

SYMMETRY

1. THE ORDER OF ROTATIONAL SYMMETRY

- A shape has rotational symmetry if the image looks like the original shape.
- The order of rotational symmetry is the number of times the image of the shape coincides with the original shape within a full turn of 360° .
- A shape or object has a point of rotational symmetry if is unchanged by a rotation through an angle of 360° .

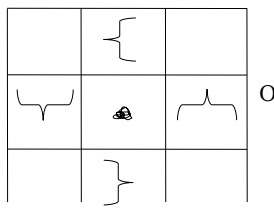
2. SYMMETRY IN SOLIDS

- A 2D shape may have a centre of rotation but a 3D object would have an axis of rotation.
- The order of rotational symmetry for a 3D object is the number of times it can be rotated through an angle not greater than 360° , so that the image looks the same as the original object before rotation.

3. PLANE OF SYMMETRY

- A 2D shape may have a line of symmetry but a 3D object would have a plane of symmetry along which you could see the reflection of the object.
- An object can have more than one plane of symmetry.

The diagram shows a squared floor tile with centre o.



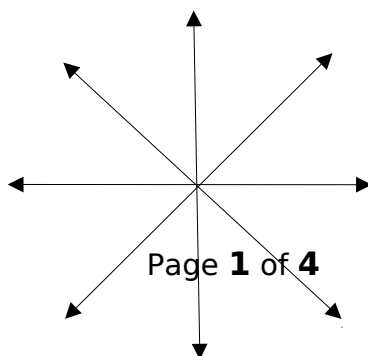
Describe the rotational symmetry about O of this floor tile.

Solution

$$\frac{360^\circ}{4} = 90^\circ$$

$\therefore$ The floor tile has a rotational symmetry of 90° about O with the order of 4.

4. The diagram shows a simplified view of a water wheel.



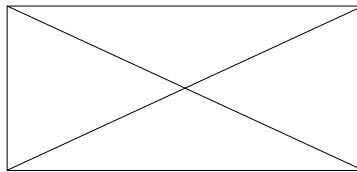
Describe fully the symmetry of the water wheel about the centre O.

Solution

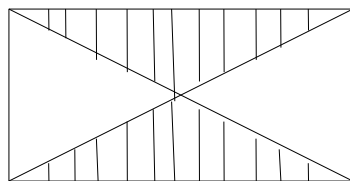
$$\begin{aligned}\text{Angle of rotational symmetry} &= \frac{360^\circ}{n} \\ &= \frac{360^\circ}{8} \\ &= 45^\circ\end{aligned}$$

∴ The water wheel has an angle of rotational symmetry of 45° about center O and with an order of 8.

In the diagram below, shade any two small triangle such that the figure has rotational symmetry of order two.



Solution



1. (a) State the order of rotational symmetry of a regular decagon
- (b) Write down those letters of the word AMBULANCE which have a vertical axis of symmetry.

Solution

(a) A regular decagon has a rotational symmetry of order 10.

(b) A, M, U

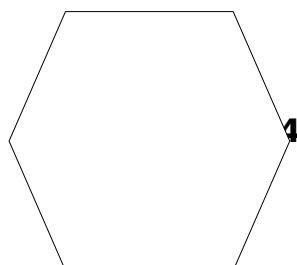
2. A prism has a cross section which is a regular hexagon. How many planes of symmetry does this prism have? [1]

Solution

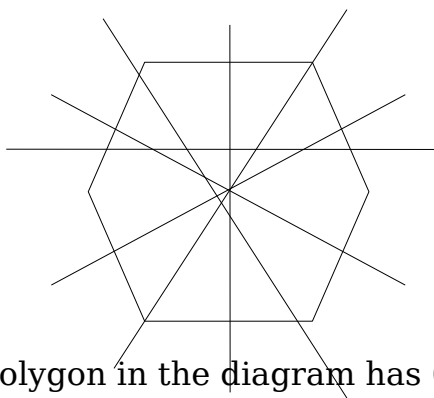
(a) 7 planes of symmetry

3. On the regular hexagon below, draw all the lines of symmetry

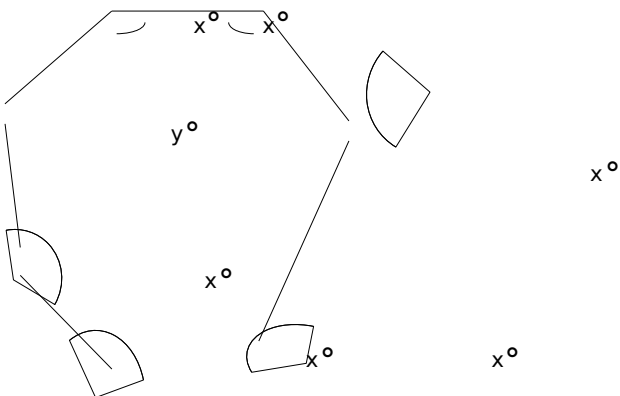
4.



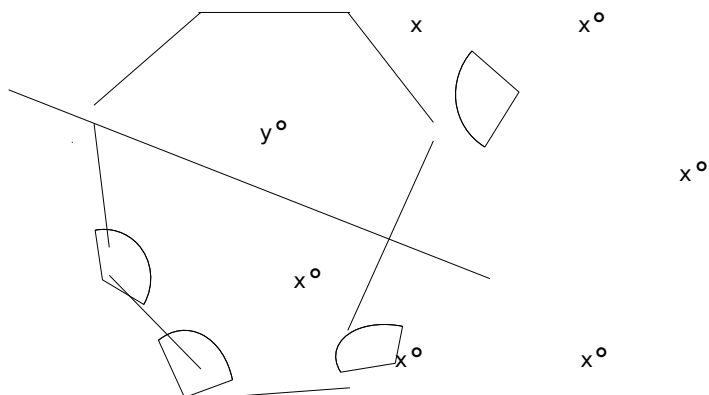
Solution



5. The 7 sided polygon in the diagram has 6 angles of x° and one of y°



- (a) Draw the line of symmetry on the diagram.



(b) If $Y = 126$, calculate the value of x

$$\begin{aligned}\text{Total interior angles} &= (7 - 2) \times 180 \\ &= 5 \times 180 \\ &= 900^\circ\end{aligned}$$

$$6x + y = 900$$

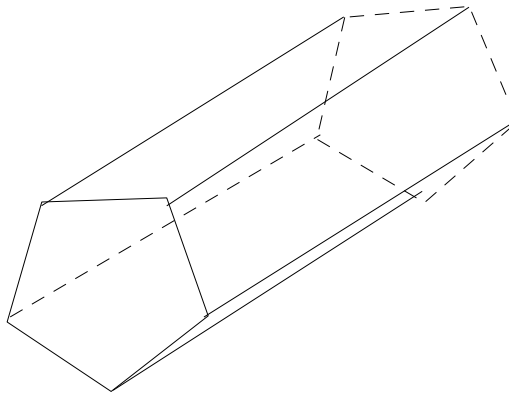
$$6x + 126 = 900$$

$$6x = 900 - 126$$

$$6x = 774$$

$$x = 129$$

6. How many planes of symmetry has a prism with a regular pentagon as the cross section



Solution

6 planes of symmetry