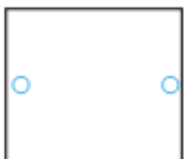


**CBSE NCERT Solutions for Class 7 Mathematics Chapter 14*****Back of Chapter Questions*****EXERCISE 14.1**

1. Copy the figures with punched holes and find the axes of symmetry for the following:

(A)



(B)



(C)



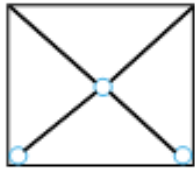
(D)



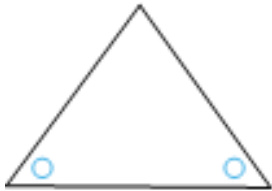
(E)



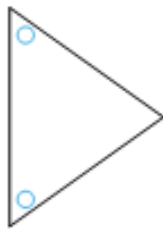
(F)



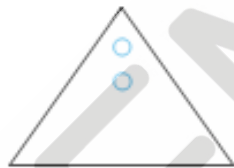
(G)



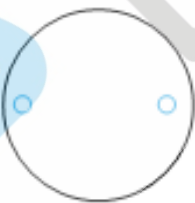
(H)



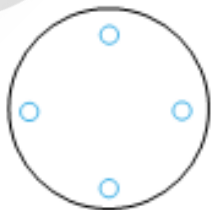
(I)



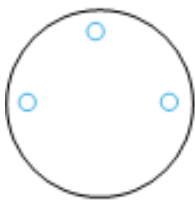
(J)



(K)

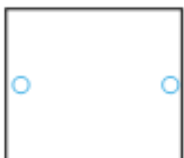


(L)

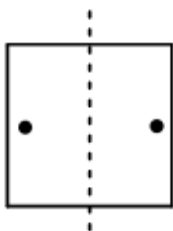


**Solution:**

(A)



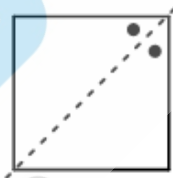
The axes of symmetry of the above figure is



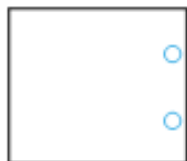
(B)



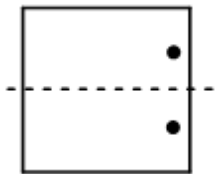
The axes of symmetry of the above figure is



(C)



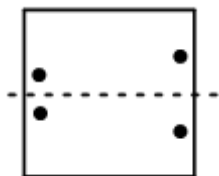
The axes of symmetry of the above figure is



(D)



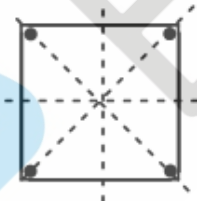
The axes of symmetry of the above figure is



(E)



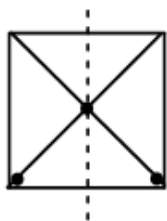
The axes of symmetry of the above figure is



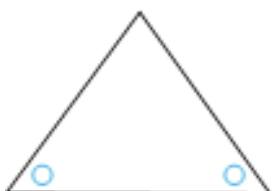
(F)



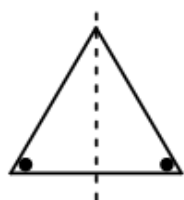
The axes of symmetry of the above figure is



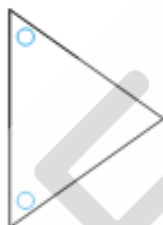
(G)



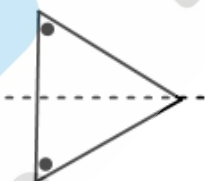
The axes of symmetry of the above figure is



(H)



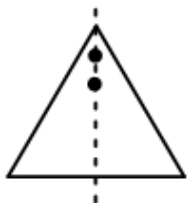
The axes of symmetry of the above figure is



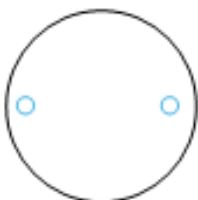
(I)



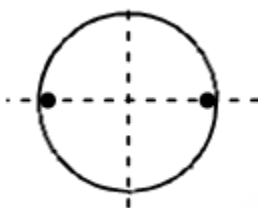
The axes of symmetry of the above figure is



