

GEOMETRIC SHAPES

To use Logo procedures to draw a series of specified shapes.

†† Pairs.

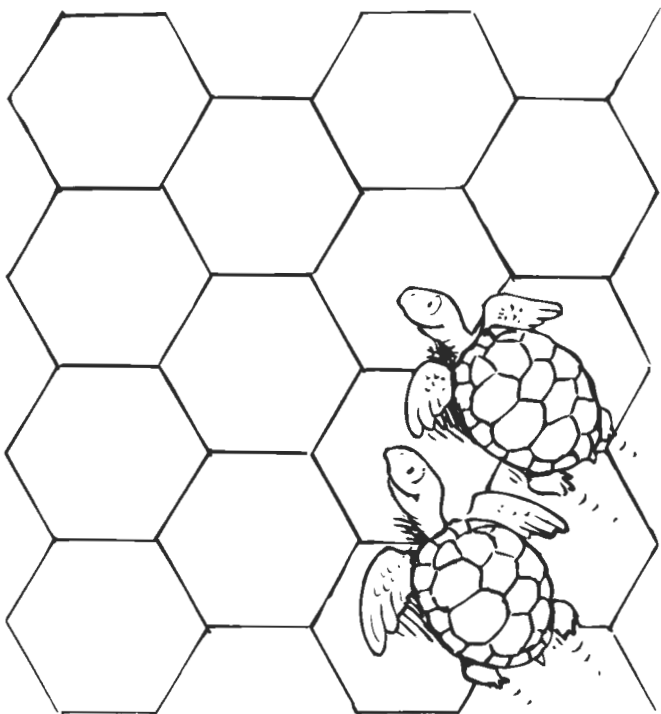
🕒 30 minutes at the computer; 15 minutes discussion/demonstration.

Previous skills/knowledge needed

The children should have experience in using Logo and be familiar with the basic commands. They should know that regular polygons have sides of equal length. Depending on their age and ability, knowledge of the external angles of various polygons would also be useful.

Key background information

The mathematical beauty of regular polygons can be explored easily with Logo. Unlike classroom floor robots, screen turtles are very accurate, drawing with precision. Through the use of Logo, the children may draw simple geometrical shapes, making use of the REPEAT command or the procedure and REPEAT function together.



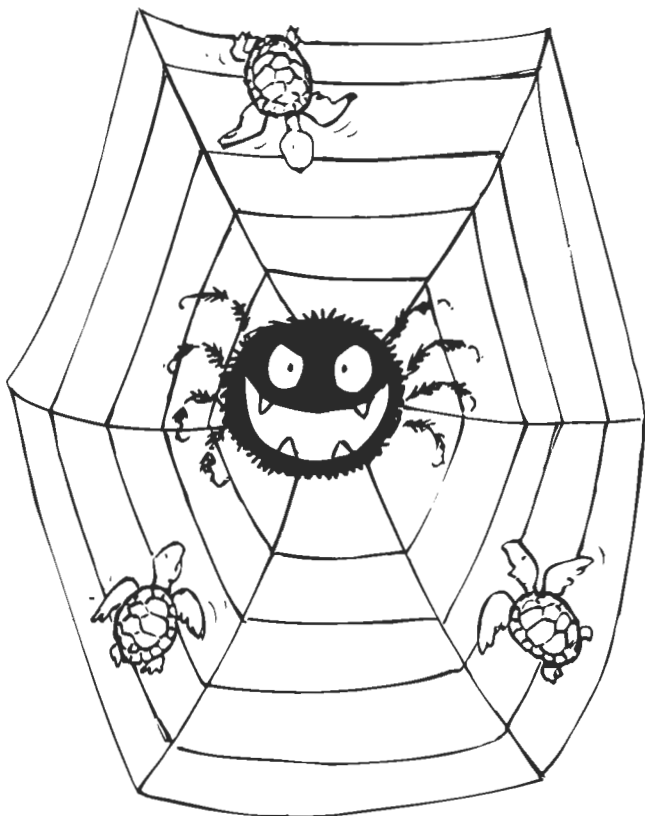
This activity knits together the use of Logo and shape and space in mathematics. The regular polygons have a magic of their own; such shapes occur in the natural world, for example in honeycombs or crystal and rock structures, and in the man-made world, where they are used for constructional and commercial purposes, as in geodome buildings.

Preparation

Make one copy of photocopiable page 157 for each child.

Vocabulary

Regular polygon, external angle, side, vertex (the apex of a figure).



Resources needed

A computer, screen turtle Logo software, a printer, photocopiable page 157.

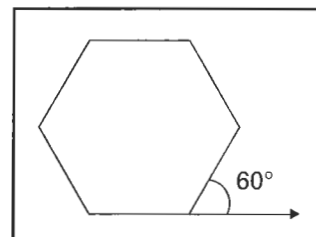
What to do

Give each child a copy of photocopiable page 157. This lists a selection of polygon shapes and provides the size of the external angles for each one in degrees, which is essential for the children to know. Allowing the children time to write their commands on paper first will pay dividends when they come to use the computer. Drawing small diagrams to aid their thinking and to provide a visual stimulus is an essential practice to help them create the Logo sequences.

Next, you will need to provide a whole class or large group demonstration of the polygon activity using Logo, but the level to which you do this very much depends on the children's abilities. Remind them that using the REPEAT command will mean making far fewer key presses. (This command has been outlined in previous activities, for example Pattern Repeated on p112 and Logo Bookmark on p116). Details on creating hexagons and setting up a hexagon procedure are included below to guide your demonstration.

Creating a hexagon

The hexagon has an external angle of 60° . At each corner, the turtle must turn through 60° before continuing on to create the next side of the hexagon.



