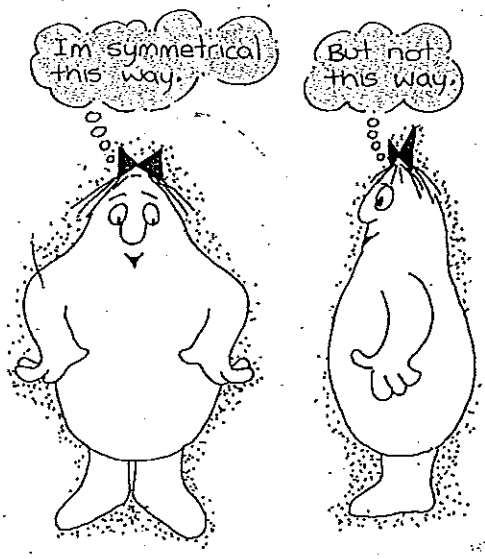
4:04 SYMMETRY



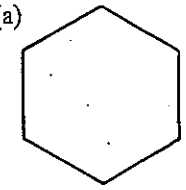
Many shapes are symmetrical. This means that they seem well balanced and in the right proportion.

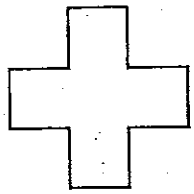
In maths there are two types of symmetry — line symmetry and rotational symmetry.

> A shape has line symmetry if it can be divided by a line into 2 identical parts which are mirror images of one another. The dividing line is called an axis of symmetry.

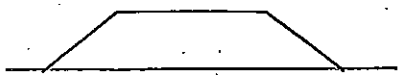
Examples

(1) Mark in the axes of symmetry of the shapes below.

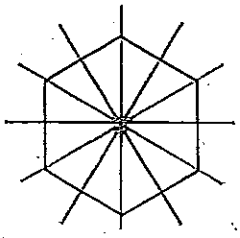
(a) 

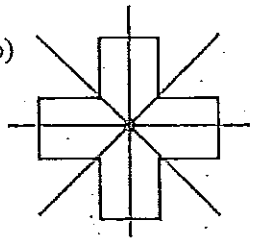
(b) 

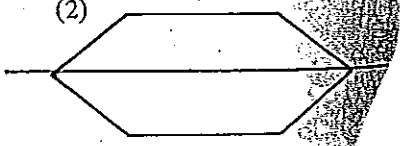
(2) If the coloured line is an axis of symmetry of the shape, complete the drawing.



Solution

(1) (a) 

(b) 

(2) 

Some shapes which do not possess line symmetry still appear to have some symmetrical properties. These shapes have rotational symmetry.

> A shape has rotational symmetry if it can be spun about a point so that it repeats its shape more than once in one rotation. If it repeats its shape after half-a-turn, it is said to have point symmetry. The point about which the shape spins is called the centre of symmetry.

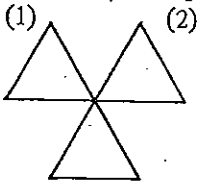
When investigating rotational symmetry it is often useful to make a tracing of the figure. The tracing can then be placed over the original figure and rotated.

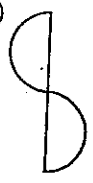
Shapes with point symmetry (half-turn symmetry) have a special property.

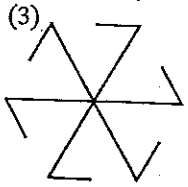
Every point on the figure has a matching point on the figure. These points are the same distance from the centre of symmetry and if they are joined by a line, the line passes through the centre of symmetry.

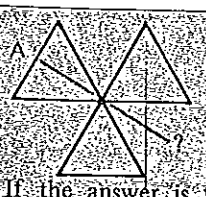
Example

Which of the shapes have point symmetry?

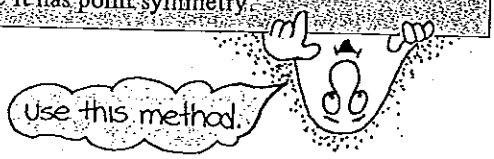
(1) 

(2) 

(3) 



Draw a line from any point through the centre. Is there a matching point on the other side of the centre the same distance away? If the answer is yes for every point on the figure it has point symmetry.