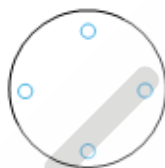
(J)



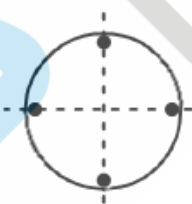
The axes of symmetry of the above figure is



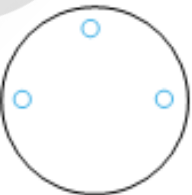
(K)



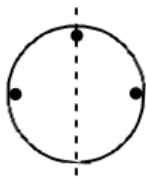
The axes of symmetry of the above figure is



(L)

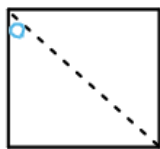


The axes of symmetry of the above figure is



2. Given the line(s) of symmetry, find the other hole(s):

(A)



(B)



(C)



(D)



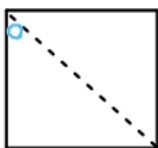
(E)



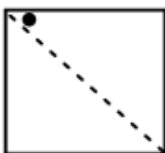
**Solution:**

(A)

Given figure is



For this figure to be symmetrical, the other hole should be put as shown in the below figure.

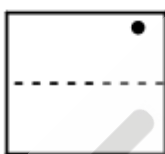


(B)

Given figure is



For this figure to be symmetrical, the other hole should be put as shown in the below figure.



(C)

Given figure is



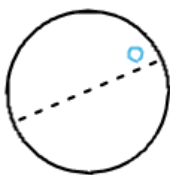
For this figure to be symmetrical, the other hole should be put as shown in the below figure.



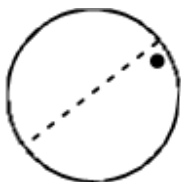
(D)

Given figure is



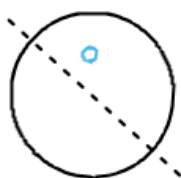


For this figure to be symmetrical, the other hole should be put as shown in the below figure.

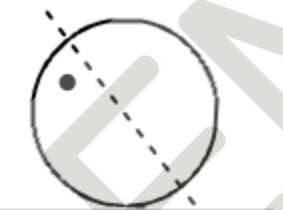


(E)

Given figure is

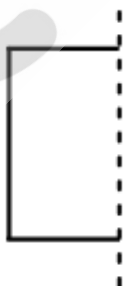


For this figure to be symmetrical, the other hole should be put as shown in the below figure.



3. In the following figures, the mirror line (i.e., the line of symmetry) is given as a dotted line. Complete each figure performing reflection in the dotted (mirror) line. (You might perhaps place a mirror along the dotted line and look into the mirror for the image). Are you able to recall the name of the figure you complete?

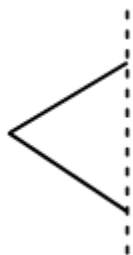
(A)



(B)



(C)



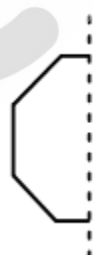
(D)



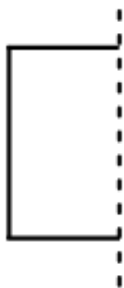
(E)



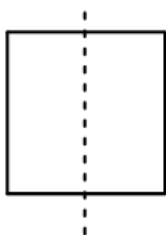
(F)

**Solution:**

(A) Given figure is

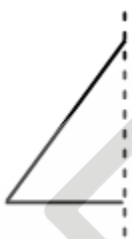


Using mirror along the dotted line, the figure is completed as shown below



Hence, it is a square.

(B) Given figure is



Using mirror along the dotted line, the figure is completed as shown below

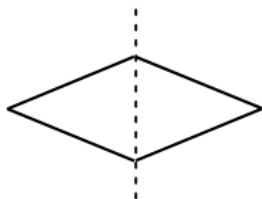


Hence, it is a triangle.

(C) Given figure is



Using mirror along the dotted line, the figure is completed as shown below

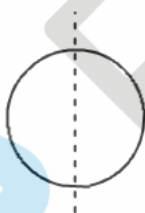


Hence, it is a rhombus.

