

INSTALLATION

Insert the CD-Rom into the disk drive and it will load automatically. Follow the on-screen instructions to install **Surrounded**. Consult your network administrator if you intend installing on a network.

RUNNING THE EXCEL MACROS

The **Surrounded** software contains macros within the Excel files. These must be enabled to run the software. ATM has confirmed that these files are safe and secure to use by ensuring they are digitally signed. This means that the macro security level can remain on 'High' when running the software.

You may receive a security warning when loading **Surrounded**.

To run the software:

- Tick 'Always trust macros from this publisher' and
- Click 'Enable macros'.

Surrounded will run without further security warnings once the macros have been enabled.

BASIC SYSTEM REQUIREMENTS

PC with Excel 2000, or later.

LICENCE AGREEMENT

The purchaser of this **Surrounded** CD-ROM is permitted to load and run the **Surrounded** files on their own machine, and also on machines within one institution site. By installing these files you are agreeing to protect the copyright of these materials by not allowing illegal copying or access for use beyond the site.

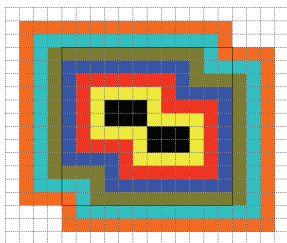
ACKNOWLEDGEMENTS

Derek Ball created the original ideas for the program and developed the software. We would also like to thank Barbara Ball and Ruth Tanner for all their suggestions and advice.

INTRODUCTION

This CD-Rom provides the opportunity to explore and extend the familiar 'pond borders' idea. The ideas will challenge pupils of all ages in both primary and secondary schools and offer many opportunities for discussion, problem solving, mathematical exploration and for posing problems.

You can use any pond shape made from squares. The software draws the surrounds one at a time or several at once.



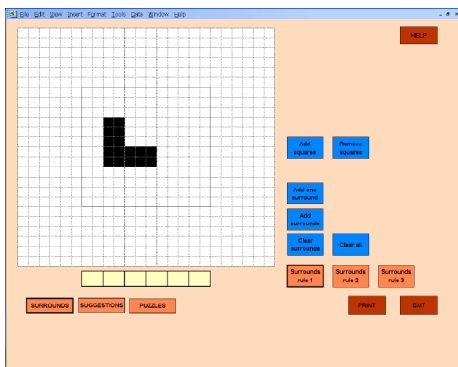
There are three different bordering rules to explore. These provide examples of mathematical art situations suitable for Reception upwards. If the table giving the number of squares in each surround is displayed then the algebra of the situation can be considered.

There are three screens available:

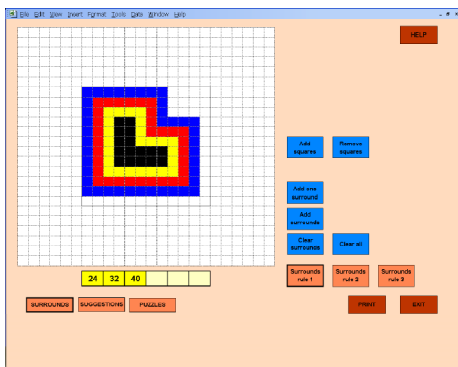
- **Surrounds** provides the three rules to be explored;
- **Suggestions** contains a number of suggestions for exploring the situations using Rule 1 (these are also listed on page 6);
and
- **Puzzles** provides an abundance of randomly generated puzzles of varying degrees of complexity to be solved. The puzzles require the user to find a pond that produces a given number pattern.

The materials are suitable for whole class use with interactive whiteboards or multimedia projectors. They are also ideal for pupils working in pairs or small groups.

USING THE *SURROUNDS* SCREEN



- First make a black starting shape by selecting some squares within the black border line.
- Use **Add squares** and **Remove squares** to create your shape.
- Use **Add one surround** to add one surround at a time.
- Use **Add surrounds** to add all surrounds together.