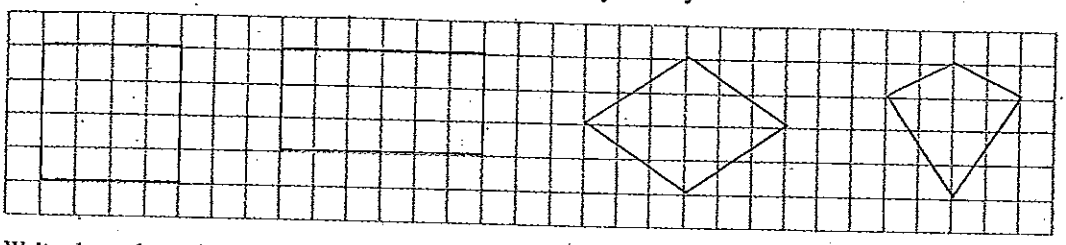


Solution

(1) No (2) Yes (3) Yes

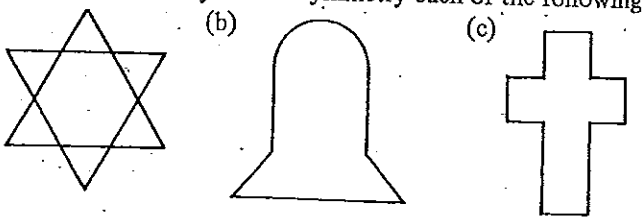
Exercise 4:04 (Theory and Practical)

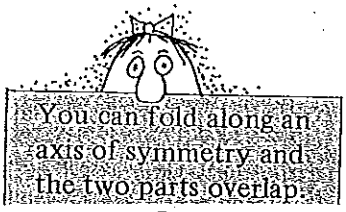
1 Copy the following shapes and mark in all the axes of symmetry.



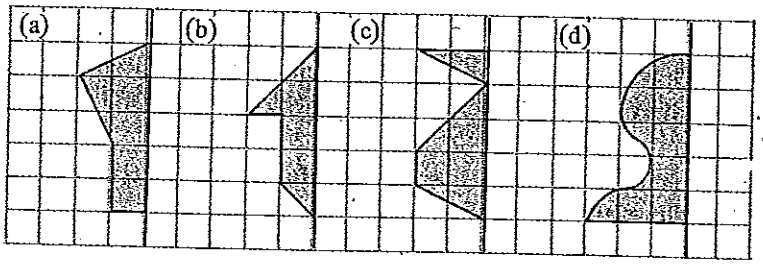
2 Write down how many axes of symmetry each of the following shapes has.

(a) (b) (c)



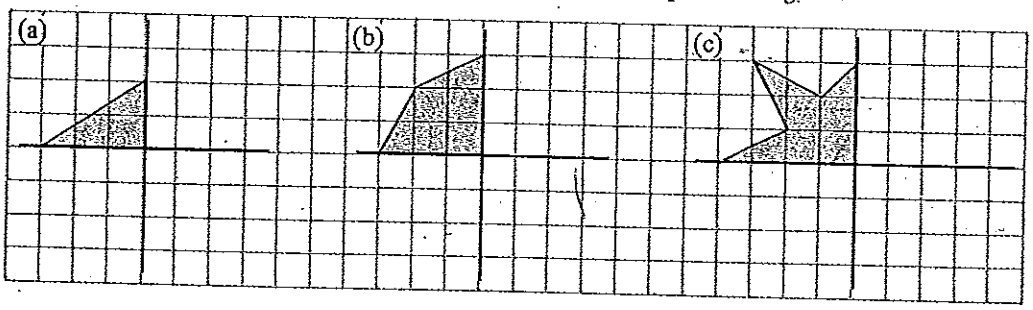


3 Copy the following and complete the other half of the figure if the coloured line is an axis of symmetry.

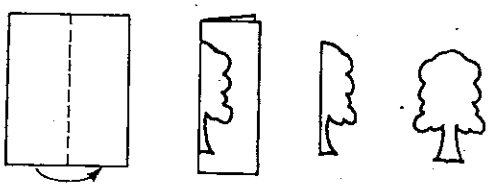


4 How many axes of symmetry has each of the shapes in question 10, exercise 4:02 on page 84?

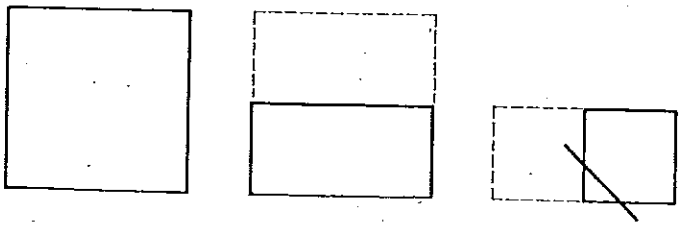
5 If the coloured lines are axes of symmetry, copy and complete the figures.



6 Take a piece of paper and fold it in half. On one side of the paper draw a figure. Cut it out and unfold the paper. Is the figure symmetrical? Is the axis of symmetry the fold line?