The following commands will draw one side and turn the turtle the required amount ready to draw the second side:

```
FORWARD 50  
LEFT 60
```

To repeat this the correct number of times using the REPEAT command, enter:

```
REPEAT 6  
FORWARD 50  
LEFT 60  
END
```

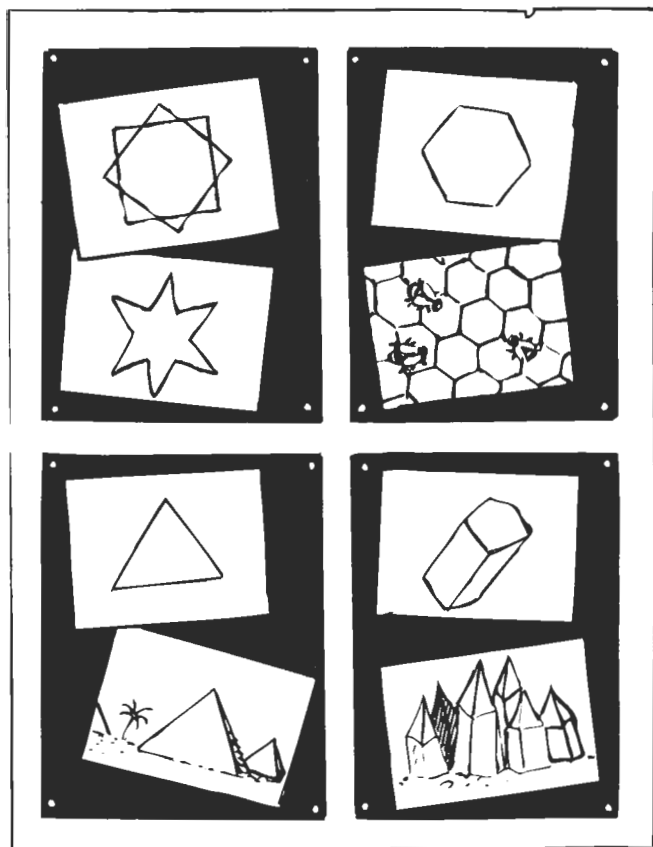
Building a hexagon procedure

To build a procedure named 'HEXAGON,' the following commands are appropriate, but this will depend on your software version of Logo:

```
TO HEXAGON  
REPEAT 6  
FORWARD 50  
LEFT 60  
END
```

On the command 'DRAW hexagon', a hexagon should now appear on the screen. An arbitrary side length of 50 units has been used in this example. Frequently, Logo software uses millimetres as a unit of distance but again, this will depend on the version used.

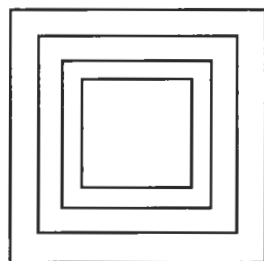
The transition from the children's paper-based sequences to the computer should be as smooth as possible. Encourage a few of them to enter their sequences for a polygon of their choice in front of the whole class or a large group and guide them in this activity to raise their



confidence. Finally, allow the rest of the children to try out their use of Logo, in pairs, to create the polygons on screen. The less confident children may not go as far as using the REPEAT command. In this case, limit their shapes up to six-sided hexagons. If they are happy using the REPEAT command, however, they can try out whatever polygon they wish. The more confident children may be able to place their sequences into a procedure such as:

HEXAGON
PENTAGON
OCTAGON

You have complete control over the requirements for this activity, for example asking the children to draw and print out three hexagons, two pentagons and one square all in different colours. The task should match their abilities but also extend them where necessary. Make the tasks challenging and interesting, perhaps including a competitive edge where appropriate.



filled shapes, and perhaps create other shapes such as regular stars.

Suggestion(s) for extension

This activity lends itself to a wide variation in levels of difficulty. More able children should be able to build procedures, produce

A further extension would be for the children to attempt to draw 'nested' shapes, fitting inside one other like a set of Russian dolls. Start with nested squares, by the use of the commands 'PENUP' and 'PENDOWN'. These shapes should not be linked by a line. Can they write a sequence which draws the pattern shown (see below left)?

Suggestion(s) for support

The tasks set for the less confident should be more straightforward. The children can be expected to draw their shapes without the use of the REPEAT command, and to create those polygons with fewer sides.

Assessment opportunities

You will be able to assess how well the children create, test and modify their sequences of instructions to draw regular polygon shapes using Logo software. Make a judgement on how confident the children are in understanding the Logo commands and in using Logo to create their shapes.

Display ideas

Results from this activity will enhance any display on geometrical shapes in your maths corner. Print out the shapes in solid colour for added impact, and accompany them with commercial photographs of regular shapes found in the natural world.

Reference to photocopyable sheet

Photocopiable page 157 provides a list of regular polygon shapes. The children have to work out the correct sequences to draw these using the 'REPEAT' command.

Polygons

Name _____ Date _____

▲ Think about how you could draw the polygons below using Logo. Could you use the 'REPEAT' command to do this? Could you write the sequence to draw tessellated shapes?

Polygon	No. of sides	External angle
Equilateral triangle	3	120
Square	4	90
Pentagon	5	72
Hexagon	6	60
Heptagon	7	51.4
Octagon	8	45
Nonagon	9	40
Decagon	10	36
Undecagon	11	32.7
Dodecagon	12	30

▲ Choose three shapes from the chart above. For each of your chosen shapes.

1 Write out the Logo sequence that would produce each of your shapes (without using a REPEAT command).

2 Now rewrite the sequence using a REPEAT command.

Can you write the Logo sequence that will join two (or three) of your chosen shapes together like this?

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