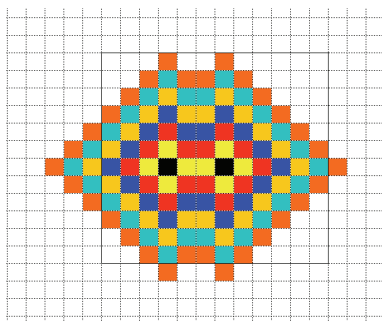


- Click on the pale yellow boxes beneath the grid to show the number of squares in each surround

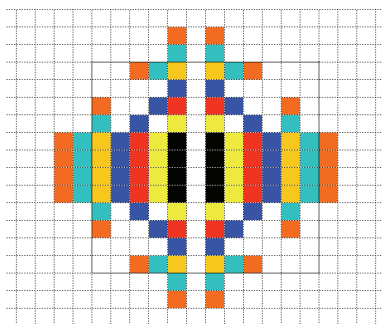
- Click **Clear surrounds** and then use **Add squares** and **Remove squares** to modify the pattern.
- **Clear all** to start again.

You can use alternative rules to create your surrounds.

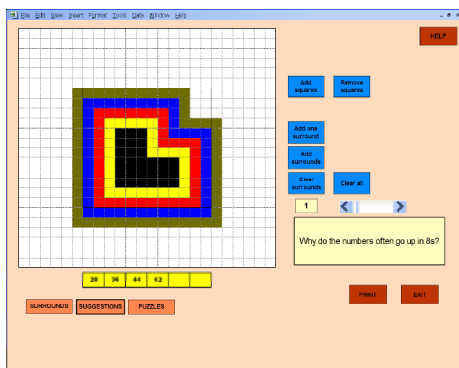
- Click on **Surrounds rule 2** or **Surrounds rule 3** to change the rule being used.
- **Surrounds rule 2** surrounds the original shape by colouring only squares that touch a previously coloured square along a side.



- **Surrounds rule 3** surrounds the original shape by colouring a square only if it touches exactly one coloured square along a side.



USING THE *SUGGESTIONS* SCREEN

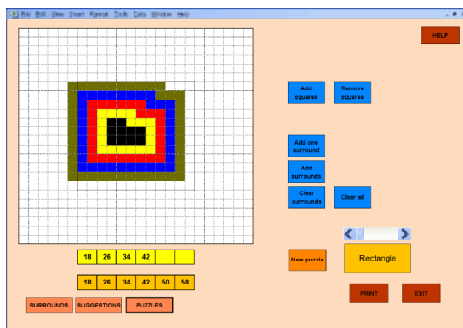


- Click on **Suggestions** to access the Suggestions screen.
- This screen works in the same way as the Surrounds screen, but only **Rule 1** is available for creating the surrounds.
- Click on the scroll bar to access the suggestions. Suggestions for activities are indicated by the number to the left of the scroll bar.
- There are 14 different suggestions on the CD-Rom and they are listed opposite.

SUGGESTIONS SCREEN ACTIVITIES USING RULE 1

- 1** Why do the numbers often go up in 8s?
- 2** Do the numbers always go up in 8s?
Why? What happens eventually?
- 3** Make a pattern where the first two numbers are the same.
- 4** Make a pattern where the first three numbers are the same.
Compare your solution with the solutions of others.
- 5** Make a pattern where the first four numbers are the same.
- 6** Make a pattern where the numbers start by getting smaller.
- 7** Make a pattern where the numbers start by going down in 8s.
- 8** Make a pattern where the first number is odd.
- 9** Make a pattern where the first two numbers are odd.
- 10** Make a pattern where as many numbers as possible are odd.
What happens eventually?
- 11** Make a pattern where the first few numbers are consecutive – up or down.
- 12** Decide what the first few numbers should be and then try to make a pattern for these numbers.
- 13** Investigate what happens if the starting shape consists of two individual squares, placed at different positions in relation to one another.
- 14** Investigate other sets of starting shapes.

