

Line Symmetry

Line Symmetry is also called Reflection symmetry. A shape is symmetrical if both sides are the same when a mirror line is drawn.



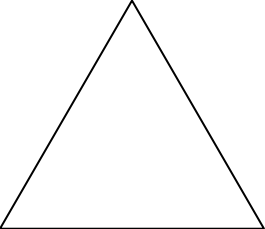
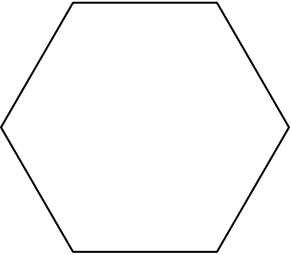
Reflection symmetry is all around us. Line symmetries can be found in Architectural designs, common items around us, origami and even crop circles! Here are some examples:

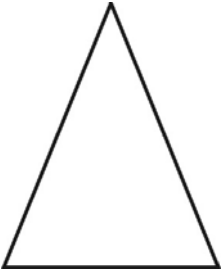
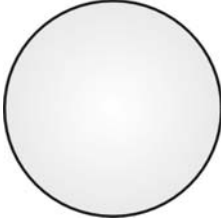
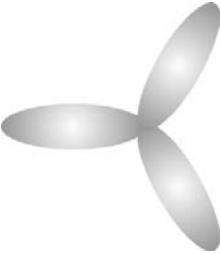



Line of symmetry is a mirror line or fold line. It is the line that you draw it on a symmetrical figure to divide it such that both sides of the line are identical.

Some shapes have several lines of symmetry. How many lines of symmetry does a square have?

Exercise 1: Identify the no. of lines of symmetry for each figure.

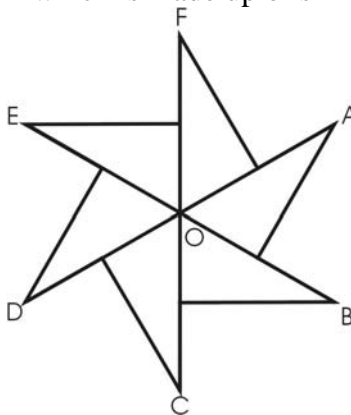
Objects and Number of Lines of Symmetry	Objects and Number of Lines of Symmetry
	
	

Objects and Number of Lines of Symmetry	Objects and Number of Lines of Symmetry
	
	

How many lines of symmetry are there in a parallelogram?

Rotational Symmetry

Consider the following windmill which is made up of six identical triangles:



Suppose we rotate it about the point O, called the centre of rotation, and after certain angles of rotation, the windmill looks as if it has not been rotated. Each time we achieve such angle, we stop.

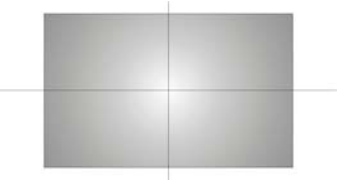
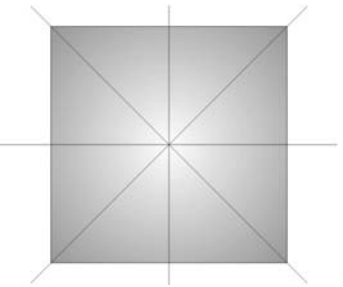
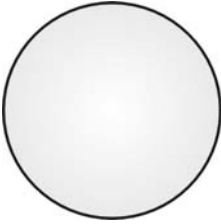

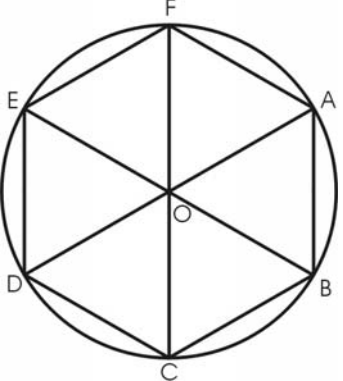

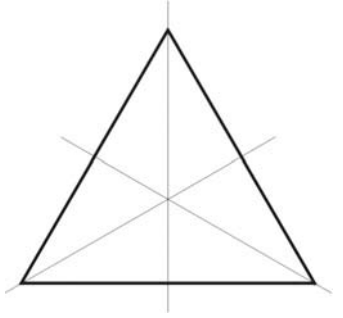
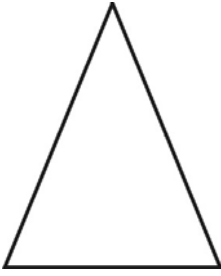
How much is this angle?


