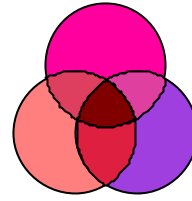


Crop Circles



UFO's, vandals or artists? Whoever makes crop circles can certainly do geometry!

Task A

In this task you will need the internet and a pencil and paper for sketching.

- 1 Go to the following website to look at some crop circles.



Lucy Pringle's website <http://www.lucypringle.co.uk/photos/index.shtml>

Choose any year and month and you will see photographs of the crop circles that appeared during that month. Click on a photograph to enlarge it.

- 2
 - a) Sketch **two** of the crop circles on paper.
 - b) Use geometrical terms to describe the crop circles.
 - c) Say which crop circle you prefer and why.

Task B

In this task you will construct a geometrical design and study its symmetries. The instructions are given on pages 2 – 4.

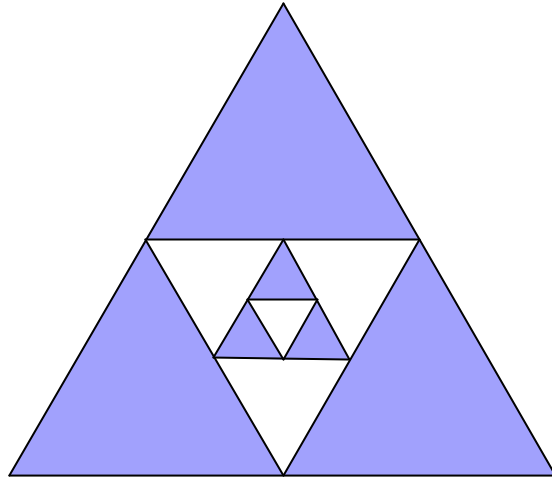
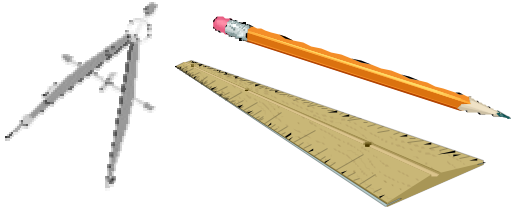
Task C

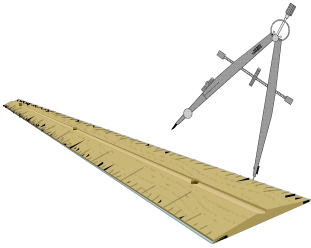
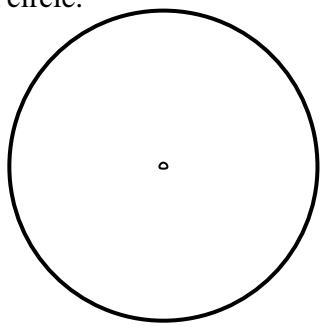
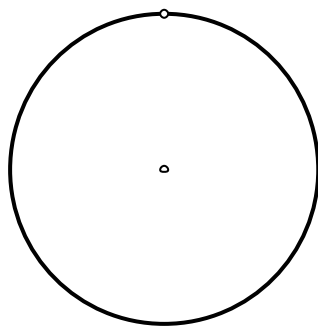
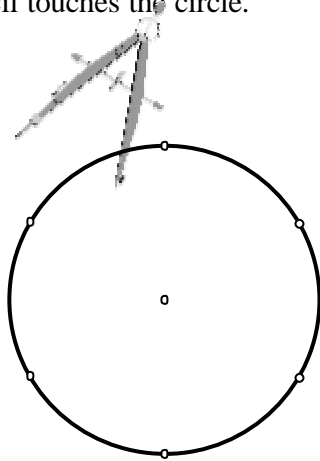
- 1 Use geometrical equipment to design a crop circle.
- 2 Write a list of instructions so that other people could draw your design.
- 3 Describe your design in words. Include any symmetries.



Constructing a Geometrical Design

To complete this design use **only** a pair of compasses, a pencil and a straight edge – you do not need to use a ruler to measure any lengths.



<p>1 Set your compasses to a fixed length and do not alter them.</p> 	<p>2 Draw a circle.</p> 
<p>3 Choose a point on the circle.</p> 	<p>4 Use your compasses to step round the circle. Make a mark at each point where your pencil touches the circle.</p> 



5
Join three of the points to draw an equilateral triangle.

6

7
Draw a line passing through a vertex of the triangle and the centre of the circle.

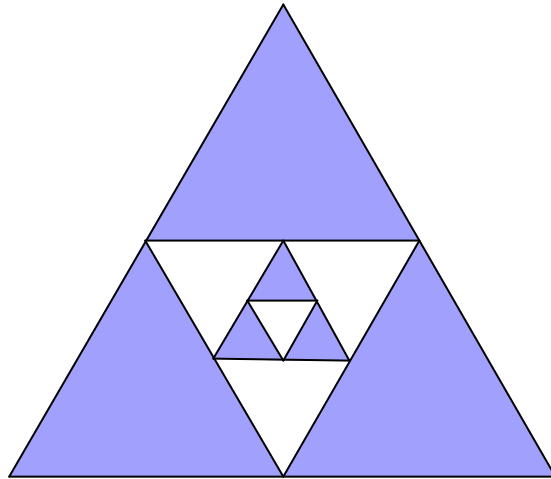
8
Draw the other two lines that do this.

