

MATHEMATICS NOTES

SYLLABUS D



TOPIC: SYMMENTRY

ALWAYS TRYING TO MAKE THINGS EASY

MR MUNUNGA. J

**A DREAM DOESN'T BECOME REALITY THROUGH MAGIC IT
TAKES SWEAT, DETERMINATION AND HARD WORK.**

ONLY THOSE THAT ARE GOOD SEE THE GOODNESS

[JM/2019]

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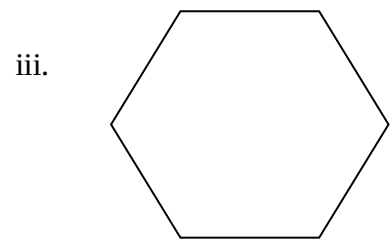
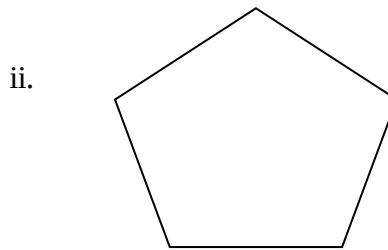
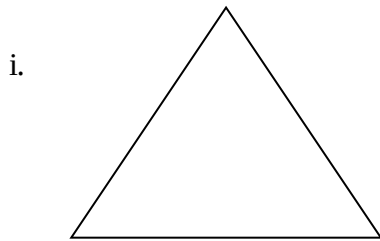
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ORDER OF ROTATIONAL SYMMETRY

- A shape has rotational symmetry if the rotated image looks like the original shape.
- The order of rotational symmetry is the number of times the image of a shape coincides with the original shape with a full turn of 360° .
- A shape has reflectional symmetry if it can be folded in half over the line of symmetry
- A shape or object has point of symmetry if it is unchanged by a rotation through an angle of 180° .

Example

Each shape below is a regular polygon. This means that all its sides are the same and all its angles are equal



a) Find the order of rotational symmetry for each shape if it is rotated through the point at its centre.

i. Triangle – has three (3)

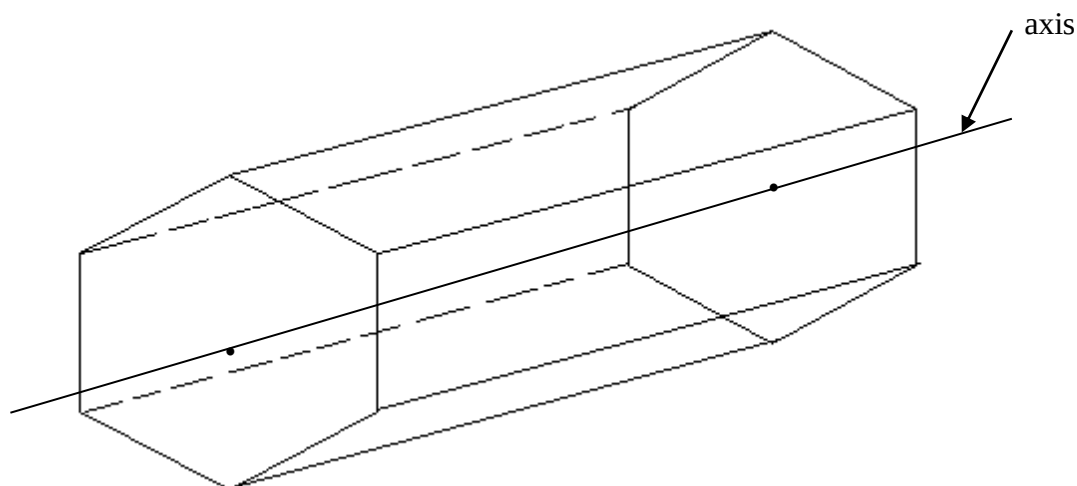
ii. Pentagon-has five (5)

iii. Hexagon-has six (6)

b) Complete a copy of the table for the three shapes

	Order of rotational symmetry	No. of lines of symmetry
Triangle	3	3
Pentagon	5	5
Hexagon	6	6

The diagram shows a regular hexagonal prism



What is the order of rotational symmetry about the indicated axis?

= 6 **Ans**

ROTATIONAL SYMMETRY

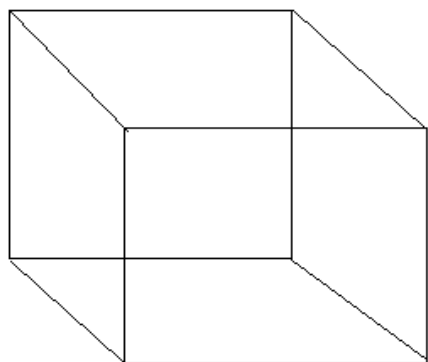
If a 2D shape has rotational symmetry. It will have a centre of rotational, but a 3D-object will have an axis of rotation.

