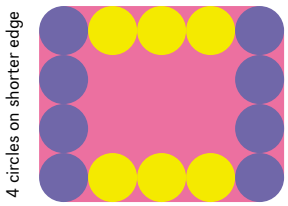
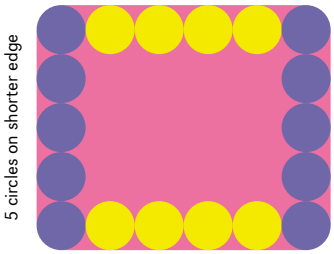
Mats, Patterns, and Rules

ACTIVITY

You need: a computer spreadsheet

1. Evalesi designs some table mats with circles as borders.
The longer edge always has one more circle than the shorter edge.





a. Evalesi uses a short cut to count the circles she has put on each mat. She writes (2 x 4) + (2 x 3) for one mat. Which mat is it?

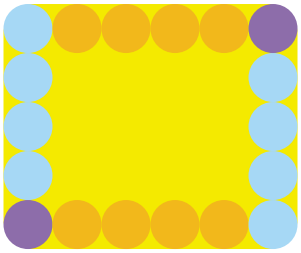
b. Write Evalesi's short cut for the other mat and check that her short cut works.

c. Complete the table below.

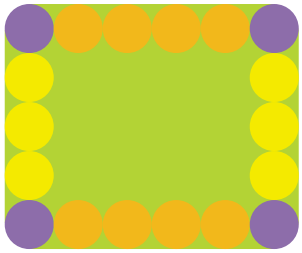
Number of circles on shorter side	Evalesi's short cut	Number of circles
3		
4		
5		
12		
34		
100		

d. Evalesi's friend Amber writes the rule 2 x x + 2 x (x – 1) to describe Evalesi's short cuts. See if you can work out what the symbol x stands for and also how Amber's rule works.

2. Terri and Waione make different table mat designs.



Terri's design



Waione's design

a. **i.** Explain how the pattern of coloured circles in Terri's design can be represented by the short cut calculation 4 x 4 + 2.

ii. Complete the table for Terri's table mat design.

Number of circles on shorter side	Short cut for Terri's design	Number of circles
3		
4		
5	4 x 4 + 2	
12		
34		
100		

iii. Amber writes a rule, $4(x - 1) + 2$, to describe the circles in Terri's mat design. Show how the rule works.

b. Write a rule, using x, to describe the circles in Waione's mat design.

c. **i.** In the spreadsheet opposite, the formula in cell B2 is =4*(A2–1)+2. Show how this formula is linked to the rule you found for Waione's mat design.

ii. Write the formula that goes in cell C2 in this spreadsheet.

iii. Make the spreadsheet.

Table Mats – Terri & Waione (SS)

B2 =4*(A2–1)+2

	A	B	C	D
1	Number of circles on shortest side	Short cut for Terri's design	Short cut for Waione's design	
2	5	18		
3	4	14		
4	7			
5	10			
6	27			
7	186			
8	253			
9	1000			

3. Evalesi notices that the columns B, C, and D in this spreadsheet show the same set of numbers.

She writes a rule to describe the number patterns.

a. Work out the number that goes in the empty box in the rule 4 x x – □. Explain how the rule works.

b. Each of the table mat rules used in questions **1** and **2** produces the same result (see the spreadsheet). Show how to make each rule as simple as possible.

i. 2 x x + 2 x $(x - 1)$

ii. 4 x $(x - 1)$ + 2

iii. 2 x $(x - 2)$ + 2 x $(x - 1)$ + 4

Table Mats – Evalesi (SS)

B2 =2*A2+2*(A2–1)

	A	B	C	D
1	Number of circles on shortest side	Evalisi's short cut	Short cut for Terri's design	Short cut for Waione's design
2	3	10	10	10
3	4	14	14	14
4	5	18	18	18
5	6	22	22	22
6	7	26	26	26
7	8	30	30	30
8	9	34	34	34
9	10	38	38	38
10	11	42	42	42
11	12	46	46	46