# Puzzles and problems for Years 5 and 6

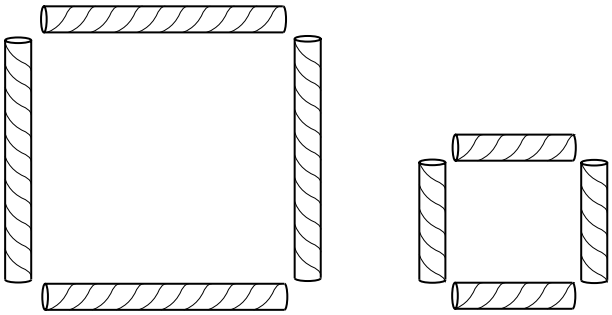
# Square it up

You need six drinking straws each the same length.

Cut two of them in half.

You now have eight straws, four long and four short.

You can make 2 squares from the eight straws.



Arrange your eight straws to make 3 squares, all the same size.

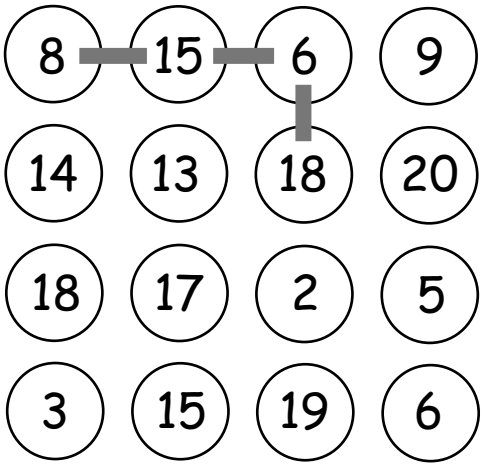
**53**

**Teaching objectives**

Solve mathematical problems or puzzles.
Visualise 2-D shapes.

# Joins

Join any four numbers.
Find their total.
Joins can go up, down or sideways, but not diagonally.
The score shown is 8 + 15 + 6 + 18 = 47.




Find the highest possible score.
Find the lowest possible score.

Try joining five numbers.
Now try joining five numbers using only diagonal joins.

**Teaching objectives**
Solve mathematical problems or puzzles.
Add and subtract two-digit numbers mentally.

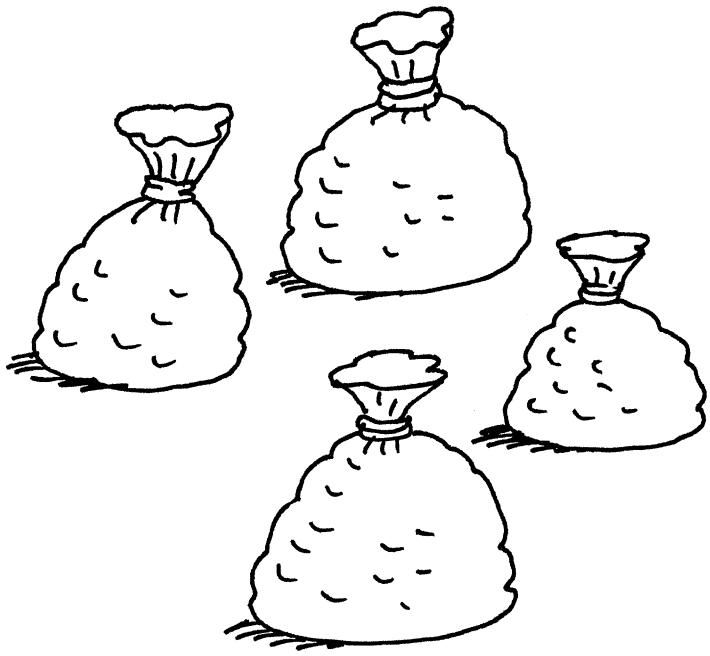
54

# Money bags

Ram divided 15 pennies among four small bags.

He could then pay any sum of money from 1p to 15p, without opening any bag.

How many pennies did Ram put in each bag?



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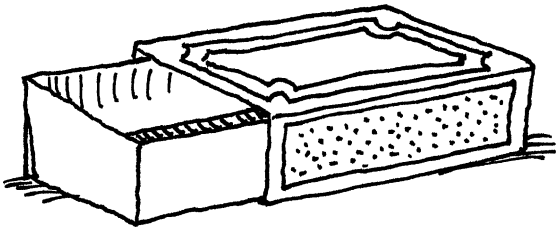
**Teaching objectives**

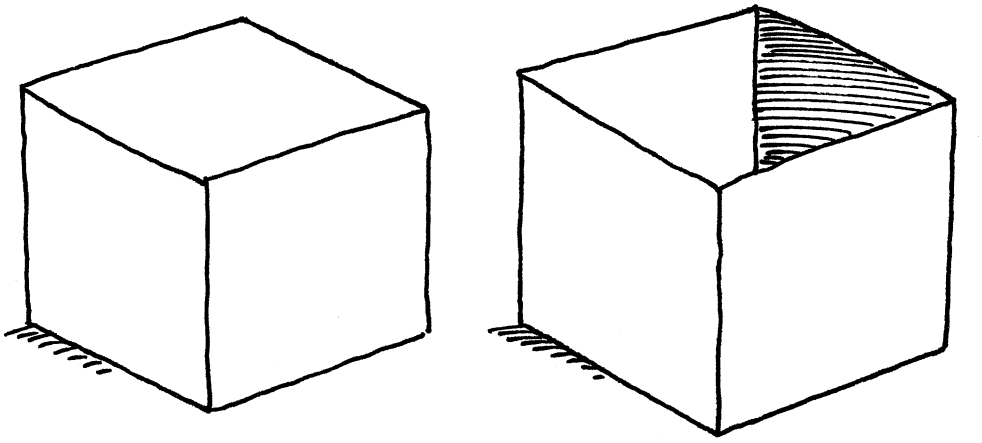
Solve mathematical problems or puzzles.
Explain methods and reasoning.

# A perfect match

1. A matchbox tray slides into its outer cover.
   In how many different ways can you do this?



2. Imagine a cube and an open box just large enough to hold it.
   In how many different ways can you fit the cube into the box?



**Teaching objectives**

Solve mathematical problems or puzzles.
Visualise 3-D shapes.

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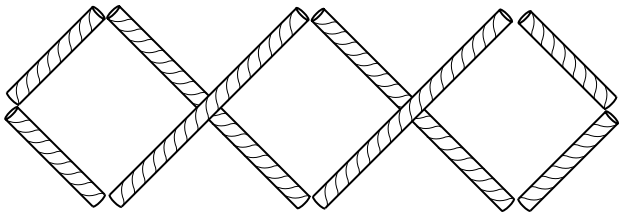
# Solutions

## 53 Square it up

For example:



## 54 Joins

Using four numbers:
the highest score is 19 + 15 + 17 + 18 = 69,
the lowest score is 6 + 5 + 2 + 17 = 30.

Using five numbers:
the highest is 20 + 18 + 13 + 17 + 18 = 86,
the lowest is 6 + 18 + 2 + 5 + 6 = 37.