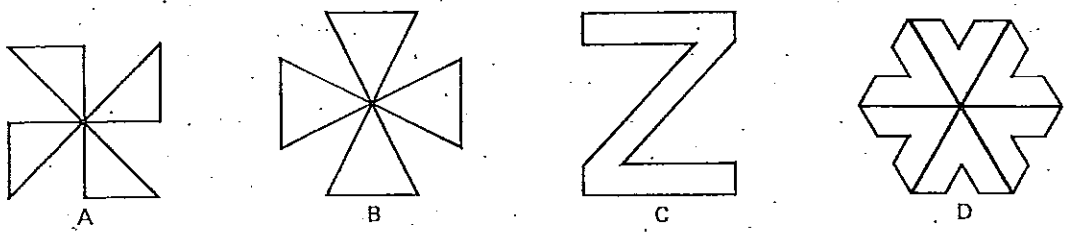


7 Take a piece of square paper and fold it in half and in half again.



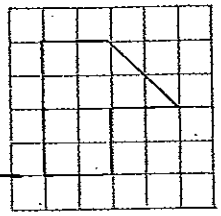
Draw a line on the fold and cut along it. Experiment by putting the line in different places. See if you can predict the shape that will result.

8 (a) Which of the shapes below have point symmetry?
(b) Which shapes also have line symmetry?



9 Which of the shapes 1 to 15 on the I.D. card on page 75 have point symmetry?

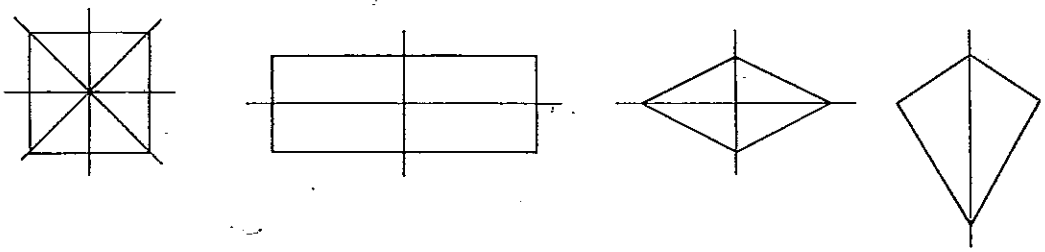
10 Copy the shape given onto square grid paper and by spinning the shape make two different shapes which have point symmetry.



↓ ANSWERS ↓

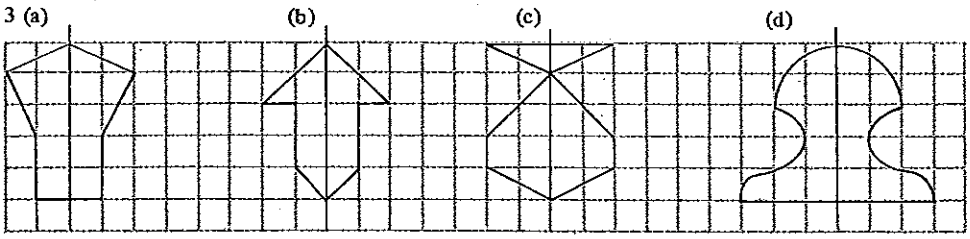
Exercise 4:04

1



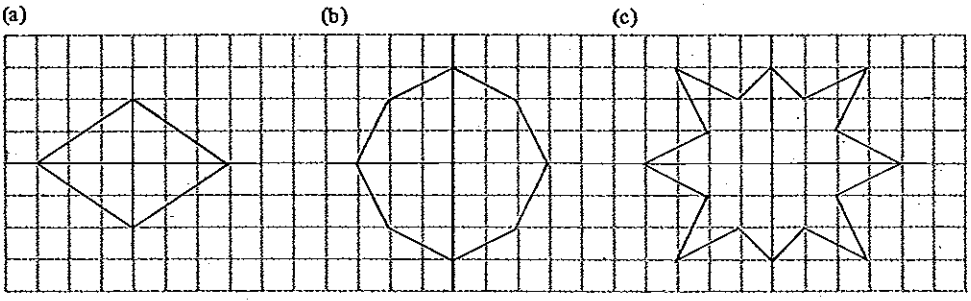
2 (a) 6 (b) 1 (c) 1

3 (a)



4 3, 4, 6, 5, 8

5 (a)



6 yes; yes 8 (a) all the shapes have point symmetry (b) B and D have line symmetry

9 shapes 1, 2, 3, 4, 6, 7, 8, 12, 13, 14 (5 may or may not, depending on how it is drawn).

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