Planner

Symmetry and transformations

- Exploring rotational symmetry
- Investigating the connection between line symmetry and reflection
- Exploring the combined effect of reflection and translation

Keywords

You should know

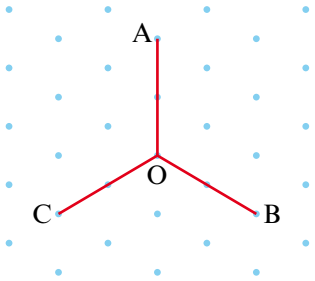
explanation 1a | explanation 1b | explanation 1c | online

1 **a** Write down the size of these angles.

i ∠AOB

ii ∠BOC

iii ∠AOC

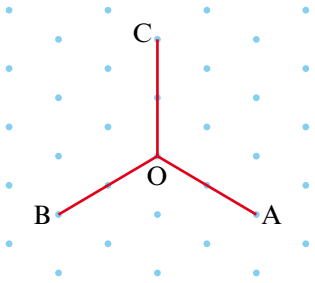


b The figure is now rotated through an obtuse angle about O to the position shown.

i What is the angle and direction of rotation?

ii If the rotation is repeated twice more, what can you say about the final position of the figure?

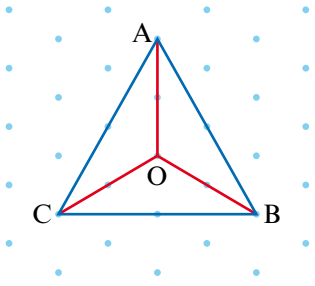
iii What is the order of rotational symmetry of the figure?



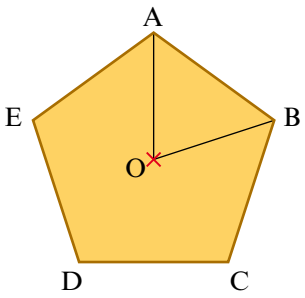
2 Points A, B and C of the diagram in question **1** are joined to make a triangle.

a What type of triangle is this?

b What is the order of rotational symmetry of the triangle?



3 The shape shown here is a regular pentagon.



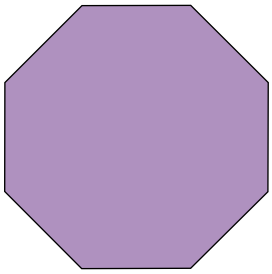
a Explain why ∠AOB must be 72°.

b The pentagon is rotated through 72° clockwise about O. Sketch the pentagon in this position.

c How many more of these rotations are needed to return the pentagon to its original position?

d Write down the order of rotational symmetry of a regular pentagon.

4 This shape is a regular octagon.



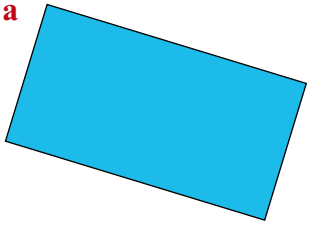
a The octagon is rotated about its centre so that it maps onto itself. What is the smallest angle for this rotation?

b How many more of these rotations are needed to return the octagon to its original position?

c What is the order of rotational symmetry of a regular octagon?

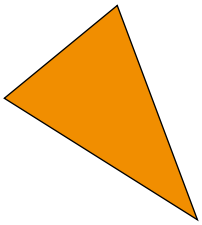
5 Write down the order of rotational symmetry of each shape.

a



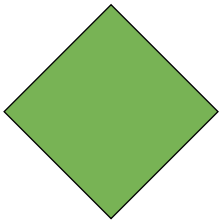
Rectangle

b



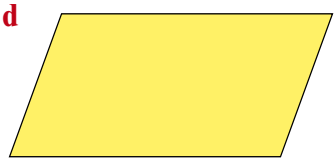
Isosceles triangle

c



Square

d

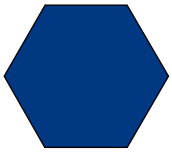


Parallelogram

e

Trapezium

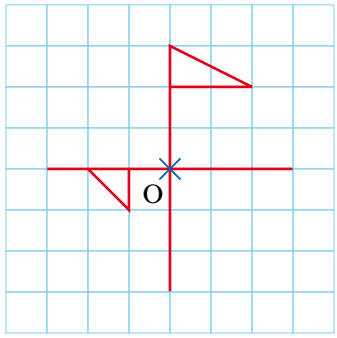
f



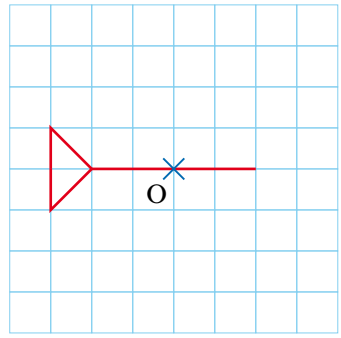
Hexagon

6 Copy and complete these diagrams so that they have rotational symmetry of order 4 with centre at O.

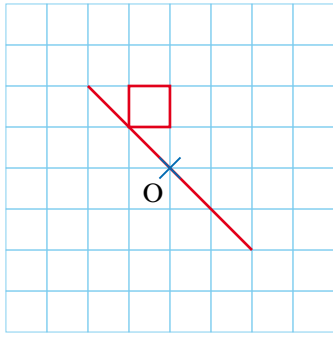
a



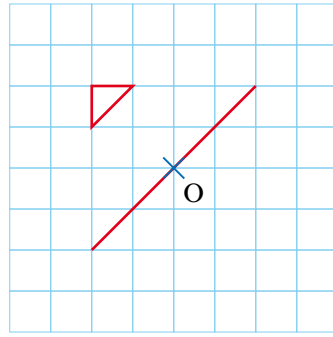
b



c



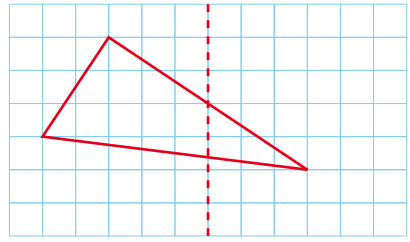
d



explanation 2 — online

7 **a** Copy this diagram and reflect the triangle in the dotted line.