Using five numbers and diagonal joins:
the highest is 19 + 17 + 14 + 15 + 18 = 83,
the lowest is 13 + 6 + 20 + 2 + 6 = 47.

## 55 Money bags

Ram put 1p, 2p, 4p and 8p in the four bags.

Any sum from 1p to 15p can be made with these amounts.

## 56 A perfect match

1. A matchbox tray fits into its outer cover in 4 different ways.
2. A cube will fit into a box with any one of its 6 faces uppermost.

   Each face can be rotated into any one of 4 different positions.

   So there are 6 x 4 = 24 ways of fitting the cube in the box.

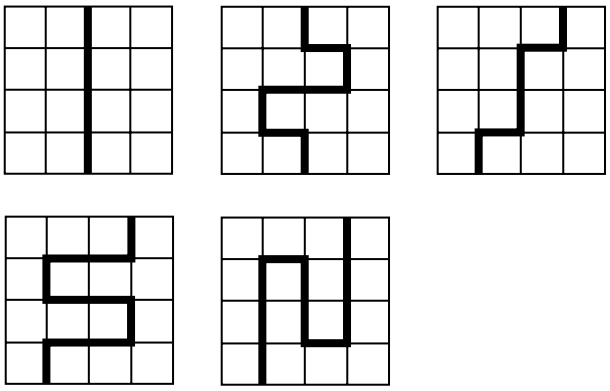
## 57 Presents

Gurmit paid £2, £4, £6, £1 and £8 for the five presents.

## 58 Spot the shapes 2

1. There are 11 triangles.
2. There are 17 squares.

## 59 Four by four



## 60 Three digits

You can make six different numbers.
In order, the numbers are:
799, 889, 898, 979, 988, 997.

## 61 Make five numbers

For example:
a. 12, 39, 45, 60, 78.
b. 7, 42, 63, 98, 105.
c. 5, 23, 67, 89, 401.
There are other solutions.

## 62 Maze

There are two routes that total 100 exactly:

+ 6 x 7 − 6 x 3 − 8 = 100
+ 9 x 7 ÷ 3 x 5 − 5 = 100

The route giving the highest total is:

+ 9 x 7 − 6 x 7 − 8 = 391

The route giving the lowest total is:

+ 6 x 7 ÷ 3 x 3 − 8 = 34

## 63 Jack's book

The book has 221 pages.
42 of the digits are a 5.

## 64 Flash Harry

Flash Harry's bank balance looked like this.

| | |
|---|---|
| April | − £100 |
| May | + £100 |
| June | − £200 |
| July | + £200 |

So Harry made £200 overall.

## 65 Age old problems

1. I am 48 years old (or possibly 104).
2. I am now 26 years old. In 38 years' time, when I am 64, my age will be both a square number and a cube.
3. I am 9 years old now.

## 66 Zids and Zods

There are 3 Zids with 4 spots and 4 Zods with 9 spots.

If Zids have 5 spots and Zods have 7 spots, the possible ways of making 140 are:

28 Zids;
21 Zids and 5 Zods;
14 Zids and 10 Zods;
7 Zids and 15 Zods;
20 Zods.

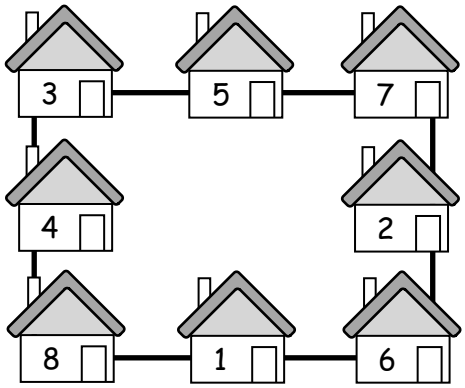
## 67 Franco's fast food

A curry costs £3.50, a pudding costs £1 and a tea costs 50p.

So the total cost of a curry, a pudding and a tea is £5.

## 68 Albert Square

For example:




## 69 Coins on the table

Anna put 12 coins on the table.

## 70 A bit fishy

Nasreen bought 4 angel fish and 8 goldfish.

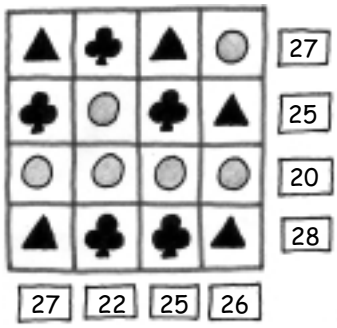
## 71 Pet shop

1. Jim sold the dog and the cat for £72 and £48 respectively, a total of £120.
2. The dog cost £50 and the cat cost £75, a total of £125.

   The cat and the dog were sold for a total of £120, so Jim made a loss of £5.

## 72 Shape puzzle

The circle has the value 5.
The triangle has the value 8.
The club has the value 6.




## 73 Eggs

Mrs Choy bought:
10 large eggs at 50p each,
10 medium eggs at 10p each,
80 small eggs at 5p each.

## 74 Anyone for tennis?

Ali, Luke, Holly and Zoe play tennis.

Two boys can play.
Ben won't play if Luke plays.
So the two boys must be Ali and Ben, or Ali and Luke.

Ali will play only if Holly plays.
Holly won't play with Ben.
So the two boys are Ali and Luke.

Luke will play only if Zoe plays.
So the two girls are Holly and Zoe.

## 75 Bus routes

There are six different routes from A back to A:

A B C D E F A
A B D C E F A
A B D E C F A

and the three reversals of these.

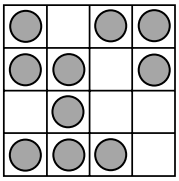
The cheapest routes are A B D E C F A and its reversal, which each cost £21.

## 76 Slick Jim

Jim won £540 000.

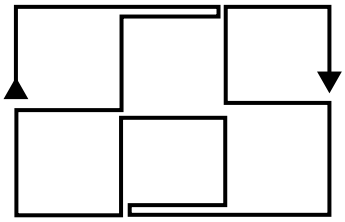
## 77 All square

For example:

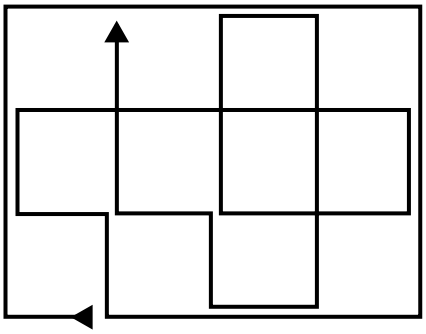


## 78 Sleigh ride

With 3 rows of 4 igloos, the shortest route is 190 metres. For example:



With 4 rows of 5 igloos, the shortest route is 350 metres. For example:



## 79 Spendthrift

Anil bought 13 choc bars and 9 fruit bars, or 4 choc bars and 22 fruit bars.

## 80 Cola in the bath

A bath 1.5 metres long by 60 cm wide would have a floor area of approximately 9000 $cm^2$. If there was 10 cm of cola in the bath, the volume of liquid would be about 90 000 $cm^3$ or 90 000 ml. This would require roughly 270 cans of cola.