- Regular polygon: is a closed 2D shape with all its sides the same length and all angles the same size.

- Regular polyhedron: is a closed 3D-object with all its edges the same length, therefore all its faces are congruent regular polygons: there are only five regular solids (the platonic solids).
- 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 the rotation\

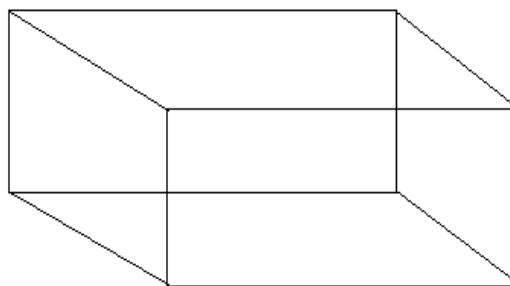
State the number of axes of rotation in each object

i. cube



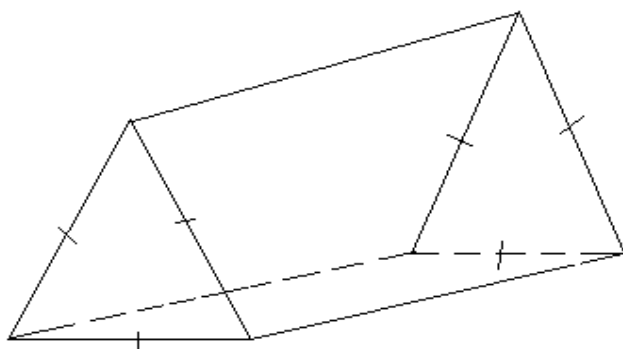
There are 13 axes of symmetry

ii. Cuboid



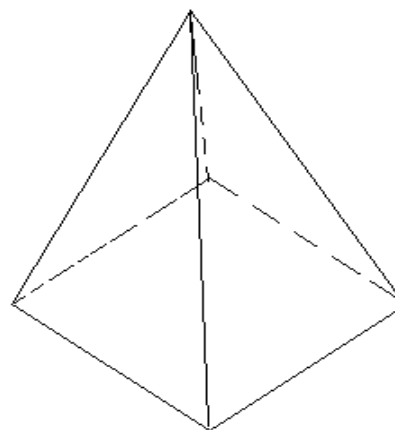
three (3) axes of rotation

iii. Equilateral triangular based prism



Four axes of rotation

iv. Rectangular based pyramid



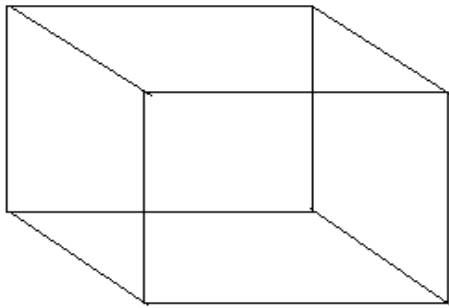
one axis of rotation

PLANES OF SYMMETRY

You have seen that a 2D-shape can have a line of symmetry along which the shape can be folded so that the two halves fit on each other. In the same way a 3D-object can have reflectional symmetry but it has a plane of symmetry and not a line of symmetry.

