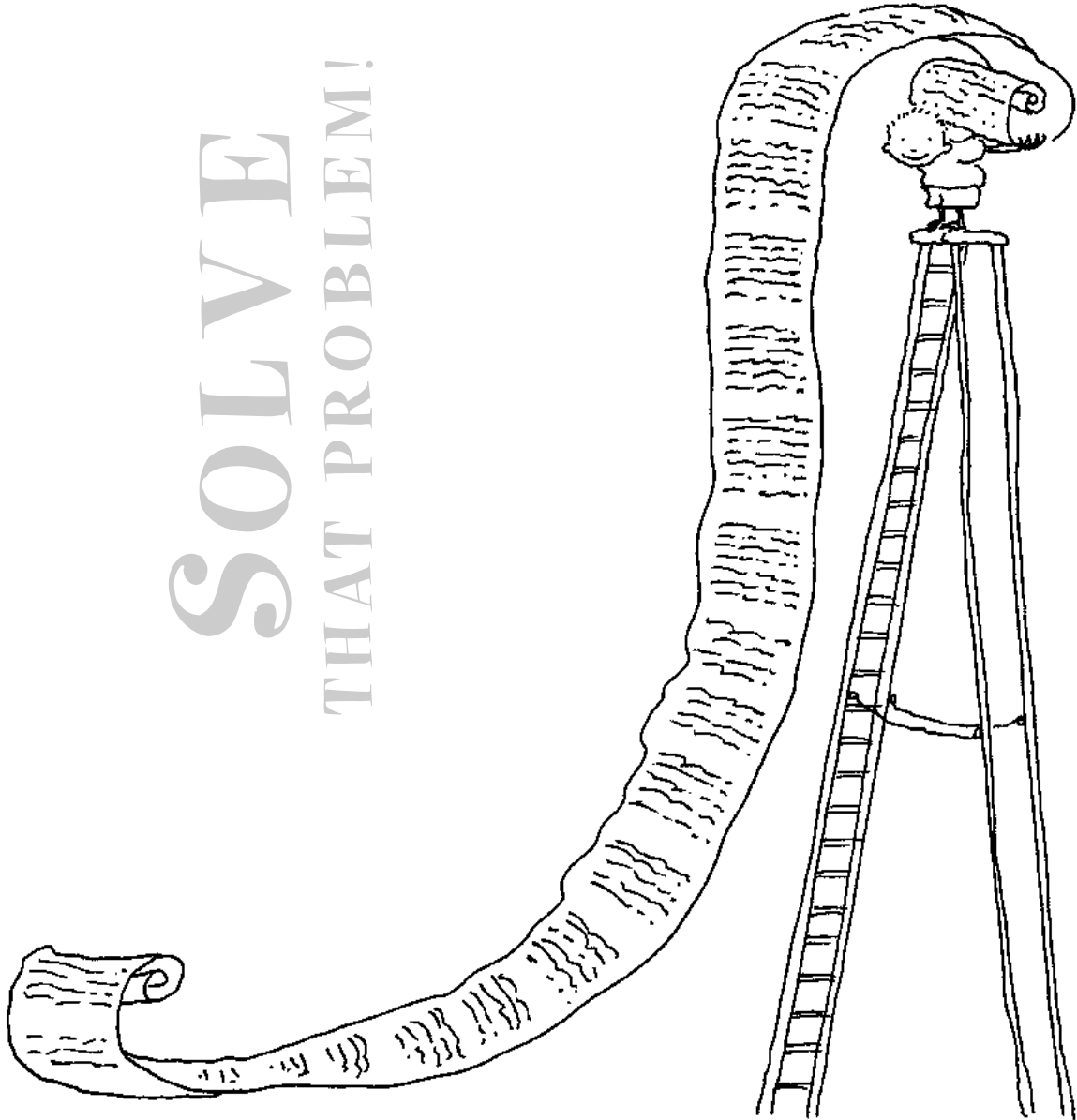


SOLVE
THAT PROBLEM!

Drawing a Table

SOLVE
THAT PROBLEM!

SOLVE
THAT PROBLEM!



SOLVE
THAT PROBLEM!

Teaching Notes Drawing a Table

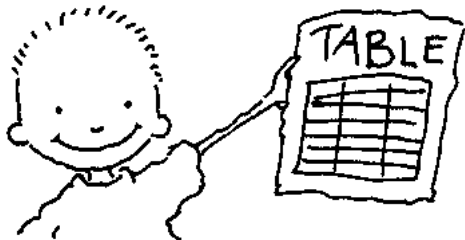


When a problem contains information that has more than one characteristic, an effective strategy is to set out that information in a table. A table helps to organise the information so that it can be easily understood and so that relationships between one set of numbers and another become clear. A table makes it easy to see what information is there, and what information is missing. When a table is drawn up, the information often shows a pattern, or part of a solution, which can then be completed. Pupils will usually have to create some of the information in order to complete the table and so solve the problem.

Using a table can help reduce the possibility of mistakes or repetitions.

Frequently teachers will need to assist pupils to decide how to classify and divide up the information in the problem and then how to construct an appropriate table. Teachers should give advice on how many rows and columns are needed and what headings to use in the table. Symbols and abbreviations are also helpful in making tables clearer and pupils should be encouraged to use them where possible.

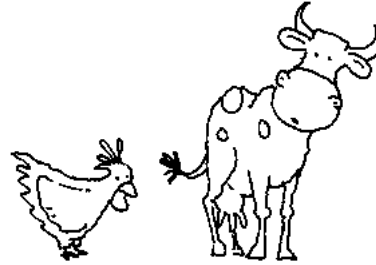
Certain skills and understandings should be reinforced before pupils begin to work with this strategy.