## 81 Millennium

| | | | |
|---|---|---|---|
| a. | 00:33:20 | 1 January | 2000 |
| b. | 09:20:00 | 2 January | 2000 |
| c. | 08:00 | 23 March | 2000 |
| d. | 00:00 | 23 June | 2005 |
| e. | 00:00 | 1 May | 2038 |

## 82 People in the crowd

There is no precise answer, but pupils can compare their estimates and discuss how they arrived at them.

## 83 Make 200

There are 22 different solutions. Eleven of the solutions are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 9 | 2 | 8 | 2 | 9 | 3 | 5 |
| 7 | 2 | 6 | 3 | 5 | 3 | 7 | 4 |

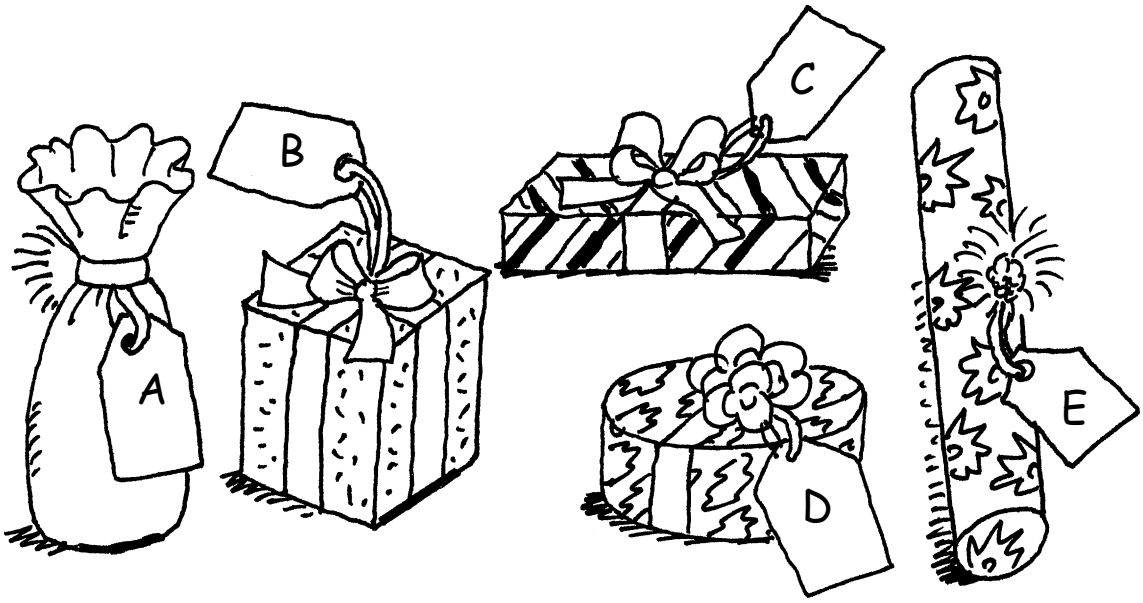
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | 1 | 4 | 2 | 4 | 3 | 5 | 1 |
| 9 | 5 | 8 | 5 | 7 | 5 | 7 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| 6 | 1 | 6 | 2 | 7 | 1 |
| 5 | 7 | 4 | 7 | 3 | 8 |

Eleven more solutions are formed by changing over the two digits in the top right and bottom left boxes.

# Presents

Gurmit paid £21 for five presents.




For A and B he paid a total of £6.
For B and C he paid a total of £10.
For C and D he paid a total of £7.
For D and E he paid a total of £9.

How much did Gurmit pay for each present?

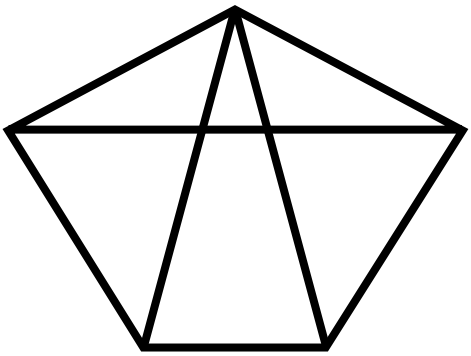
**57**

**Teaching objectives**

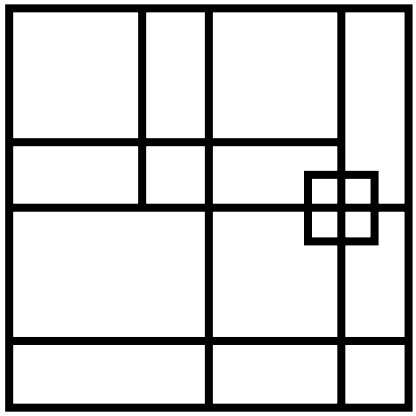
Solve a given problem by organising information.
Explain methods and reasoning.

# Spot the shapes 2

1. How many triangles can you count?



2. How many squares can you count?



3. Draw your own diagram to count triangles.
   Don't use too many lines!
   How many triangles can a friend find?
   Can you find more?

**Teaching objectives**

Solve mathematical problems or puzzles.
Visualise 2-D shapes.
Explain methods and reasoning.

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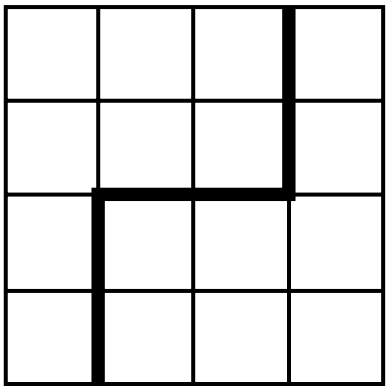
# Four by four

You need some squared paper.

This 4 by 4 grid is divided into two identical parts.
Each part has the same area and the same shape.



Find five more ways of dividing the grid into two identical parts by drawing along the lines of the grid.
Rotations and reflections do not count as different!

Explore ways of dividing a 4 by 4 grid into two parts with equal areas but different shapes.