(D) Given figure is

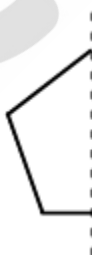


Using mirror along the dotted line, the figure is completed as shown below

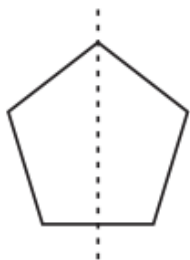


Hence, it is a circle.

(E) Given figure is

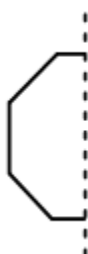


Using mirror along the dotted line, the figure is completed as shown below

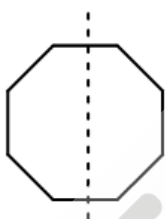


Hence, it is a pentagon.

(F) Given figure is



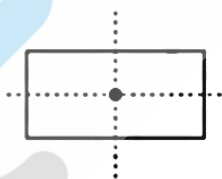
Using mirror along the dotted line, the figure is completed as shown below



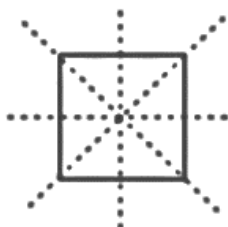
Hence, it is an octagon.

4. The following figures have more than one line of symmetry. Such figures are said to have multiple lines of symmetry.

(A)



(B)



(C)



Identify multiple lines of symmetry, if any, in each of the following figures:

(A)



(B)



(C)



(D)



(E)



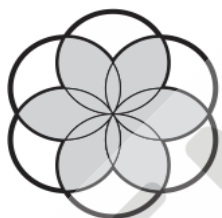
(F)



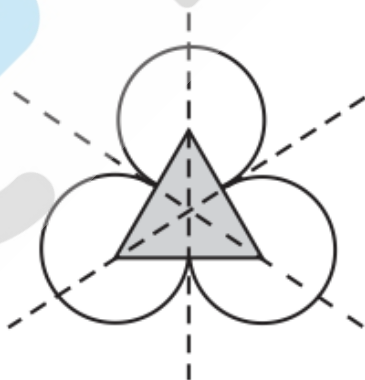
(G)



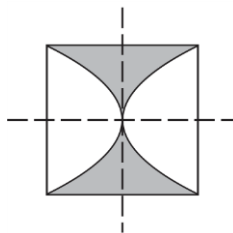
(H)

**Solution:**

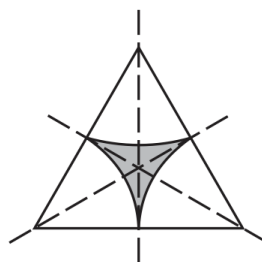
- (A) The given figure has 3 lines of symmetry.  
Hence, it has multiple lines of symmetry.



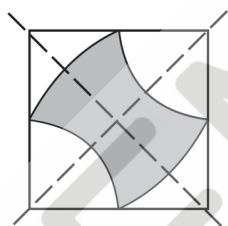
- (B) The given figure has 2 lines of symmetry.  
Hence, it has multiple lines of symmetry.



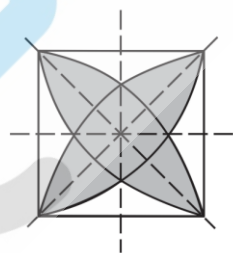
- (C) The given figure has 3 lines of symmetry.  
Hence, it has multiple lines of symmetry.



- (D) The given figure has 2 lines of symmetry.  
Hence, it has multiple lines of symmetry.

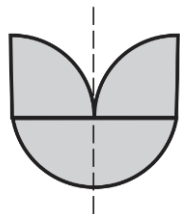


- (E) The given figure has 4 lines of symmetry.  
Hence, it has multiple lines of symmetry.

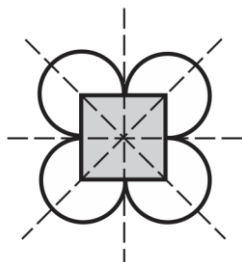


- (F) The given figure has only 1 line of symmetry.

