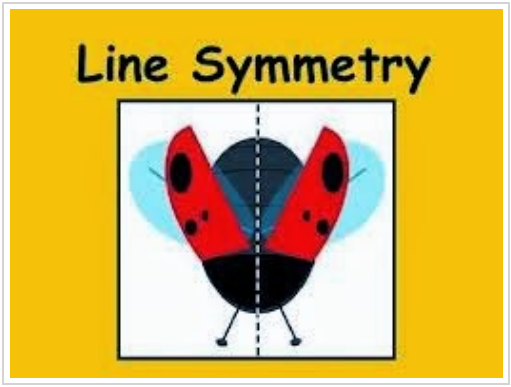
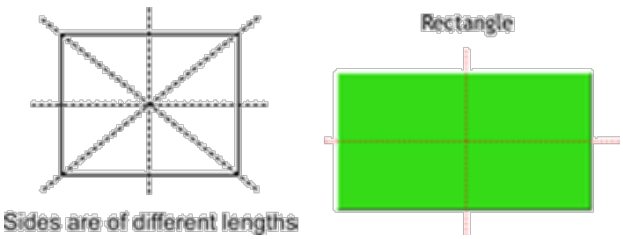
Line Symmetry

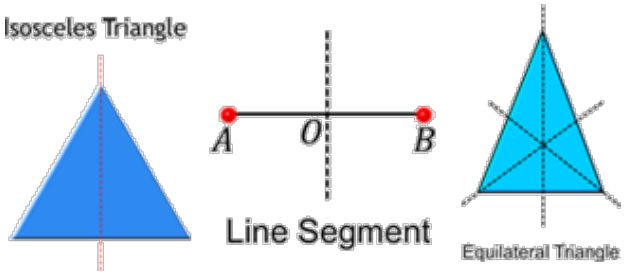
The word **symmetry** comes from the Greek word **symmetros**, which means even.
A figure has **line symmetry** if a line can be drawn dividing it into two identical parts. The line is called the **line of symmetry** or **axis of symmetry**.



Line symmetry is also known as **reflection symmetry** because a mirror line resembles the **line of symmetry**, where one half is the mirror image of the other half. Remember, while looking at a mirror, an object placed on the right appears to be on the left, and vice versa.

- For a **line segment**, the **perpendicular bisector** is the **line of symmetry**.
- For an **equilateral triangle**, the **bisectors of the internal angles** are the **lines of symmetry**.
- For a **square**, the **lines of symmetry** are the **diagonals** and the **lines joining the mid-points of the opposite sides**.
- The **lines of symmetry** of a **rectangle** are the lines joining the **mid-points** of the **opposite sides**.
- The **line of symmetry** of an **isosceles triangle** is the **perpendicular bisector** of the non-equal side.
- A **scalene triangle**, in which all the **sides are of different lengths,** doesn't have any **line of symmetry**.





Regular polygon:

- A **polygon** is said to be a **regular polygon** if all its sides are equal in length and all its angles are equal in measure. If a polygon is not a **regular polygon**, then it is said to be an **irregular polygon**.
- **Regular and irregular polygons** have **lines of symmetry**. An **equilateral triangle** is regular because each of its sides has the same length, and each of its angles measures sixty degrees.
- The number of **lines of symmetry** in a **regular polygon** is equal to the number of sides that it has.
- A **pentagon** has five **lines of symmetry.**
- Similarly, a **regular octagon** has eight sides, and therefore, it will have eight **lines of symmetry,** while a **regular decagon**has ten sides, so it will have ten **lines of symmetry**.

Irregular polygon:

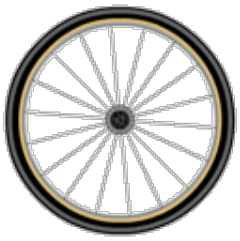
- Most **irregular polygons** do not have **line symmetry**. However, some of them do. Look at the **rectangle** and the **isosceles triangle**. A **rectangle** has two **lines of symmetry,** and an **isosceles triangle** has one **line of symmetry**.
- Some letters have **line symmetry**.
- The letters A, B, C, D, E, I, K, M, T, U, V, W and Y have **one line of symmetry**.
- The letter H overlaps perfectly both vertically and horizontally. So it has **two lines of symmetry**.
- Similarly, the letter X has **two lines of symmetry**.
- The letters F, G, J, L, N, P, Q, R, S and Z have **no line of symmetry**.

About Rotational Symmetry

Rotational Symmetry

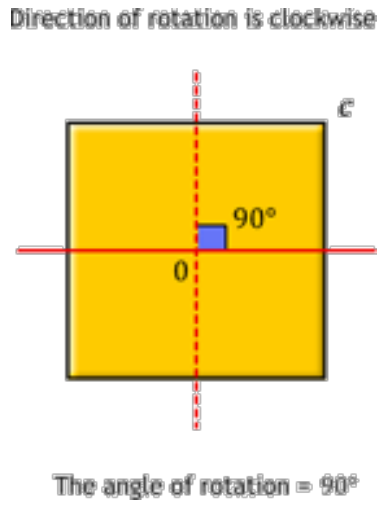
- Any object or shape is said to have **rotational symmetry** if it looks exactly the same at least once during a **complete rotation** through three hundred and sixty degrees.
- During the rotation, the object rotates around a **fixed point**. Its shape and size do not change.
- This **fixed point** is called the **centre of rotation**.
- **Rotation** may be **clockwise** or **anti-clockwise**.
- A full turn refers to a **rotation** of three hundred and sixty degrees.
- A half turn refers to a **rotation** of one hundred and eighty degrees.
- A quarter turn refers to a **rotation** of ninety degrees.
- The angle at which a shape or an object looks exactly the same during **rotation** is called the **angle of rotation**.
- The **order of rotational symmetry** can be defined as the number of times that a shape appears exactly the same during a full 360^{o} rotation.

The fixed point about which an object turns during rotation is called the centre of rotation.

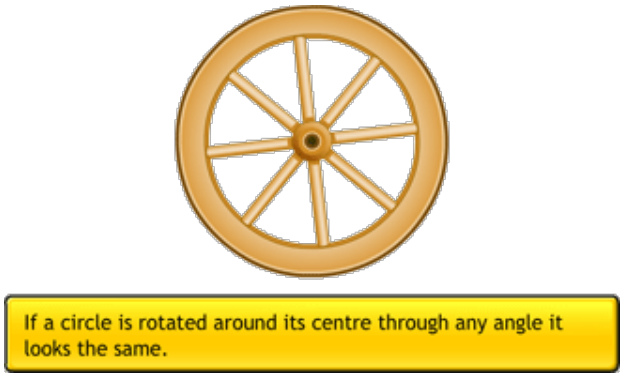


Centre of Rotation

- The **centre of rotation** of a square is its centre. The **angle of rotation** of a square is 90 degrees, and its **order of rotational symmetry** is 4.



- The **centre of rotation** of a circle is the **centre of the circle**.



- There are many shapes that have only **line symmetry** and **no rotational symmetry** at all.
- Some objects and shapes have both, **line symmetry** as well as **rotational symmetry**.
- The Ashok Chakra in the Indian national flag has both, **line symmetry** and **rotational symmetry**.

- **Symmetry** can be seen in the English alphabet as well.
- The letter H has both **line symmetry** and **rotational symmetry**.

Letter	Line Symmetry	Rotational Symmetry
Z	No	Yes
H	Yes	Yes
O	Yes	Yes
E	Yes	No
N	No	Yes
C	Yes	No
A	Yes	No
B	Yes	No