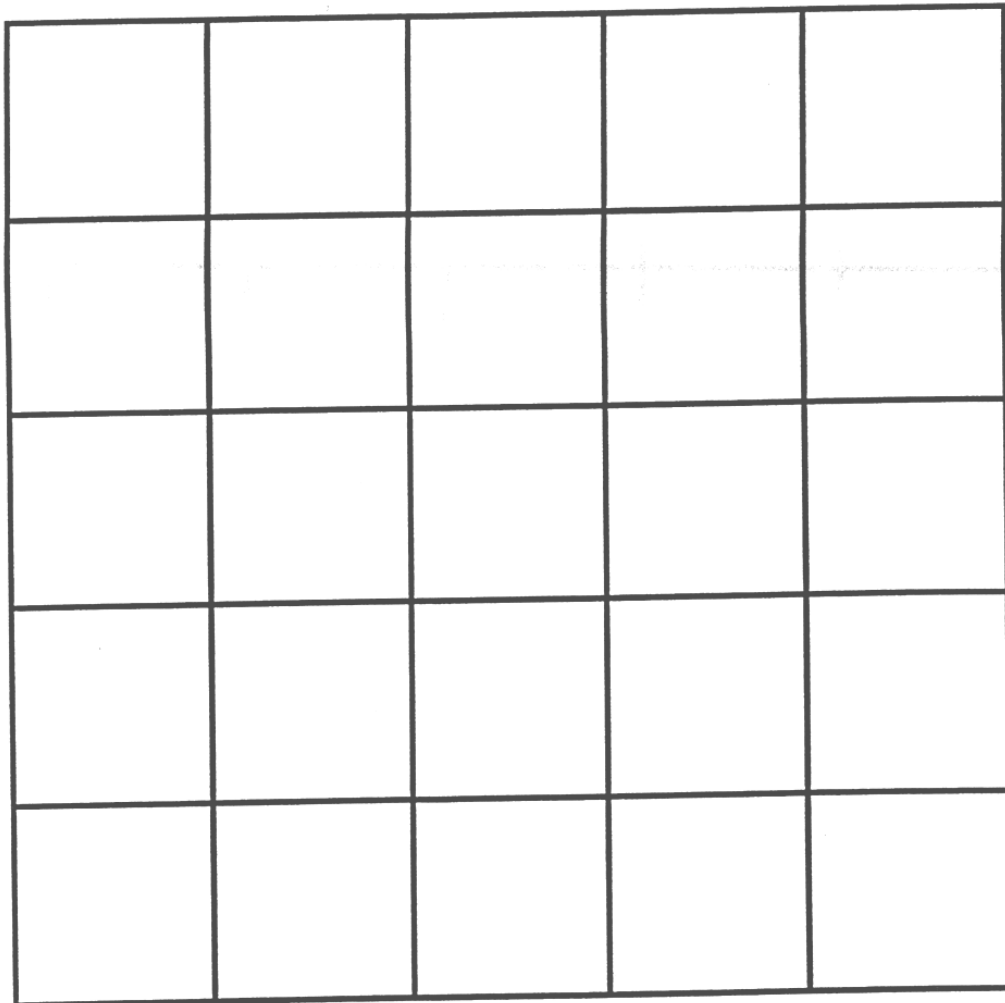
Each line different

Take Problem Solving
guess, check, improve
(Level C) page 43

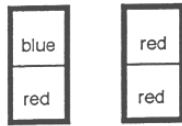
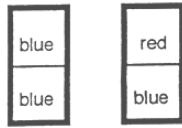
Get 5 red, 5 yellow, 5 green, 5 blue and 5 black cubes.

Put them onto the grid below so that there is a red, yellow, green, blue and black cube on every horizontal and vertical line.

Use the strategy guess, check and improve.



Let's be systematic

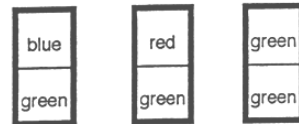
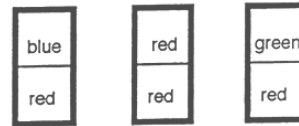
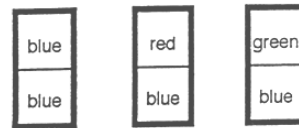


**Towers 2 high
with 2 colours**

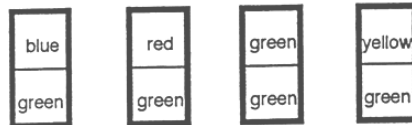
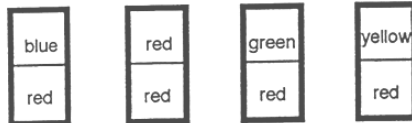
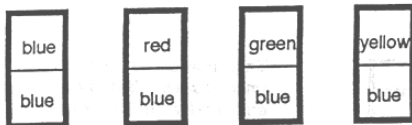
(we can get 4)

**Towers 2 high
with 3 colours**

(we can get 9)