DECIDING ON THE NUMBER OF COLUMNS TO FIT THE VARIABLES

When drawing up a table, the first very important step is for pupils to read the problem carefully and establish how many variables are to be included in the table. This is a skill that pupils should be encouraged to develop. First they should decide how many factors are involved in each problem and then discuss whether the factor requires a column or row. Pupils should be clear about what the table is going to tell them. Headings for columns and rows are also important because they indicate the exact contents of the table.

For example: There are 18 animals at the farm. Some are chickens and others are cows. Seventy legs are visible. How many of each type of animal can be seen?



Pupils will need to draw up a table that has three columns.

| Number of chickens | Number of cows | Number of legs |
|--------------------|----------------|----------------|
|--------------------|----------------|----------------|

LEAVING GAPS IN TABLES AND COMPLETING PATTERNS MENTALLY

Often when a table is drawn up a pattern becomes obvious. The pupil may be able to leave out some of the data, (that is, leave a gap in the table) and by following the pattern, calculate mentally until the required number, or amount, is reached.

For example, two people are being compared in this problem: Mrs Shappy is 32 years old and her daughter Lisa is eight years old. How old will Lisa be when she is half as old as her mother?

A two column table is drawn.

| Lisa | Mrs Shappy |
|------|------------|
| 8 | 32 |
| 9 | 33 |
| 10 | 34 |
| 11 | 35 |
| 12 | 36 |
| 13 | 37 |
| | |
| | |
| 24 | 48 |



By leaving gaps and calculating mentally we established that when Lisa is 24 years old her mother will be 48 years old.

Teaching Notes Drawing a Table



DRAWING TABLES TO HELP CALCULATE MULTIPLES OF NUMBERS

When calculating multiples of numbers a pattern quickly emerges. Once again, it may be necessary only to complete certain steps to establish the pattern and by following the pattern to reach the required number.

For example: Research shows three out of ten people are blond. How many blonds will be found in 1000 people?

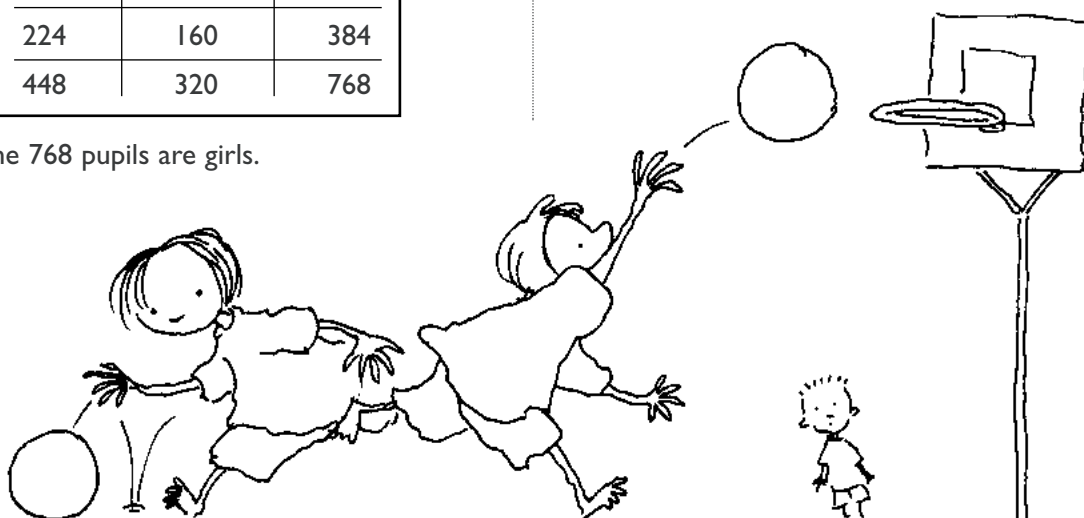
| Blond | Number of people |
|-------|------------------|
| 3 | 10 |
| 30 | 100 |
| 300 | 1000 |

This second example shows how a pattern can be established when calculating a cumulative total.

Five out of 12 pupils in the school are boys. If there are 768 children how many are girls?

| Girls | Boys | Total |
|-------|------|-------|
| 7 | 5 | 12 |
| 14 | 10 | 24 |
| 28 | 20 | 48 |
| 56 | 40 | 96 |
| 112 | 80 | 192 |
| 224 | 160 | 384 |
| 448 | 320 | 768 |

448 of the 768 pupils are girls.



FOLLOWING PATTERNS

Tables can be used to establish many different types of patterns. The information presented in the problem can be listed in the table and then examined to see if there is a pattern.

For example: A child is playing a game of basketball by himself in the park. Then, at regular intervals, other groups of pupils begin to arrive at the park. From each new group, two children decide to join the basketball game. The first group has three children, the second group has five children and the third group has seven children. How many groups will have appeared by the time there are 64 people in the park?

Three columns are needed for the table. The columns should be headed groups, people and total.

| Groups | People | Total |
|--------|--------|-------|
| | 1 | 1 |
| 1 | 3 | 4 |
| 2 | 5 | 9 |
| 3 | 7 | 16 |
| 4 | 9 | 25 |
| 5 | 11 | 36 |
| 6 | 13 | 49 |
| 7 | 15 | 64 |

Seven groups will have appeared.

Teaching Examples Drawing a Table



EXAMPLE I

A group of pupils are learning a long poem to perform at the school concert. Each week they are taught a certain number of verses. The first week they are taught one verse and by the end of the second week they know three verses. At the end of the third week the pupils can recite six verses and at the end of the fourth week they know ten. How many verses would they be able to recite after 12 weeks?

Understanding the problem

WHAT DO WE KNOW?