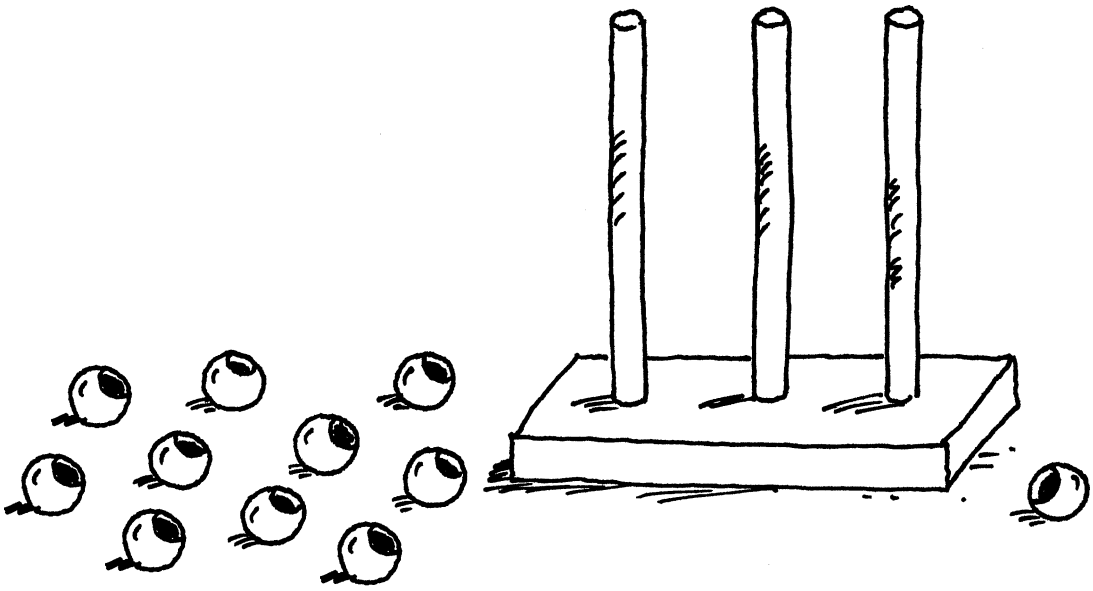
**59**

**Teaching objectives**

Solve mathematical problems or puzzles.
Visualise 2-D shapes.
Find fractions of shapes.

# Three digits

Imagine you have 25 beads.
You have to make a three-digit number on an abacus.
You must use all 25 beads for each number you make.



How many different three-digit numbers can you make?
Write them in order.

**Teaching objectives**

Solve mathematical problems or puzzles.
Know what each digit represents.
Order a set of whole numbers.

60

# Make five numbers

Take ten cards numbered 0 to 9.


Each time use all ten cards.

Arrange the cards to make:

a. five numbers that are multiples of 3

b. five numbers that are multiples of 7

c. five prime numbers

Make up more problems to use all ten cards to make five special numbers.

**61**

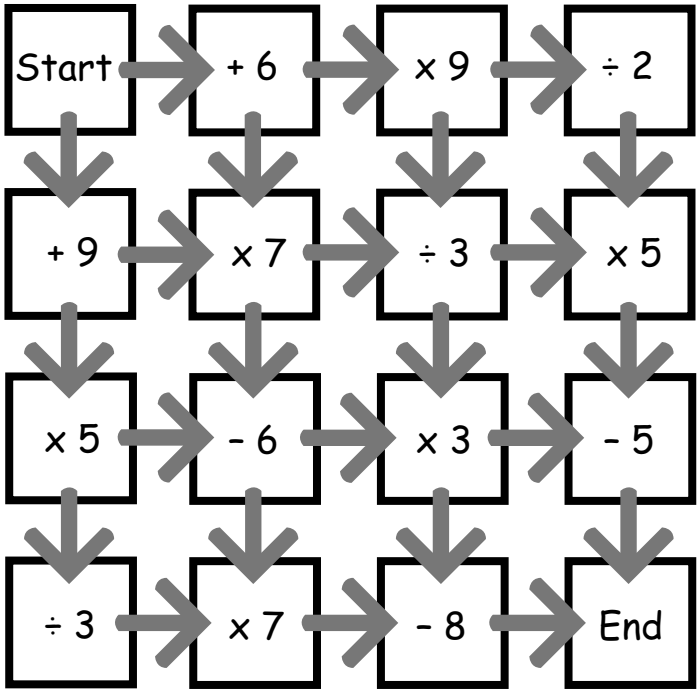
**Teaching objectives**

Solve mathematical problems or puzzles.
Know 3 and 7 times tables.
Recognise prime numbers.

# Maze

Start with zero.

Find a route from 'Start' to 'End' that totals 100 exactly.




Which route has the highest total?

Which has the lowest total?

Now try some different starting numbers.

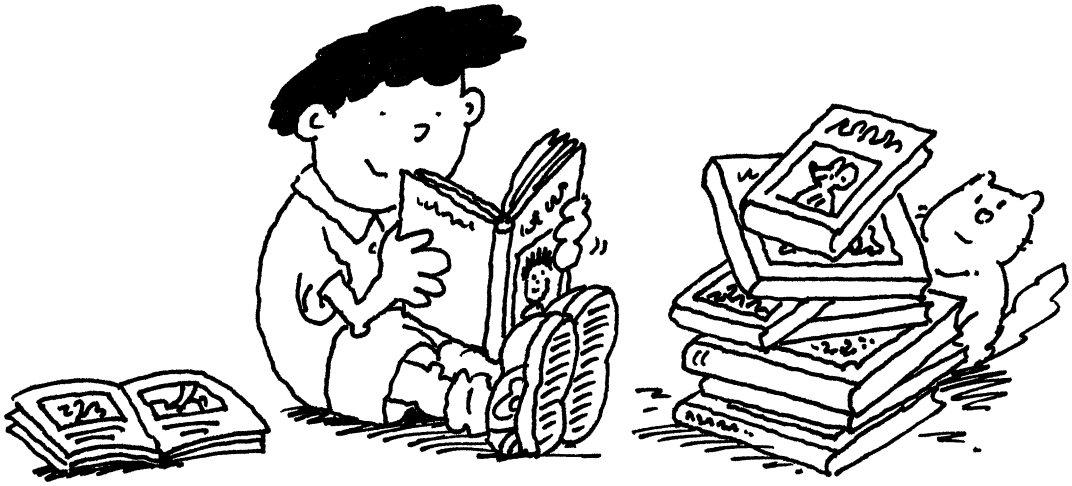
**Teaching objectives**

Solve mathematical problems or puzzles.
Add and subtract two-digit numbers mentally.
Multiply and divide by single-digit numbers.

62

# Jack's book

The pages of Jack's book are numbered from 1.



The page numbers have a total of 555 digits.

How many pages has the book?

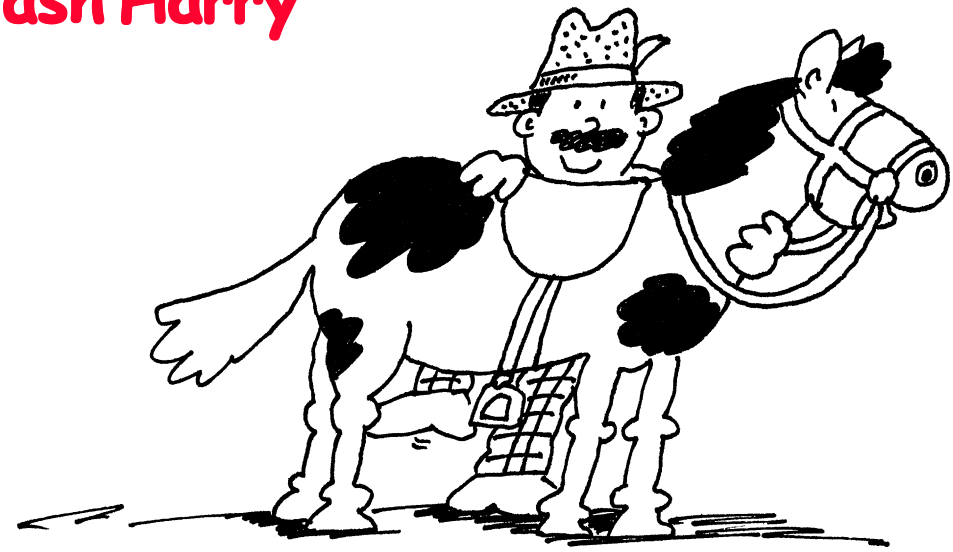
How many of the digits are a 5?

