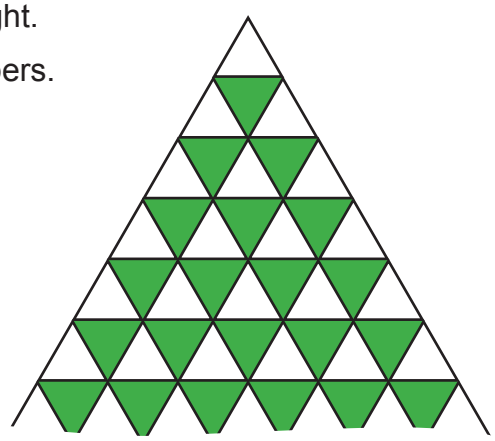
RESOURCE SHEET 4.3
Cracking the codes

Cracking the codes

A teacher has been captured by the Aliens and locked in the mother ship!

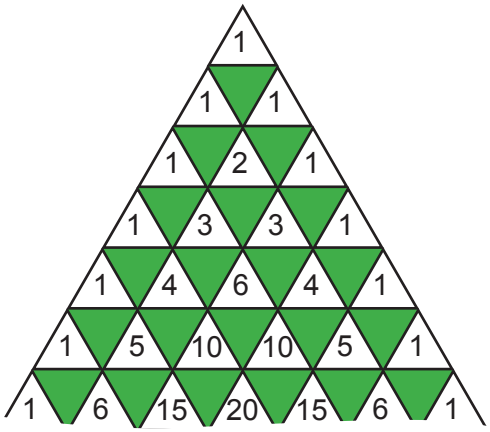
She is next to the huge communicator with a pattern of small triangles.
She can see only the first 7 rows. The rest of it is out of sight.

The keypad next to the communicator is for entering numbers.



a To switch on the communicator, the teacher has to type in the total number of small triangles in the 100th row.
What number should she type in? _____

b It works! The communicator is switched on!
Immediately, a number starts to flash in each of the small white triangles.
Explain how the number pattern builds up.



c The teacher can see only up to the 7th row.
What are the numbers in the next two rows?

_____

_____

d The teacher knows that to send a message she has to type in the total of the numbers in one of the rows of the communicator. To help her, complete this table.

Row	1	2	3	4	5	6	7
Total of all the numbers in the row	1	2	4				

Use the table to help you to work out a formula for the total of the numbers in the *n*th row of the communicator.

e Messages to the Aliens from the communicator are sent in two parts for security reasons.

To send the first part of her message, the teacher must type in the total of the numbers in the 21st row. Use your calculator to work out this number.

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RESOURCE SHEET 4.3
Cracking the codes (continued)

Cracking the codes (continued)

f Each digit of the total stands for a letter.

Use this code-breaker to work out the first part of the message.

0	1	2	3	4	5	6	7	8	9
O	N	P	E	W	A	E	K	M	D

g To work out the second part of the message to the Aliens from the communicator, the teacher must work out the 10th number in this sequence.

11^0 11^1 11^2 11^3 11^4 11^5 ...

