Activity description

This activity enables students to consolidate their knowledge of the properties of two dimensional shapes by working with a variety of stained glass designs. Students may enjoy designing their own suncatchers, perhaps as part of a collaborative project with art or design departments.

Suitability

Level 2 (Intermediate/Higher)
Could also be used for Level 1 (Foundation) but in this case you may wish to omit question 4 which involves the angle of rotation.

Time

1-2 hours

Resources

Student information and work sheets
Optional: slideshow

Equipment

Compasses, rulers, protractors, pencils etc.

Key mathematical language

- quadrilateral including rectangle, square, parallelogram, rhombus, trapezium, kite
- triangle including right-angled, obtuse-angled, acute-angled, equilateral, isosceles
- pentagon, hexagon, octagon
- line of symmetry
- rotational symmetry (including the idea of centre and order)
- regular, in the context of a 2D shape

Notes on the activity

The images on the third slide are intended to show students that this activity is based on a real life context, and to aid class discussion about 2D shapes and symmetry. These images can be used to encourage students to think about how a suncatcher is constructed, the need for accuracy, and the difficulties of drawing some of the shapes. This discussion could form part of the introduction to the activity or could take place prior to learners designing their own suncatchers.

During the activity

It is suggested that learners work individually, discussing their work with a partner if they wish. They should be encouraged to describe the designs orally to reinforce the meanings of the words listed above, and to practise communicating mathematically.

Points for discussion

What shapes are found in the designs?
What shapes are not found in the designs?
Can you suggest a reason for your answers to the above two questions?

How could you change a design so that it has rotational symmetry only?
How could you change a shape so that it has line symmetry only?
How could you change the order of symmetry of one of the shapes?

Extension

Students may enjoy looking at other examples of stained glass work on the internet, such as images at

http://www.flickr.com/photos/russianjohn/4668899325/in/set-72157627013512210/

Here are sources of the images in the slides and student sheets – not all pure geometric shapes.

http://noether.uoregon.edu/~sadofsky/windows/

http://www.etsy.com/shop/BrightMoonDesigns

Students could practise their construction techniques by copying a section of one of these pictures. Weaker learners may find copying a suitable image less challenging than designing their own suncatchers.

Answers

Most of the shapes included in the designs are listed below, but note that combining shapes can give other polygons.

Design A

1 Triangles (right-angled, isosceles), squares, parallelograms, pentagons

2 4 **3** 4 **4** 90°

Design B

1 Circle, triangles (isosceles, obtuse-angled), kites, pentagons

2 5 **3** 5 **4** 72°

Design C

1 Triangles (right-angled, acute-angled), squares, quadrilaterals

2 0 **3** 4 **4** 90°

Design D

1 Circle, triangles (equilateral, isosceles, obtuse-angled), rhombi, hexagons

2 2 **3** 2 **4** 180°

Design E

1 Rectangles, squares, trapezia, octagons

2 4 **3** 4 **4** 90°

Design F

1 Triangles (isosceles, acute and obtuse-angled), quadrilaterals, parallelograms, rectangles, rhombus, trapezia, square

2 1 **3** 1 **4** 360°

Design G

1 Circles, kites, rhombi

2 6 **3** 6 **4** 60°

Design H

1 Triangles (right-angled, acute-angled, isosceles), square, parallelograms, trapezia, kites, hexagons

2 4 **3** 4 **4** 90°