63

**Teaching objectives**

Solve mathematical problems or puzzles.
Know what each digit represents.

# Flash Harry



In April Flash Harry bought a saddle for £100.
In May he sold it for £200.

In June he was sorry he had sold it.
So he bought it back for £300.

In July he got tired of it.
So he sold it for £400.

Overall, did Flash Harry make or lose money?
How much did he make or lose?

**Teaching objectives**

Solve mathematical problems or puzzles.
Use negative numbers.

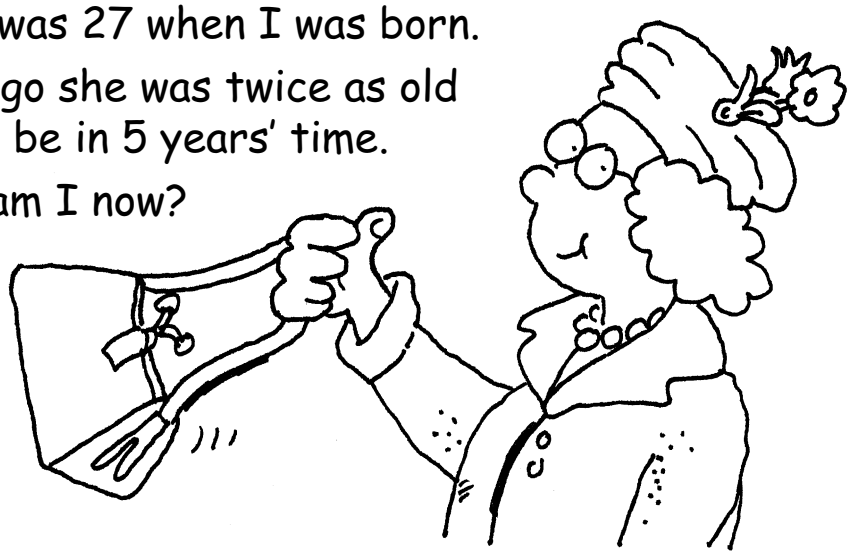
64

# Age old problems

1. My age this year is a multiple of 8.
   Next year it will be a multiple of 7.
   How old am I?

2. Last year my age was a square number.
   Next year it will be a cube number.
   How old am I?
   How long must I wait until my age is both a square number and a cube?

3. My Mum was 27 when I was born.
   8 years ago she was twice as old as I shall be in 5 years' time.
   How old am I now?

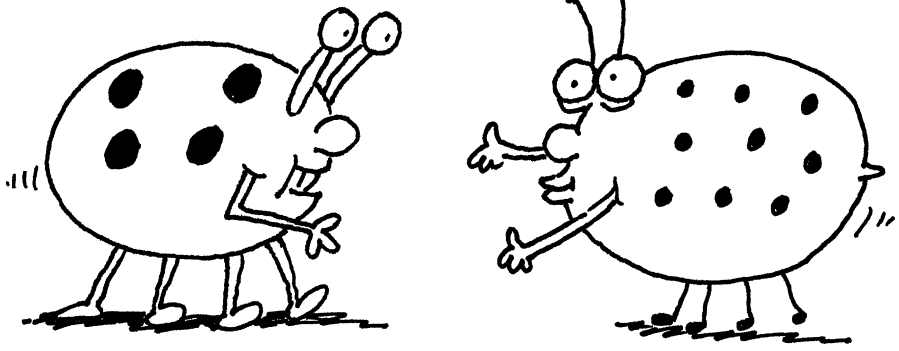


**65**

**Teaching objectives**

Solve mathematical problems or puzzles.
Know multiplication facts to 10 x 10.
Recognise square and cube numbers.

# Zids and Zods



Zids have 4 spots.
Zods have 9 spots.

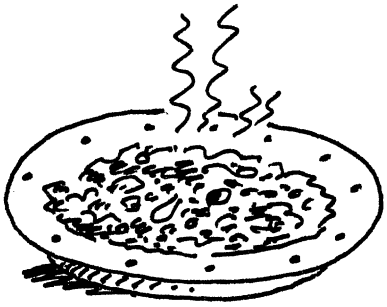
Altogether some Zids and Zods have 48 spots.
How many Zids are there?
How many Zods?

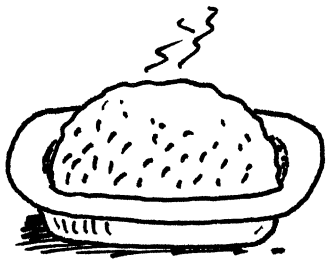
What if Zids have 5 spots, Zods have 7 spots, and there are 140 spots altogether?
Find as many solutions as you can.

**Teaching objectives**
Solve mathematical problems or puzzles.
Know multiplication facts to 10 x 10.
Add two-digit numbers mentally.

66

# Franco's fast food





This is what food costs at Franco's café.

1 curry and 1 tea cost £4.
2 curries and 2 puddings cost £9.
1 pudding and 2 teas cost £2.

What do you have to pay in total for
1 curry, 1 pudding and 1 tea?
What does each item cost on its own?

67

**Teaching objectives**

Solve mathematical problems or puzzles.
Explain methods and reasoning.

# Albert Square

36 people live in the eight houses in Albert Square.
Each house has a different number of people living in it.
Each line of three houses has 15 people living in it.
How many people live in each house?

**Teaching objectives**

Solve mathematical problems or puzzles.
Add several small numbers mentally.
Explain methods and reasoning.

68

# Coins on the table

Anna put some 10p coins on the table.
One half of them were tails up.


Anna turned over two of the coins, and then one third of them were tails up.

How many coins did Anna put on the table?

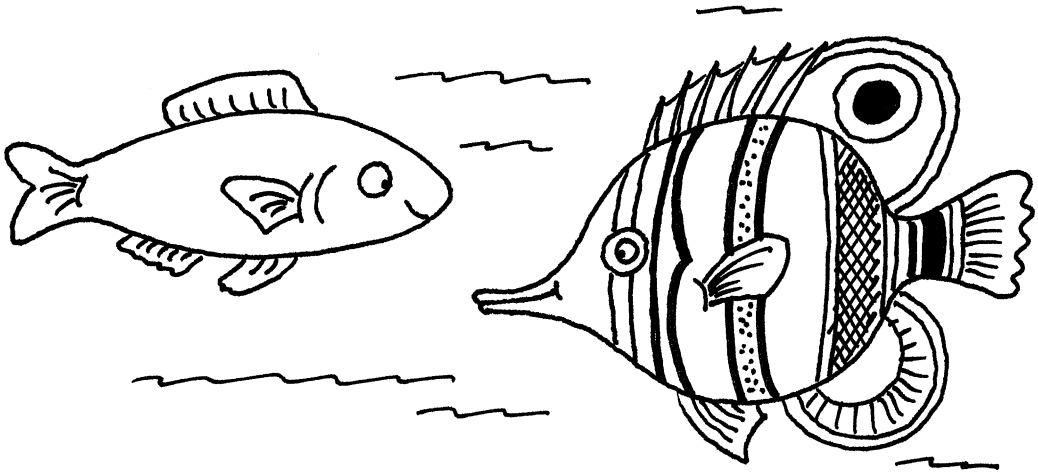
69

**Teaching objectives**

Solve mathematical problems or puzzles.
Understand simple fractions.
Explain methods and reasoning.