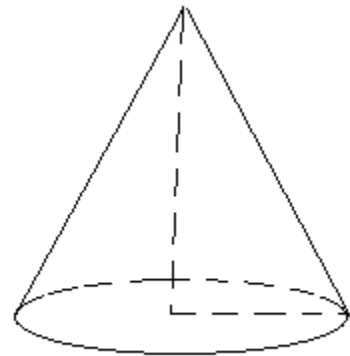
Example

i. cube



A cube has 9 planes of symmetry

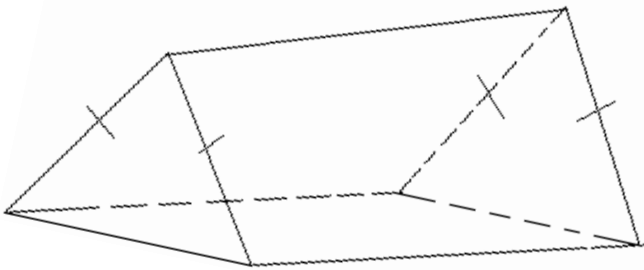
ii. Cone



a cone has an infinite planes of symmetry

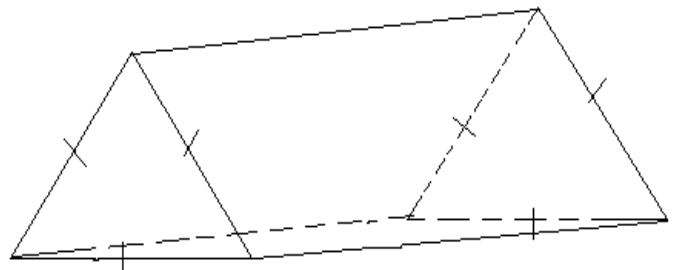
TRIANGULAR BASED PRISMS

i. An isosceles triangular based prism



Has 2 planes of symmetry

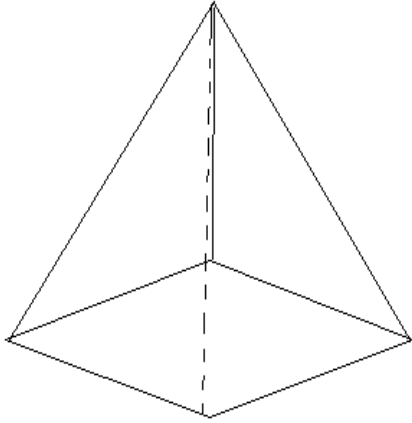
ii. Equilateral triangular based prism



has four (4) planes of symmetry

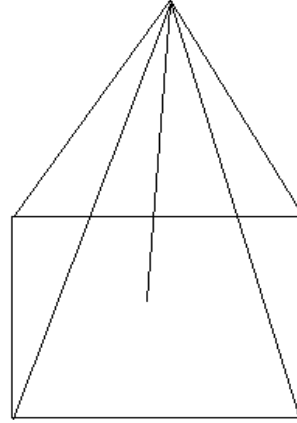
PYRAMIDS

i. A rectangular based pyramid



Has 2 planes of symmetry

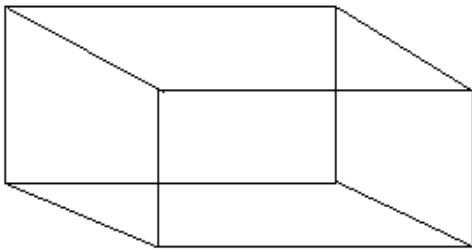
ii. Square based pyramid



has 4 planes of symmetry

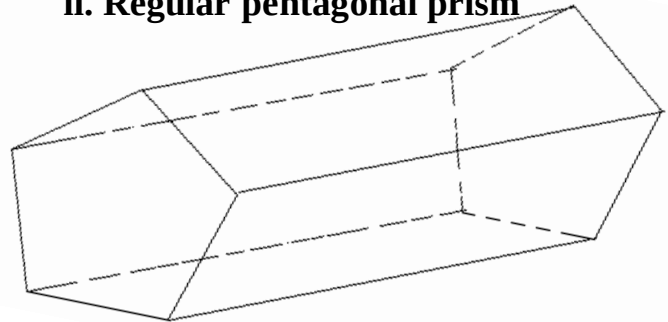
PRISMS

i. Rectangular prism



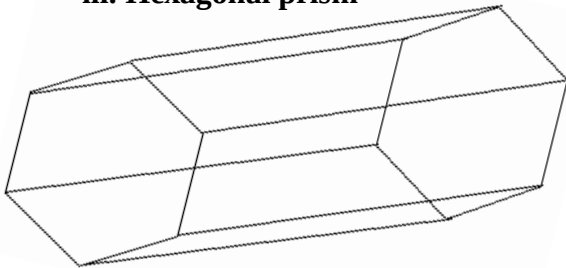
Has 3 planes of symmetry

ii. Regular pentagonal prism



has 6 planes of symmetry

iii. Hexagonal prism



has 7 planes of symmetry

iv. A regular heptagonal prism has 8

Planes of symmetry

v. Regular octagonal prism has 9

Planes of symmetry

NOTE: a plane of symmetry divides a three dimensional objects into two congruent halves that are mirror images of each other.

QUESTIONS

1. State the order of rotation symmetry of a regular hexagon.

Order=number of sides

$$=6$$

2. Describe fully the rotational symmetry of a 72 sided regular polygon with the centre k.

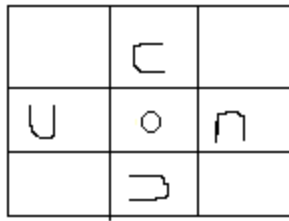
$$\text{Angle of R symmetry} = \frac{360}{n} = \frac{360}{72} = 5$$

The polygon has rotational symmetry of 5° about centre k with order of 72.

3. What is the angle of rotational symmetry of a regular pentagon?

$$= \frac{360}{n} = \frac{360}{5} = 72^\circ$$

4. The diagram below shows a squared floor tile with centre o.



Describe fully the rotational symmetry, about O of this floor tile

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

Floor tile has a rotational symmetry of 90° about O with the order of 4.