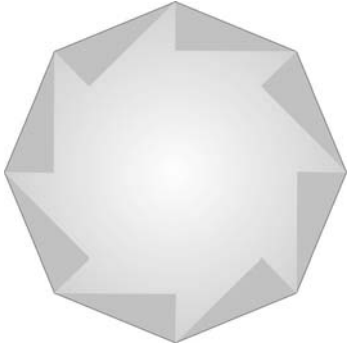
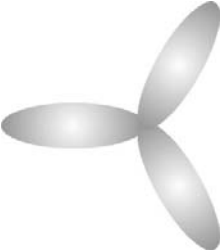
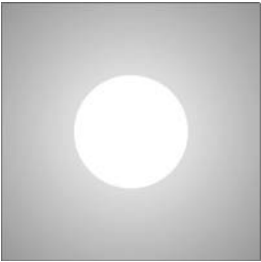
How many stops do you think we get before we return to its original position? We call this number of stops the **order** of rotational symmetry.

Can you tell how is the order of rotational symmetry related to the angle we have found above?

If a shape will only fit itself in one way it has no rotation symmetry. In Math, we consider only objects of rotational symmetry of order above 2 to have rotational symmetry.

Let's see if you can tell the order of symmetry for the objects below? Indicate where the center of rotation is.

Objects & Order of Rotational Symmetry	Objects & Order of Rotational Symmetry
	
	
	
	

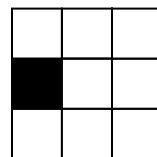
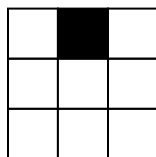
Objects & Order of Rotational Symmetry	Objects & Order of Rotational Symmetry
	
	

Exercise 2

Q1 Shade the following figures to make the figure have

(a) 2 line of symmetry

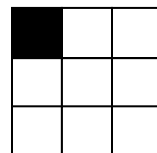
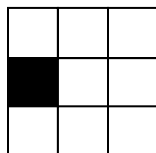
(b) 4 lines of symmetry



Q2 Shade the following figures to make the figures have

(a) rotational symmetry of order 2

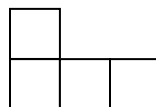
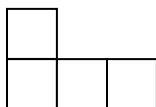
(b) rotational symmetry of order 4



Q3 Complete the following figures such that the figures have

(a) 1 line of symmetry

(b) rotational symmetry of order 2



Some interesting objects with line/rotational symmetry

1.



2.



3.



4.



5.



6. A Celtic knot design



7. Flag of Isle of Man, a British crown dependency in Europe



8.



9. An ancient Islamic tile design.



10. M.C. Escher suffered from poor health when making this woodcut, and it is his last print.



11.



12. Here are some of the creative works of Scott Kim, a contemporary puzzle master.

(a)

SUPERTEACHER

(b)

Inversions
Scott Kim

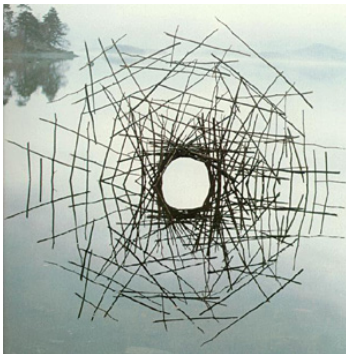
(c)

Infinity

(d)

Mathematics

13. British artist Andy Goldsworthy uses materials from nature to create beautiful outdoor sculptures. The artful arrangement of sticks on the left below might appear to have rotational symmetry, but instead, it has _____.



14. Shah Jahan, Mughal emperor of India from 1628 to 1658, had the beautiful Taj Mahal built in memory of his wife, Mumtaz Mahal. Its architect, Ustad Ahmad Lahori, designed it with perfect symmetry. How does the design of the building's grounds give this view of the Taj Mahal even more symmetry than the building itself has?



Symmetry of Names



Answers:

Line Symmetry

Square – 4 lines

(left-right, row by row): 2, 10, 3, 6, 1, Infinite, 3, 1

Parallelogram – None

Rotational Symmetry

Angle = 60°

No. of Stops = 6

Angle = $\frac{360^\circ}{\text{no. of stops}}$

(left-right, row by row): 2, 4, Infinity, 2, 6, 5, 2, None, None, 8, 3, 4

Centre of rotation is the point where all the line symmetry intersect.