9
Use the points where these lines cut the original triangle to draw a new equilateral triangle.

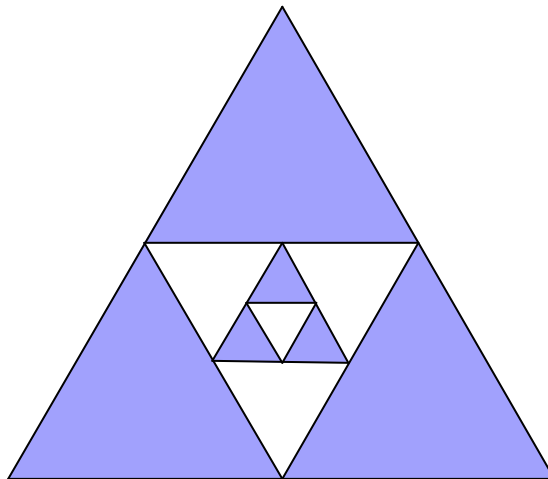
10
Continue the design by drawing triangles inside triangles.

Symmetry in the Geometrical Design

- 1 Draw all the lines of symmetry on the first copy of the design.



- 2 What is the order of rotational symmetry of the design?
Find and mark the centre of rotation on the second copy of the design.



Teacher Notes

Unit Foundation Level, Working in 2 and 3 dimensions

Skills used in this activity:

- finding information from the internet
- sketching and constructing geometrical designs
- describing geometrical designs using geometrical terms and symmetry

Preparation For the class you need:

- internet access
- worksheets (pages 1 – 4) for each student
- plain paper
- compasses, rulers, pencils etc. for construction work

Notes on the Activity

This activity consists of three tasks. You may wish to do the first task in one session and the others in a separate session. Task A requires students to look at some of the pictures of crop circles which are available on the internet.

(Please note that websites are often updated and addresses and details sometimes change – you may need to alter the worksheet occasionally. Weblinks to other crop circle websites can be found on the Nuffield website.)

The students are asked to sketch two of the circles, describe them in geometrical terms and say which of the two they prefer. It is obviously important that the students have met the geometrical terms they may need. A list of possibilities is given below.

Geometrical terms

Angles – acute, right angle, obtuse, reflex

Triangles – equilateral, isosceles

Quadrilaterals – square, rectangle, rhombus, parallelogram, trapezium, kite

Polygons – regular, pentagon, hexagon, octagon, decagon

Lines and line segments – parallel, perpendicular

Other terms – bisect, bisector, mid-point

Tasks B and C involve construction work and symmetry. Task B is based on equilateral triangles and in Task C students are asked to produce their own design, describe it in words and write instructions to show how it was done.

N.B. It should be emphasised to students that farmers are usually not happy about the appearance of crop circles on their land and that it is a criminal offence to destroy crops. Any student wanting to try making a real crop circle must have the permission of the owner of the land.



Before students attempt the activity you may wish to use some crop circles to introduce the names of shapes and other geometrical terms or discuss symmetry. Lucy Pringle's website includes a huge variety of crop circles. Some of the older crop circles that would be most useful for class discussion are listed below. This would leave the more recent crop circles for students to explore.

Shapes

Cley Hill, Wiltshire	1997	14 th Jul	<i>Discuss vocabulary involving circles &:</i> hexagon, pentagon, triangle s
Beckhampton, Wiltshire	1998	8 th Aug	pentagon, triangle s, kite
Opp carpark - Avebury, Wiltshire	1998	23 rd Aug	triangle, quadrilateral, kite, octagon
Allington nr Devizes, Wiltshire	1999	24 th Jun	parallelogram/rhombus , hexagon
Honey Street	1999	17 th July	hexagon, parallelogram/rhombus
Devil's Den nr Clatford, Wiltshire	1999	19 th Jul	parallelogram/rhombus , triangle, hexagon
Windmill Hill, Wiltshire	1999	19 th Jul	square/rectangle
Beckhampton (2), Wiltshire	1999	28 th Jul	trapezium, triangle , hexagon
Henwood (2), Hampshire	1999	3 rd Aug	hexagon, triangle

Symmetry

			<i>No of lines</i>	<i>Rotational order</i>
Headbourne Worthy, Hampshire	1997	6 th Jul	4	4
Bishops Canning, Wiltshire	1997	12/13 th Jul	5	5
Cley Hill, Wiltshire	1997	14 th Jul	6	6
Etchilhampton, Wiltshire (2 circles)	1997	1 st Aug	1) 4 2) 0	1) 4 2) 6
Silbury Hill, Wiltshire	1998	22 nd Jul	0	4
Beckhampton, Wiltshire	1998	8th Aug	5	5
Allington nr Devizes, Wiltshire	1999	24 th Jun	0	3
Honey Street	1999	17 th July	1	1
Devil's Den nr Clatford, Wiltshire	1999	19 th Jul	6	6
Windmill Hill, Wiltshire	1999	19 th Jul	4	4
Silbury Hill (2), Wiltshire	1999	24 th Jul	0	4
Beckhampton (2), Wiltshire	1999	28 th Jul	0	6
Henwood (2), Hampshire	1999	3 rd Aug	3	3

Alternatives/Extensions

Students could be asked to draw *accurate* scale drawings where the dimensions of the crop circles are known. However the constructions are often very difficult and students working at Foundation Level are likely to need a lot of help with the more complex examples.