In the first week pupils are taught one verse.
At the end of the second week they know three.
At the end of the third week they know six.
By the end of the fourth week they know ten.

WHAT DO WE NEED TO FIND OUT?

Questioning: How many verses did they know at the end of 12 weeks?
Is there a pattern that will help with the completion of the chart?

Planning and communicating a solution

Pupils should draw up a table consisting of two rows and 13 columns or two columns and 13 rows. The first row should list the week numbers (1–12) and the second row should list the number of verses. Once the known data has been inserted a pattern will emerge and the number of verses can be calculated. (The pattern here is +1, +2, +3.....)

| | | | | | | | | | | | | |
|---------------|---|---|---|----|----|----|----|----|----|----|----|----|
| Week | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| No. of verses | 1 | 3 | 6 | 10 | 15 | 21 | 28 | 36 | 45 | 55 | 66 | 78 |

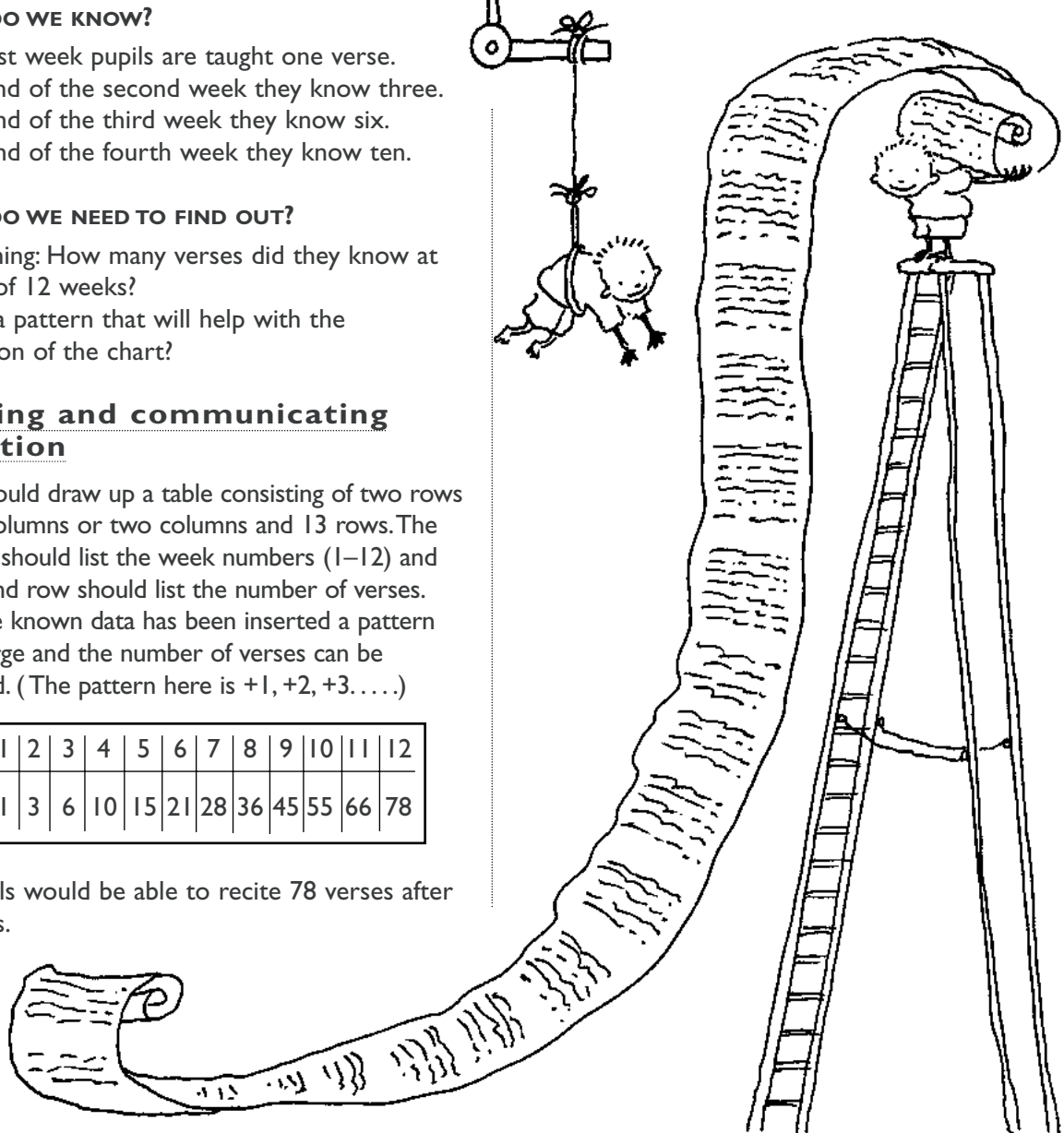
The pupils would be able to recite 78 verses after 12 weeks.

Reflecting and generalising

Once the table has been drawn up a pattern is easy to see. A pupil who has gained confidence may leave part of the table empty and simply complete the pattern mentally. Pupils should be encouraged develop the skill of looking for patterns and completing them.

Extension

The problem can be extended by including revision weeks at regular intervals, when no new verses are learnt. How will this affect the result?



Teaching Examples Drawing a Table



EXAMPLE 2

We are running a fund raising concert in our school hall. The first member of the audience comes in on her own, then a group of three friends come in together. Each time a group of people arrives there are two more than in the previous group. How many people will arrive in the twentieth group?

Understanding the problem

WHAT DO WE KNOW?

The first person is on her own.
Then three people come in.
Each time the group increases by two.

WHAT DO WE NEED TO FIND OUT?

Questioning: How big is each subsequent group?
How many people are in the twentieth group?