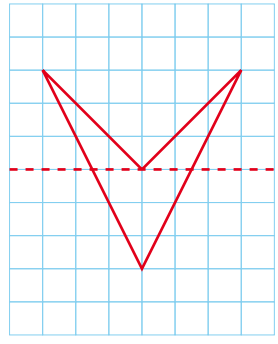
b Check that the dotted line is a line of symmetry for the completed diagram.



8 **a** Copy this diagram and reflect the arrowhead in the dotted line.

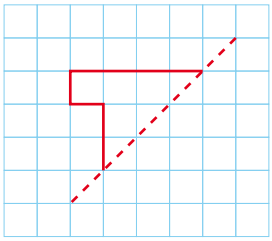
b Check that the dotted line is a line of symmetry for the completed diagram.

c Add any other lines of symmetry to the diagram.



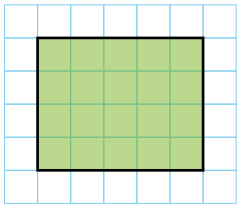
9 **a** Copy this diagram and reflect the shape in the dotted line.

b Check that the dotted line is a line of symmetry for the completed diagram.

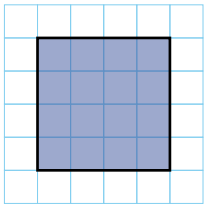


10 Copy these shapes and draw any lines of symmetry. If no line of symmetry exists then write 'None'.

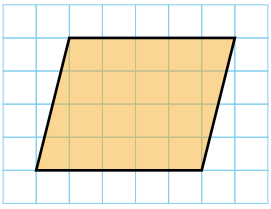
a



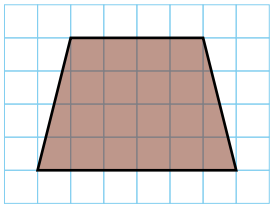
b



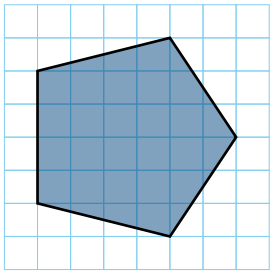
c



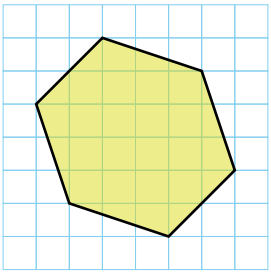
d



e



f



11 For each shape, state which of these symmetries it has.

A Line symmetry but not rotational symmetry.
B Rotational symmetry but not line symmetry.
C Both rotational symmetry and line symmetry.

a

b

c

d

e

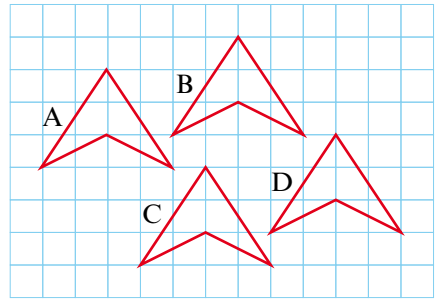
f

explanation 3

12 Describe each translation.

a A to B **b** C to A

c D to C **d** B to D



13 Describe these translations.

i X → Y

ii Y → Z

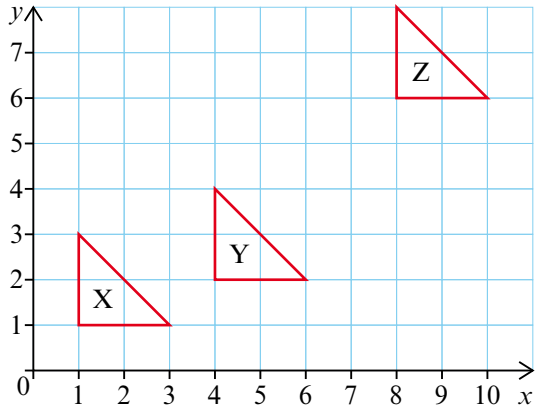
iii X → Z

b Shape Y maps to shape P by the translation '7 right and 2 up'. Describe the translation X → P.

c Shape Y maps to shape Q by the translation '4 down'.

i Copy and complete. Translation Y → Q is ☐ right and ☐ up.

ii Describe translation X → Q.



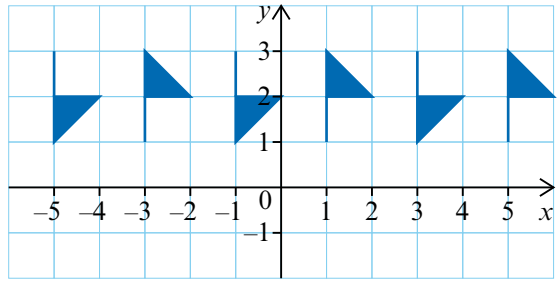
14 The pattern shown in the diagram continues forever in both directions.

a Which of these translations will map the whole pattern onto itself?

i 2 right **ii** 4 right

iii 8 left **iv** 3 left

v 1000 right **vi** $4n$ right where n is an integer



b Describe a reflection, followed by a translation that maps the whole pattern onto itself.

c Describe a translation followed by a reflection that maps the whole pattern onto itself.