USING THE *PUZZLES* SCREEN

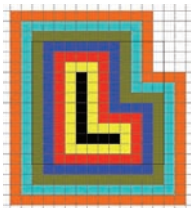


- Click **Puzzles** to access the Puzzles screen, then **New puzzle** to obtain a puzzle to solve.
- The computer will fill the six dark yellow boxes with six numbers. These are the numbers of squares in the first six surrounds of a pattern. All puzzles use Rule 1 for the surrounds. Create a pattern that produces the same six numbers to solve the puzzle.
- Use the scroll bar to select the type of puzzle to solve.
 - **Rectangle** means that the puzzle can be solved by using a rectangle as the starting shape.
 - **Dents** can be solved using a single starting shape with one or more dents in it.
 - **Towers** can be solved using a number of vertical strips of squares all the same length, all in a line and all equally spaced.
 - **Two dominoes** or **monominoes** can be solved using a starting shape consisting of either two dominoes or two monominoes.
 - **Three monominoes** can be solved using three isolated squares.
 - **Any** means that the puzzle may use any of these starting shapes or some other starting shape altogether.

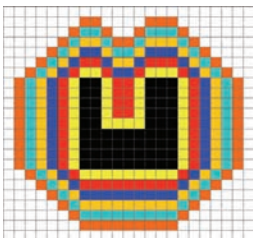
SUGGESTED ACTIVITIES USING ALL THREE RULES

- Use the **Surrounds** screen.
- Make a rectangle for the black starting shape.
Click **Add Surrounds** and discuss the rules used by the computer to make the surrounds.
- Now use other rectangles or different types of starting shape. Or use different rules

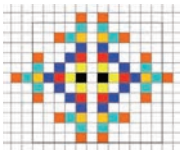
RULE 1



RULE 2



RULE 3



- Discuss the different types of pattern you get and ask pupils to predict how the patterns will continue.

SUGGESTED ACTIVITIES USING RULE 2

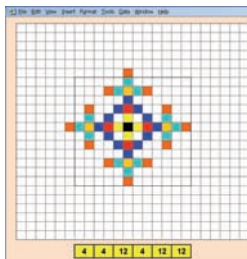
- Use the **Surrounds** screen and select **Surrounds Rule 2** for these suggestions
 - 1 Why do the numbers often go up in 4s?
 - 2 Do the numbers always go up in 4s? Why? What happens eventually?
 - 3 Make a pattern where the first two numbers are the same.
 - 4 Make a pattern where the first three numbers are the same. Compare your solution with the solutions of others.
 - 5 Make a pattern where the first four numbers are the same.
 - 6 Make a pattern where the numbers start by getting smaller.
 - 7 Make a pattern where the numbers start by going down in 4s.
 - 8 Make a pattern where the first number is odd.
 - 9 Make a pattern where the first two numbers are odd.
 - 10 Make a pattern where as many numbers as possible are odd. What happens eventually?
 - 11 Make a pattern where the first few numbers are consecutive – up or down.
 - 12 Decide what the first few numbers should be and then try to make a pattern for these numbers.
 - 13 Investigate what happens if the starting shape consists of two individual squares, placed at different positions in relation to one another.
 - 14 Investigate other sets of starting shapes.

SUGGESTED ACTIVITIES USING RULE 3

- Use the **Surrounds** screen and select **Surrounds Rule 3** for these suggestions

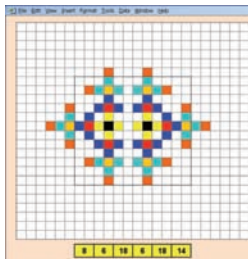
- 1 Use just one square for the black starting shape. Look at the numbers for the first six surrounds.

How does the pattern of numbers continue?



- 2 Now use two squares for the starting shape. The squares could be touching or there could be a gap between them. The gap could be of any size. For each starting shape, look at the numbers for the first six surrounds.

How do they relate to the numbers in question 1? Explain why.



- 3 Use other starting shapes and explore the numbers obtained for the surrounds.