Planning and communicating a solution

Draw up a table consisting of two rows and 21 columns (or two columns and 21 rows.) Write the heading of the first row as 'audience groups' and the second 'numbers'. The audience groups are numbered to 20 and the numbers increase in odd numbers starting from one.



Reflecting and generalising

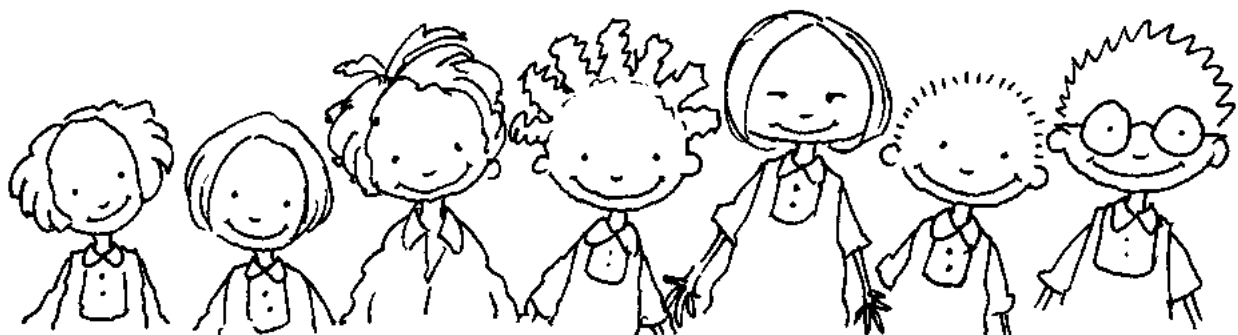
By following the pattern it is easy to calculate how many people are in the twentieth group. A more confident pupil would be able to leave part of the table incomplete as they see the pattern that is emerging.

Extension

The problem can be extended by varying the size of the groups or including more groups.

| | | | | | | | | | | | | | | | | | | | | |
|-----------------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Audience groups | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Numbers | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 |

There will be 39 people in the twentieth group.



Teaching Examples Drawing a Table



EXAMPLE 3

How many different ways can you change a £1 coin into 50p, 20p and 10p coins?

Understanding the problem

WHAT DO WE KNOW?

We have a £1 coin.

We can change it into 50p, 20p and 10p coins.

WHAT DO WE NEED TO FIND OUT?

Questioning: How many different ways can you make £1 out of 50p, 20p and 10p coins?

Planning and communicating a solution

Start by using only 50p coins and work through the possible combinations which make £1, then include those in the table.

Then look at all possible combinations of 50p + 20p + 10p.

Leave out 50p and look at combinations of 20p and 10p.

Finally, see how many 10p coins are needed to make up £1.

By setting out all the combinations in a table we made sure that none were missed or repeated.

| 50p | 20p | 10p |
|-----|-----|-----|
| 2 | | |
| 1 | 2 | 1 |
| 1 | 1 | 3 |
| 1 | | 5 |
| | 5 | |
| | 4 | 2 |
| | 3 | 4 |
| | 2 | 6 |
| | 1 | 8 |
| | | 10 |

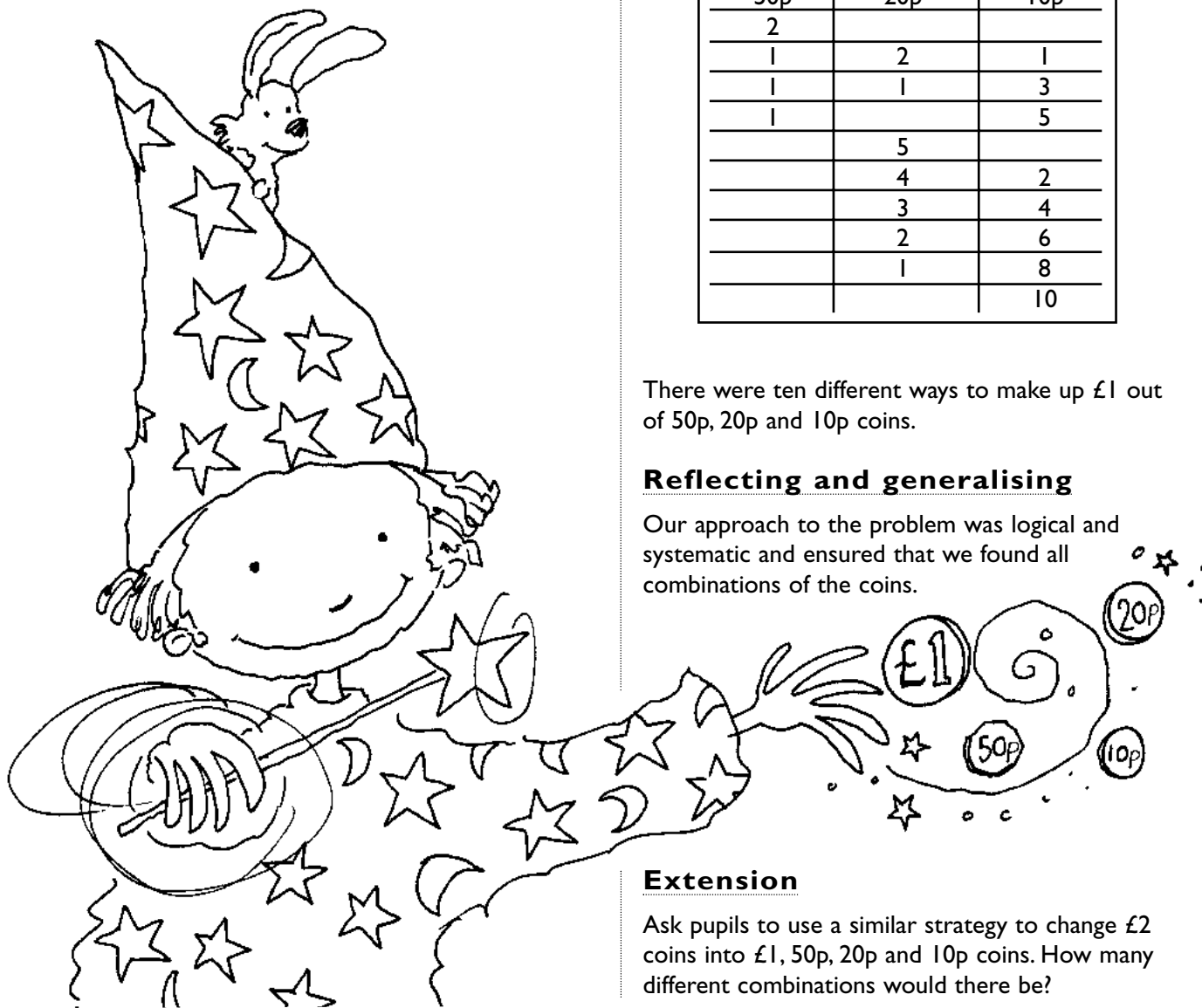
There were ten different ways to make up £1 out of 50p, 20p and 10p coins.