# A bit fishy

A goldfish costs £1.80.
An angel fish costs £1.40.



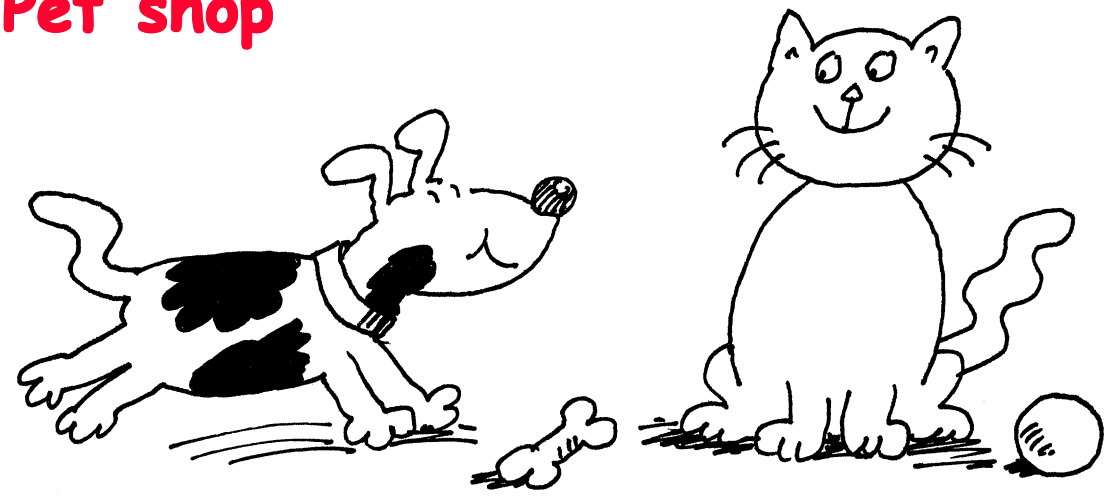
Nasreen paid exactly £20 for some fish.
How many of each kind did she buy?

**Teaching objectives**

Solve problems involving ratio and proportion.
Choose and use efficient calculation strategies to solve a problem.
Explain methods and reasoning.

**70**

# Pet shop



1. Jim bought a cat and dog for £60 each.
   Later he sold them.
   He made a profit of 20% on the dog.
   He made a loss of 20% on the cat.
   How much did he get altogether when he sold the cat and dog?

2. Jim bought another cat and dog.
   He sold them for £60 each.
   He made a profit of 20% on the dog.
   He made a loss of 20% on the cat.
   Did he make a profit or loss on the whole deal?

**71**

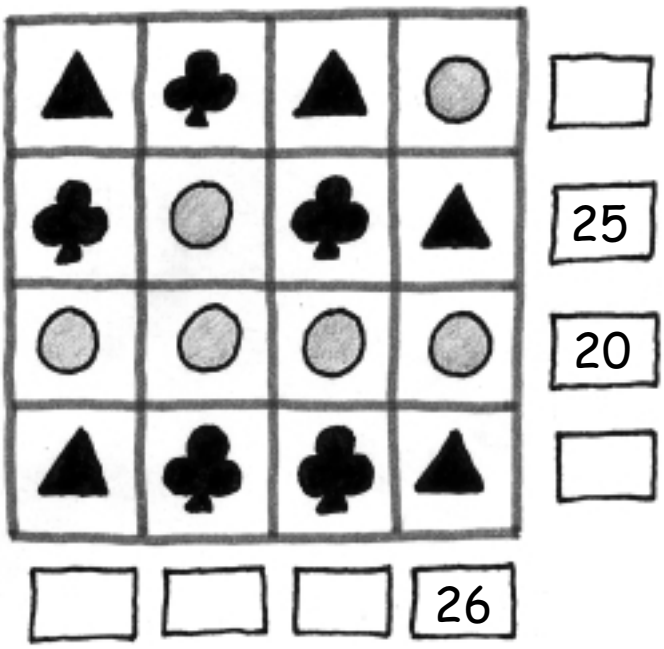
**Teaching objectives**

Solve mathematical problems or puzzles.
Find simple percentages.

# Shape puzzle

Each shape stands for a number.

The numbers shown are the totals of the line of four numbers in the row or column.




Find the remaining totals.

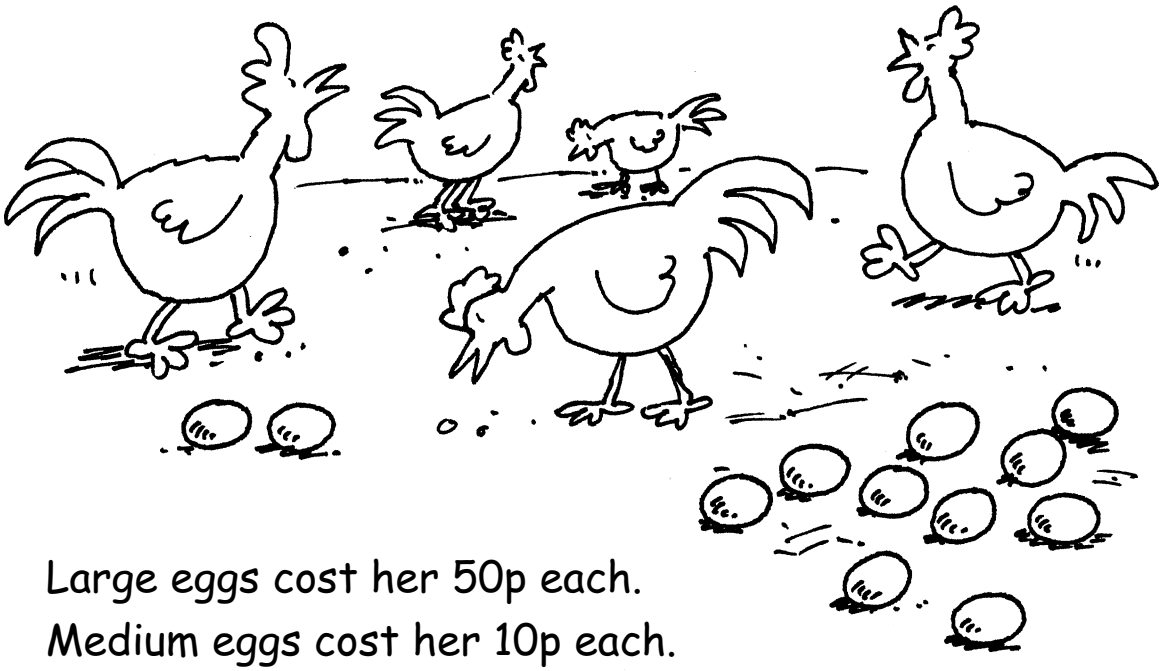
**Teaching objectives**

Solve mathematical problems or puzzles.
Use a symbol to stand for an unknown number.
Explain methods and reasoning.