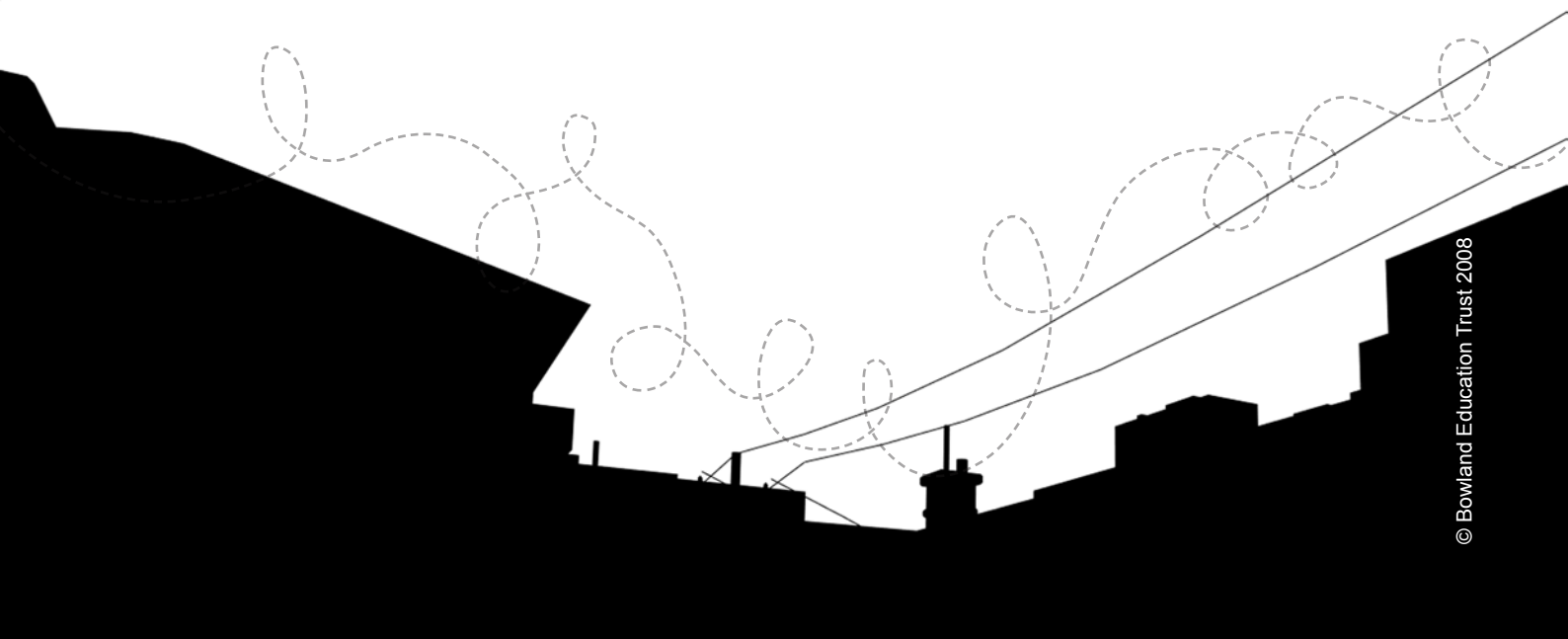
By typing in the 10th number in the sequence, the teacher will send the second part of the message to the Aliens.

Think how you could work out the 10th term of this sequence.

Use your calculator to work out this number.

Each digit of the number stands for a letter.
Now use this code-breaker to work out the second part of the message.

0	1	2	3	4	5	6	7	8	9
C	N	F	A	E	S	U	T	H	R



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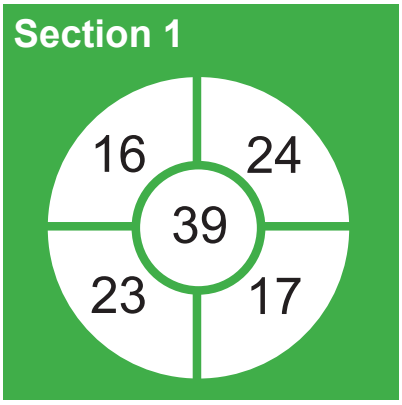
RESOURCE SHEET 4.4
Supplementary problem 4

Supplementary problem 4

There is a massive door to the cell in which the teacher has been held.
It has an electronic combination lock which has **three sections**.

The teacher has watched the Aliens.
She knows that the total of the numbers pressed in any section is always 100.

1 Here is the first section. There are five keys with numbers on them.

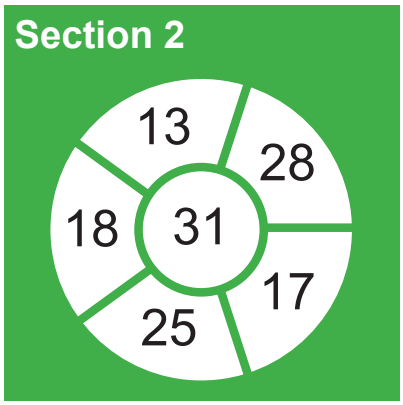


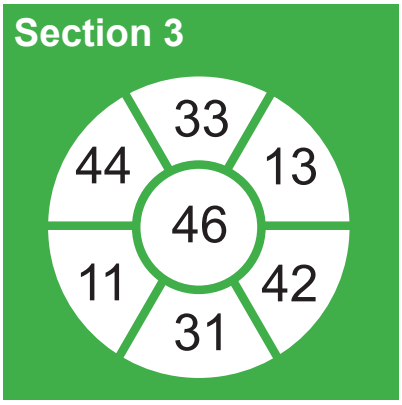
Only two of the keys can be pressed in any section but they can be pressed as many times as you like.

If the wrong key is pressed, the space ship will self-destruct!
If the correct numbers are pressed, the teacher can escape.

Which two keys should the teacher press in this section to make 100?
How many times should she press each of the two keys?

2 Here are sections 2 and 3 of the combination lock.





There are six keys in section 2 and seven keys in section 3.

a Which two keys should the teacher press in section 2 to make 100?
How many times should she press each of the two keys?

b Which two keys should the teacher press in section 3 to make 100?
How many times should she press each of the two keys?

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