Reflecting and generalising

Our approach to the problem was logical and systematic and ensured that we found all combinations of the coins.

Extension

Ask pupils to use a similar strategy to change £2 coins into £1, 50p, 20p and 10p coins. How many different combinations would there be?



Copymaster Drawing a Table



★ Understanding the problem

List what you know

.....

.....

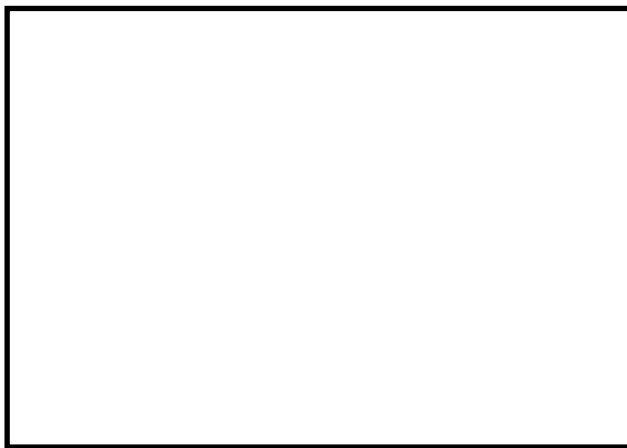
★ What do you need to find out?

Questioning: What questions do you have? What are you uncertain about? Is there any unfamiliar or unclear language? What you are being asked to do?

.....

.....

.....



★ Planning and communicating a solution

How many variables are there?
How many columns will be needed in the table? What would be suitable headings? Can symbols or images be used? Can gaps be left in the table once a pattern is established?

★ Reflecting and generalising

How accurate is the answer? How can this strategy be applied to other situations? Could a more effective method have been used? What technology was useful?

.....

.....

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★ Extension

How can this problem be extended? What factors can be added as part of a 'what if' question?

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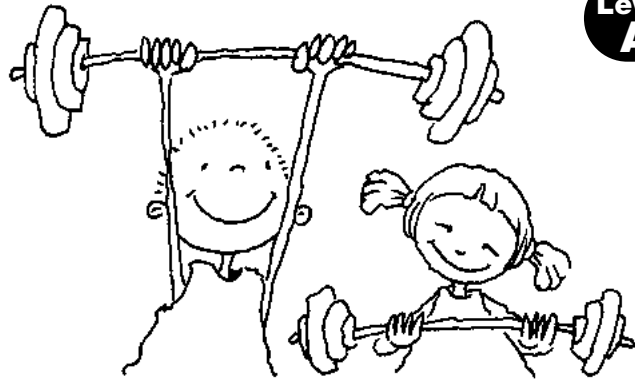
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PROBLEM SOLVING TASK CARDS - Drawing a Table

Problem 19

Numbers **123**

Sam and Marilyn both go to the gym each week. Sam goes every three days but Marilyn goes every fourth day. If they both attend on Monday when will they next be at a class together?

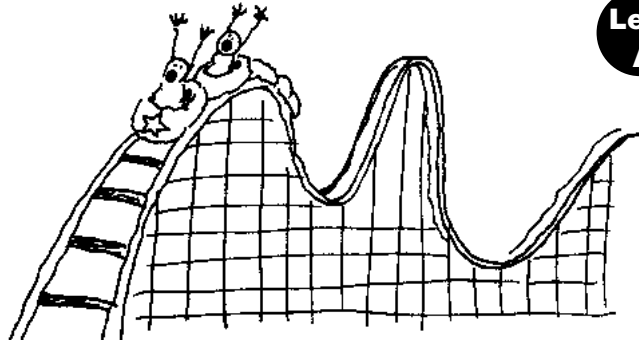


Level
A

Problem 20

Numbers **123**

There were 18 people seated on the roller coaster ride. For every two seats there was one empty. How many empty seats were there?