72

# Eggs

Mrs Choy spent exactly £10 on 100 eggs for her shop.



Large eggs cost her 50p each.
Medium eggs cost her 10p each.
Small eggs cost her 5p each.

For two of the sizes, she bought the same number of eggs.
How many of each size did she buy?

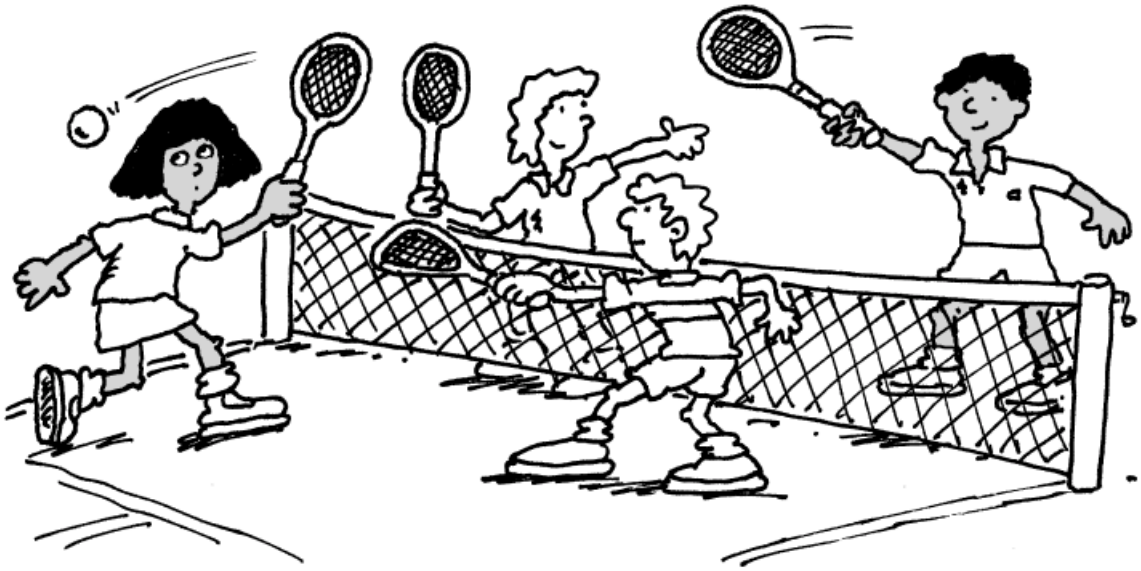
**73**

**Teaching objectives**

Solve problems involving ratio and proportion.
Explain methods and reasoning.

# Anyone for tennis?

Two boys and two girls can play tennis.



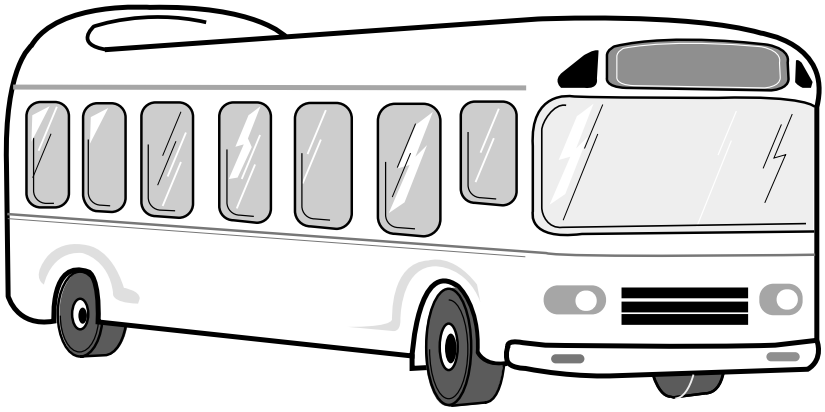
Ali said: 'I will only play if Holly plays.'
Holly said: 'I won't play if Ben is playing.'
Ben said: 'I won't play if Luke or Laura plays.'
Luke said: 'I will only play if Zoe plays.'
Zoe said: 'I don't mind who I play with.'

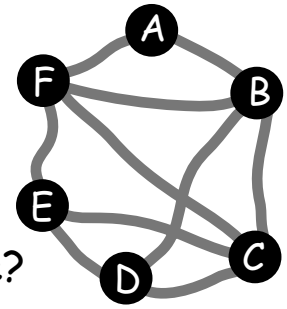
Which two boys and which two girls play tennis?

**Teaching objectives**
Solve a problem by extracting and interpreting data.
Explain methods and reasoning.

74

# Bus routes






Six towns are connected by bus routes.
The bus goes from A back to A.
It visits each of the other towns once.
How many different bus routes are there?

This table shows the bus fare for each direct route.
B to A costs the same as A to B, and so on.

| A to B | B to C | C to D | D to E | E to F | F to A | B to D | B to F | C to E | C to F |
|---|---|---|---|---|---|---|---|---|---|
| £4 | £3 | £4 | £4 | £3 | £4 | £5 | £3 | £2 | £2 |

Which round trip from A to A is the cheapest?

75

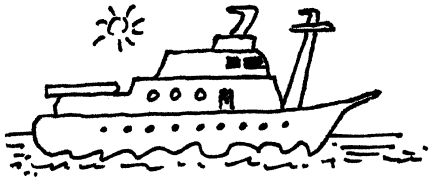
**Teaching objectives**

Solve a problem by extracting and interpreting data.
Add several numbers mentally.

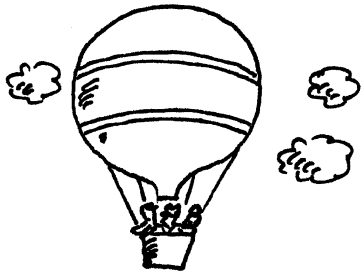
# Slick Jim

Slick Jim won the lottery.

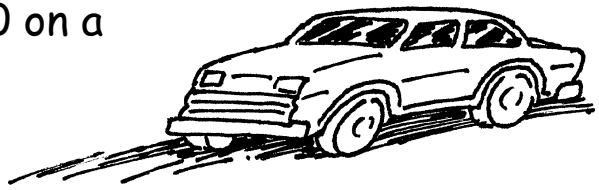
He spent two thirds of his winnings on a very posh house.



He spent two thirds of what he had left on a luxury yacht.



Then he spent two thirds of what he had left on a hot air balloon.



He spent his last £20000 on a flashy car.

How much did Slick Jim win on the lottery?