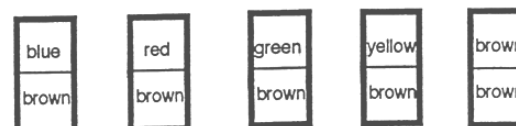
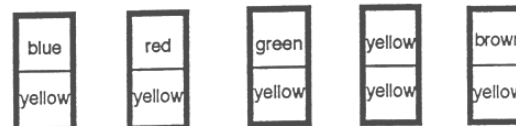
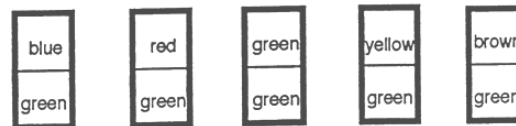
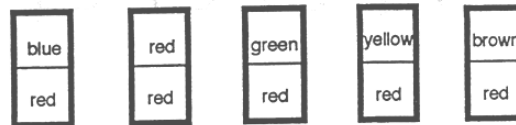


**Be systematic,
and build models
of these towers.**



**Towers 2 high
with 4 colours**

(we can get 16)



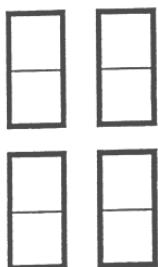
**Towers 2 high
with 5 colours**

(we can get 25)

Get 12 red, 12 blue, 12 yellow,
12 green, 12 black and 12 white cubes.

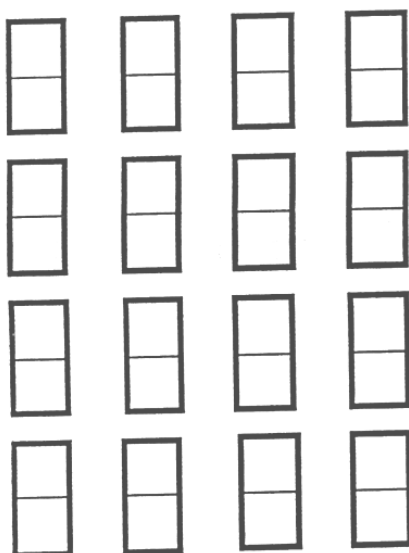
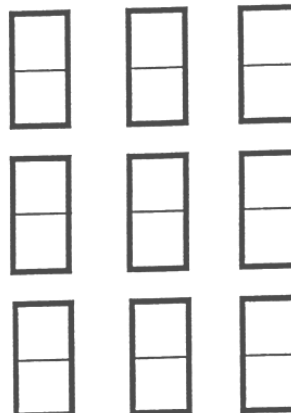
Can you take a systematic approach
and build all 36 different towers that are 2 high?

Be systematic

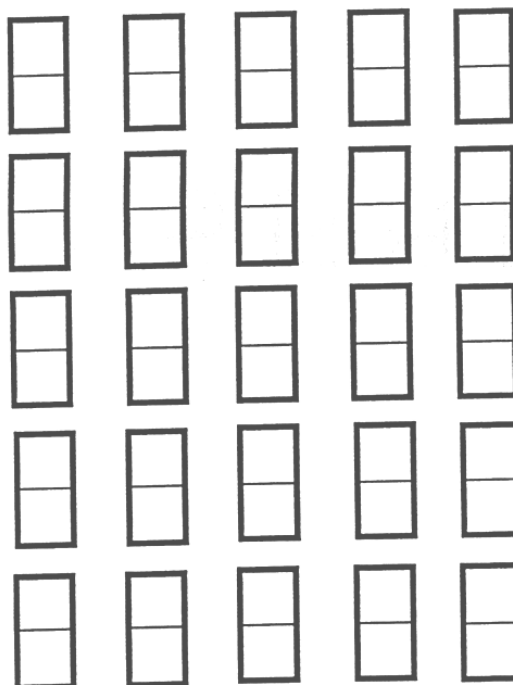


Choose 2 colours,
and colour the towers
so that each tower is
different. Be systematic.

Choose 3 colours,
and colour the towers
so that each tower
is different.
Be systematic.



Choose 4 colours, and colour
the towers so that each tower is
different. Be systematic.



Choose 5 colours, and colour
the towers so that each tower
is different. Be systematic.

2 colours give 4 towers (2 x 2)
3 colours give 9 towers (3 x 3)
4 colours give 16 towers (4 x 4)
5 colours give 25 towers (5 x 5)

If you had 6 colours, how many different towers do you think
you would get? **Can you draw them?**

If you had 7 colours, how many different towers do you think
you would get?
You would have to be systematic to draw them all!

Sadie has 10p

Sadie has 10p, but we don't know how her 10p is made up.

Here are 2 of the possible ways;

$$5p + 2p + 1p + 1p + 1p$$

and

$$2p + 2p + 2p + 2p + 1p + 1p$$

There are other ways.

Can you write out all the 11 different ways yourself?

To help find as many as you can, be systematic.

Make the numbers

You can use a 1, 2 and a 3 to make 6 three-digit numbers eg

123 132 213 231 312 321

Each digit is used once in each three-digit number.

Mr Coont was systematic to help him find them all.

Can you find all the 24 different four-digit numbers using only a 1, 2, 3 and 4 each time? Be systematic.

.....
.....
.....
.....

Mr Coont realised that when he was using the 1, 2 and 3's he could have used the 1, 2 and 3 numbers more than once in the three-digit numbers he was writing

eg 111, or 211, or 121 etc

Lucy found 27 numbers this way, instead of just 6.
Can you find them all? Be systematic.

.....
.....
.....
.....
.....