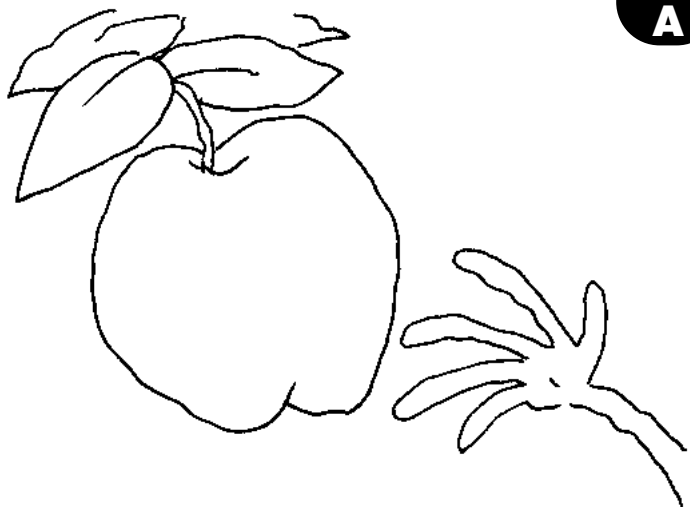


Level
A

Problem 21

Numbers **123**

Arlene has a holiday job picking apples. Her employer is happy to pay her one penny for the first tree she picks, two pence for the second, four pence for the third and eight pence for the fourth. How much will she receive for the eighth tree she picks and how much will she earn altogether for the eight trees?



Level
A

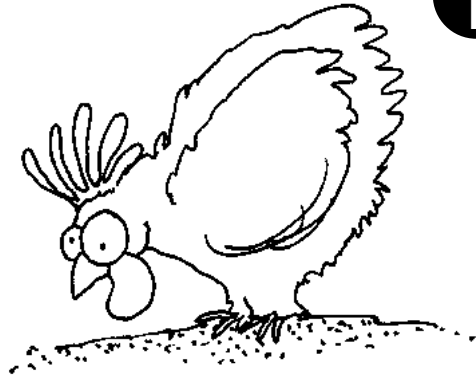
PROBLEM SOLVING TASK CARDS - Drawing a Table

Problem 22

Numbers 1 2 3

Level
B

A farmer has three different hen houses. One hen house contains red hens, the second black hens and the third white hens. Every day the red hens lay five eggs, the black hens lay eight eggs and the white hens lay three eggs. How many days will it take for the hens to lay a total of 80 eggs?

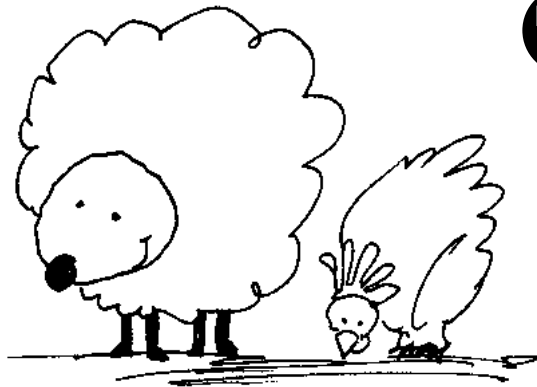


Problem 23

Numbers 1 2 3

Level
B

There are 18 animals on the farm. Some are chickens and others are sheep. If you can count 50 legs how many chickens and how many sheep are there?

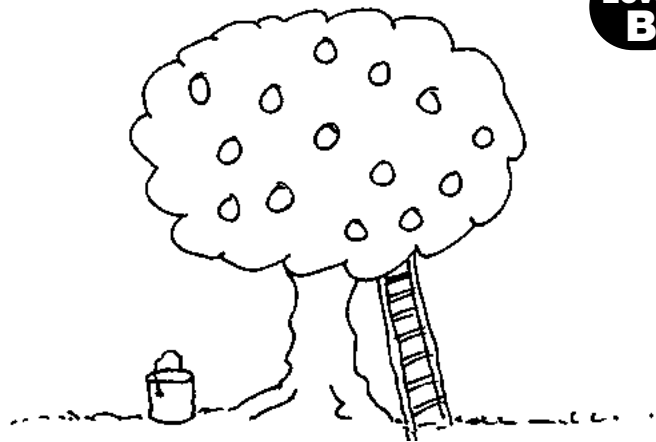


Problem 24

Numbers 1 2 3

Level
B

Simone had three peach and three plum trees in her garden. For every eight ripe peaches she picked, she picked three ripe plums. When the trees were bare she had 64 peaches. How many pieces of fruit did she collect altogether?



PROBLEM SOLVING TASK CARDS - Drawing a Table

Problem 25

Numbers **123**

Level **B**

A wild dog swallowed a total of 105 nuts in five days. Each day he managed to eat eight more than he had on the previous day. How many did he eat on each day?

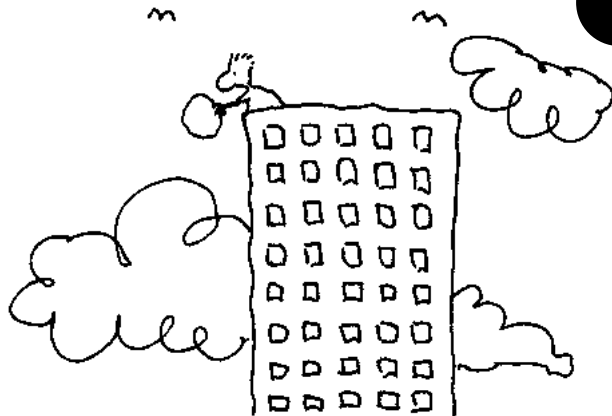


Problem 26

Measures

Level **B**

Each time a bouncy ball bounces, it bounces to half the height from which it falls. If Jack drops a ball from a building and it rises to a height of 24 metres, how high will it bounce on the fifth bounce?