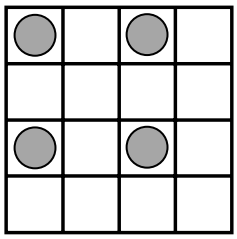
**Teaching objectives**

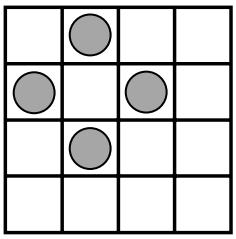
Solve a problem by organising information.
Find fractions of quantities.
Understand the relationship between multiplication and division.

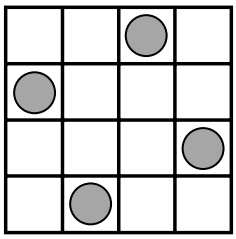
**76**

# All square

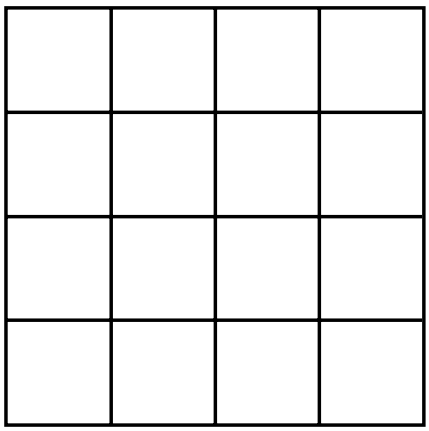
On each of these grids, the counters lie at the four corners of a square.







What is the greatest number of counters you can place on this grid without four of them lying at the corners of a square?



77

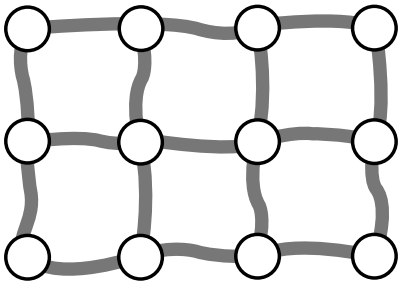
**Teaching objectives**

Solve a problem by organising information.
Visualise 2-D shapes.

# Sleigh ride

In Snow Town, 3 rows of 4 igloos are linked by 17 sleigh paths.

Each path is 10 metres long.



When Santa visits, he likes to go along each path at least once.

His route can start and end at any igloo.

How long is the shortest route Santa can take?

What if there are 4 rows of 5 igloos?

**Teaching objectives**

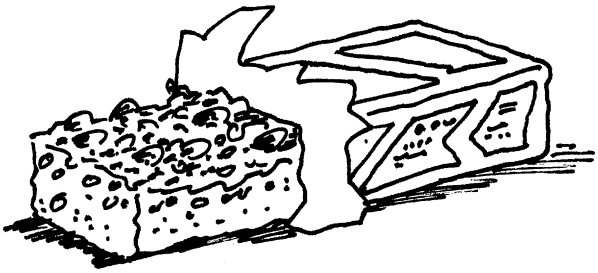
Solve a problem by organising information.
Visualise 2-D shapes.

78

# Spendthrift

Choc bars cost 26p each.

Fruit bars cost 18p each.



Anil spent exactly £5 on a mixture of choc bars and fruit bars.

How many of each did he buy?

**79**

**Teaching objectives**

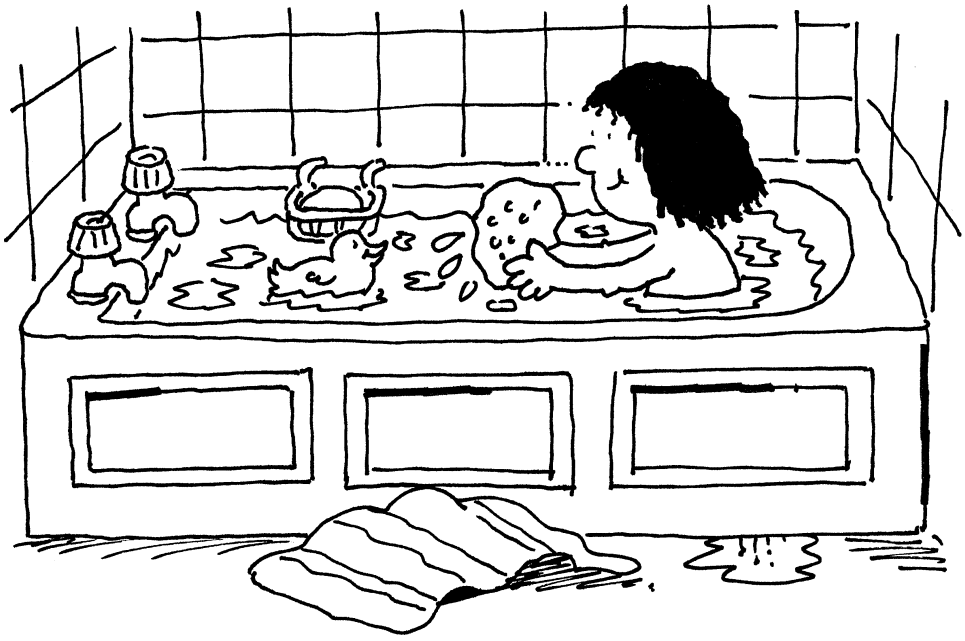
Solve mathematical problems or puzzles.
Choose and use efficient calculation strategies to solve a problem.
Add sums of money.

# Cola in the bath

A can of cola holds 33 centilitres.


If you had a bath in cola – don't try it! – approximately how many cans of cola would you need?

Hint: 1 cubic centimetre is the same as 1 millilitre.



**Teaching objectives**

Solve mathematical problems or puzzles.
Estimate lengths and convert units of capacity.
Develop calculator skills and use a calculator effectively.

**80**

# Millennium

At what time of what day of what year will it be:

a. 2000 seconds
b. 2000 minutes
c. 2000 hours
d. 2000 days
e. 2000 weeks

after the start of the year 2000?

**81**

**Teaching objectives**

Solve mathematical problems or puzzles.
Convert smaller to larger units of time.
Develop calculator skills and use a calculator effectively.

# People in the crowd

Estimate how many people there are in the crowd.


**Teaching objectives**

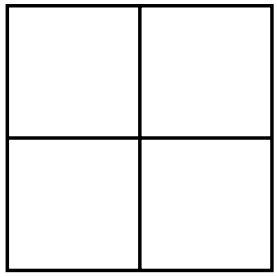
Solve mathematical problems or puzzles.
Count larger collections by grouping.
Give a sensible estimate.

82

# Make 200

**1 2 3 4 5 6 7 8 9**

Choose four of these digits.
Each one must be different.
Put one digit in each box.



This makes two 2-digit numbers reading across and two 2-digit numbers reading down.
Add up all four of the numbers.

In this example the total is 100.

| | |
|---|---|
| 1 | 2 |
| 4 | 7 |

12 + 47 + 14 + 27 = 100

How many different ways of making 200 can you find?

**83**

**Teaching objectives**

Solve mathematical problems or puzzles.
Know what each digit represents.
Add several two-digit numbers.