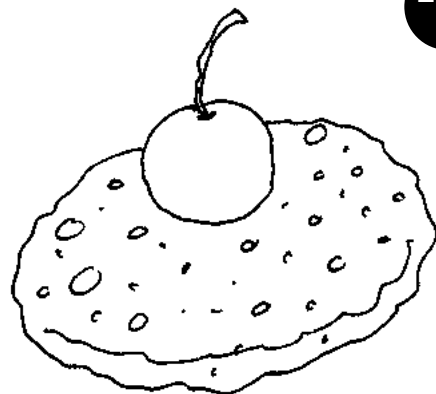


Problem 27

Numbers **123**

Level **B**

Nicole is baking 100 biscuits for the school fete. She becomes bored with decorating the biscuits so she decides to vary the decoration. She tops every third biscuit with a nut, ices every fourth and places a cherry on every fifth. When she has finished all 100, how many biscuits will have all three decorations?



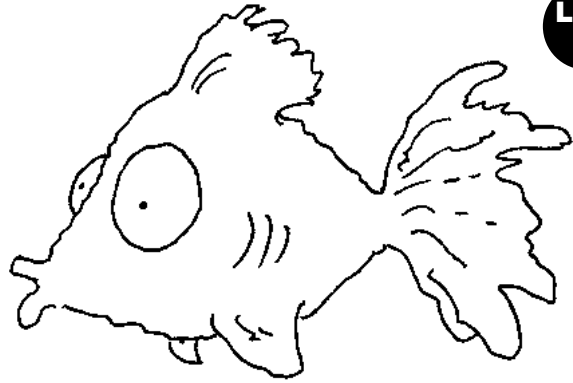
PROBLEM SOLVING TASK CARDS - Drawing a Table

Problem 28

Numbers **123**

Level
C

At the pet shop it was found that for every seven female goldfish born, only five male goldfish were born. If there were 156 goldfish hatched in a year how many will be female?

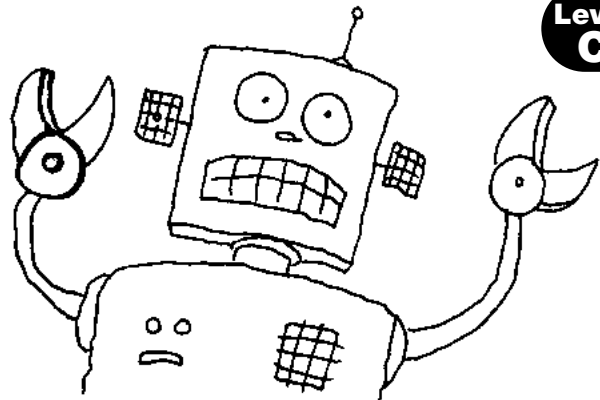


Problem 29

Numbers **123**

Level
C

On an alien planet, six out of twenty inhabitants are animals, nine out of twenty are humans and the rest are robots. If there are 108 humans on the planet how many robots are there?

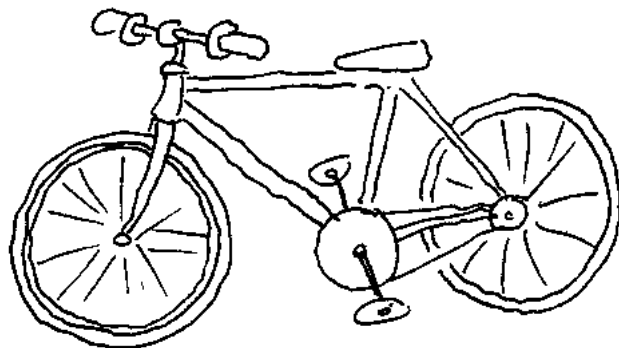


Problem 30

Numbers **123**

Level
C

A bike shop was selling bicycles and tricycles. In the shop there were 25 wheels. How many bicycles and how many tricycles were there?



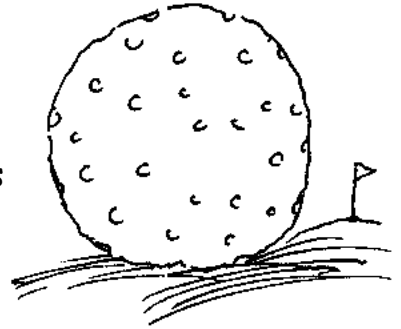
PROBLEM SOLVING TASK CARDS - Drawing a Table

Problem 31

Numbers **123**

Level
C

Peter lives next door to the golf course. Every day he goes and collects golf balls after school. On the first day he collects one and on the second day he also collects one. On the third day he collects two and on the fourth day three. Then on the fifth day he collects five and on the sixth day eight. On the seventh day he collects 13 golf balls. How many will he collect the next day? How many golf balls will he have in total?



Problem 32

Numbers **123**

Level
C

You have been asked to bury some bags of money on an island. The money has been divided into nine separate bags containing these amounts: £21, £20, £19, £12, £11, £10, £3, £2, £1.



You must bury the money in a three by three grid so that each row and column, either horizontal, vertical or diagonal, has £33.

Problem 33

Numbers **123**

Level
C

Jessica is rowing along the coast to Sunshine Bay. Each day she rows less because she gets more tired. On the first day she covers 38 kilometres, on the second day 35 kilometres, on the third day 32 kilometres and on the fourth day 29 kilometres. How many days will it take her to cover the distance of 203 kilometres to Sunshine Bay.



Answers to Task Cards Drawing a Table

Problem 19

Saturday of the second week both Sam and Marilyn will be at the gym.

| Days | S | M | T | W | T | F | S |
|----------------|---|---|---|---|---|---|---|
| Susan week 1 | | x | | | x | | |
| week 2 | x | | | x | | | x |
| Marilyn week 1 | | x | | | | x | |
| week 2 | | | x | | | | x |

Problem 20

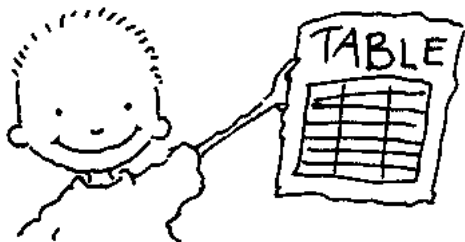
There are nine empty seats.

| | | | | | | | | | |
|--------|---|---|---|----|----|----|----|----|----|
| Filled | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| Empty | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Total | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |

Problem 21

Arlene will be paid 128 pence for the eighth tree and she will be paid 255 pence altogether.

| Apple tree | Pence | Total pence |
|------------|-------|-------------------|
| 1 | 1 | 1 |
| 2 | 2 | 2 (+1) = 3 |
| 3 | 4 | 4 (+ 3) = 7 |
| 4 | 8 | 8 (+ 7) = 15 |
| 5 | 16 | 16 (+15) = 31 |
| 6 | 32 | 32 (+ 31) = 63 |
| 7 | 64 | 64 (+ 63) = 127 |
| 8 | 128 | 128 (+ 127) = 255 |



Problem 22

It will take five days for the hens to lay 80 eggs.

| Days | Red | Black | White | Total |
|------|-----|-------|-------|-------|
| 1 | 5 | 8 | 3 | 16 |
| 2 | 10 | 16 | 6 | 32 |
| 3 | 15 | 24 | 9 | 48 |
| 4 | 20 | 32 | 12 | 64 |
| 5 | 25 | 40 | 15 | 80 |

Problem 23

There are eleven chickens and seven sheep.

| | | | | | | |
|----------|----|----|----|----|-----------------|----|
| Chickens | 1 | 2 | 3 | 4 | (+ 1 each time) | 11 |
| Sheep | 17 | 16 | 15 | 14 | (- 1 each time) | 7 |
| Legs | 70 | 68 | 66 | 64 | (- 2 each time) | 50 |

Problem 24

She collected 88 pieces of fruit altogether.

| Peaches | Plums | Total |
|---------|-------|-------|
| 8 | 3 | 11 |
| 16 | 6 | 22 |
| 24 | 9 | 33 |
| 32 | 12 | 44 |
| 40 | 15 | 55 |
| 48 | 18 | 66 |
| 56 | 21 | 77 |
| 64 | 24 | 88 |

Problem 25

| Day | Number of nuts each day | Total |
|-----|-------------------------|-------|
| 1 | 5 | 5 |
| 2 | 13 | 18 |
| 3 | 21 | 39 |
| 4 | 29 | 68 |
| 5 | 37 | 105 |

Answers to Task Cards Drawing a Table

Problem 26

The ball will bounce $1\frac{1}{2}$ metres on its fifth bounce.

| | |
|----------|-----------------------|
| Bounce 1 | 24 metres |
| Bounce 2 | 12 metres |
| Bounce 3 | 6 metres |
| Bounce 4 | 3 metres |
| Bounce 5 | $1\frac{1}{2}$ metres |

Problem 27

Only one biscuit has all three decorations, the sixtieth one.

| | | | | | | | | | |
|---|----|---|----|----|----|---|----|---|-----|
| | | N | I | C | N | | I | N | C |
| | NI | | | NC | I | | N | | IC |
| N | | | NI | C | | N | I | | NC |
| | I | N | | C | NI | | | N | IC |
| | N | | I | NC | | | NI | | C |
| N | I | | N | C | I | N | | | NIC |
| | | N | I | C | N | | I | N | C |
| | NI | | | NC | I | | N | | IC |
| N | | | NI | C | | N | I | | NC |
| | I | N | | C | NI | | | N | IC |

Problem 28

There will be 91 female goldfish out of 156 born.

| Female | Male | Total |
|--------|------|-------|
| 7 | 5 | 12 |
| 14 | 10 | 24 |
| 21 | 15 | 36 |
| 28 | 20 | 48 |
| 35 | 25 | 60 |
| 42 | 30 | 72 |
| 49 | 35 | 84 |
| 56 | 40 | 96 |
| 63 | 45 | 108 |
| 70 | 50 | 120 |
| 77 | 55 | 132 |
| 84 | 60 | 144 |
| 91 | 65 | 156 |

Problem 29

There are 60 robots.

| | | | | |
|-------------------|----|----|-----|-----|
| Total inhabitants | 20 | 80 | 160 | 240 |
| Animals | 6 | 24 | 48 | 72 |
| Humans | 9 | 27 | 72 | 108 |
| Robots | 5 | 20 | 40 | 60 |

Problem 30

There are 11 bicycles and one tricycle in the shop.

| | | | | | |
|-----------|----|----|----|-----------------|----|
| Bicycles | 1 | 2 | 3 | (+ 1 each time) | 11 |
| Tricycles | 11 | 10 | 9 | (- 1 each time) | 1 |
| Wheels | 35 | 34 | 33 | (- 1 each time) | 25 |

Problem 31

On the eighth day Peter collected 21 golf balls. He collected 54 in total.

| | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|------|
| 1 | 1 | 2 | 3 | 5 | 8 | 13 | 21 |
| | 1+0 | 1+1 | 2+1 | 3+2 | 5+3 | 8+5 | 13+8 |

Problem 32

| | | |
|-----|-----|-----|
| £12 | £19 | £2 |
| £1 | £11 | £21 |
| £20 | £3 | £10 |

Problem 33

It will take Jessica seven days to reach Sunshine Bay.

| Day | Kilometres | Total |
|-----|------------|-------|
| 1 | 38 | 38 |
| 2 | 35 | 73 |
| 3 | 32 | 105 |
| 4 | 29 | 134 |
| 5 | 26 | 160 |
| 6 | 23 | 183 |
| 7 | 20 | 203 |