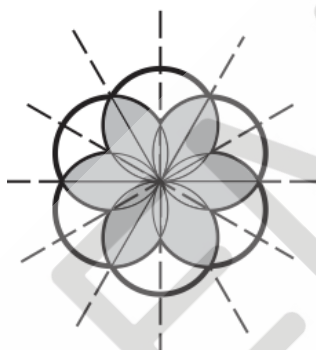




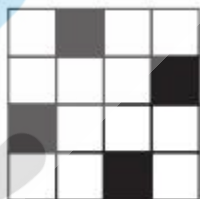
- (G) The given figure has 4 lines of symmetry.  
Hence, it has multiple lines of symmetry.



- (H) The given figure has 6 lines of symmetry.  
Hence, it has multiple lines of symmetry.



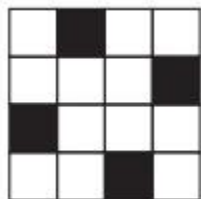
5. Copy the figure given here.



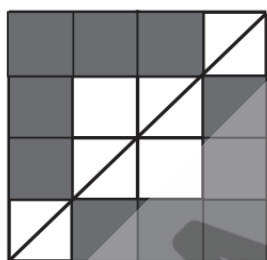
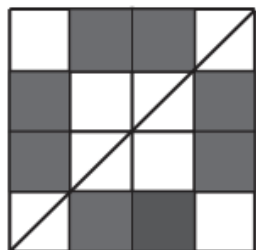
Take any one diagonal as a line of symmetry and shade a few more squares to make the figure symmetric about a diagonal. Is there more than one way to do that? Will the figure be symmetric about both the diagonals?

**Solution:**

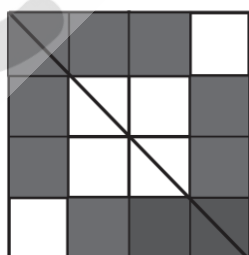
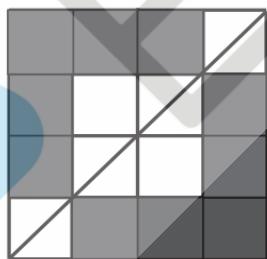
Given figure is



After shading figure to make symmetric about diagonal, resulting figure looks as below:



From the above figure, we can see that there are many other ways to make square symmetrical about its diagonal.

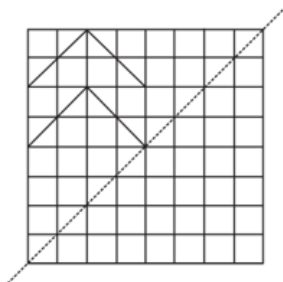


From the above figure,

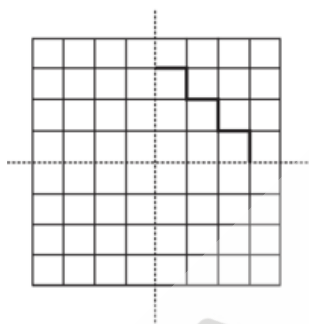
Hence, it is clearly symmetrical along both diagonals of square.

6. Copy the diagram and complete each shape to be symmetric about the mirror line(s):

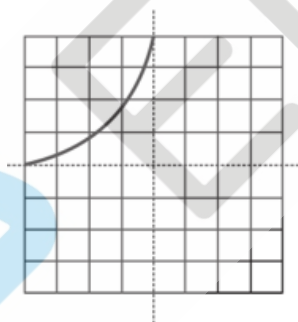
(A)



(B)



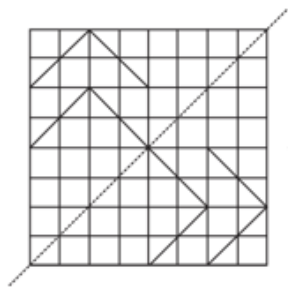
(C)



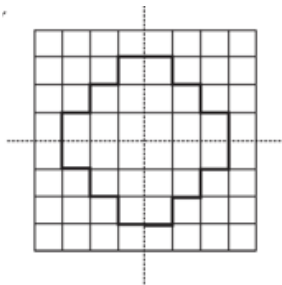
**Solution:**

(A)

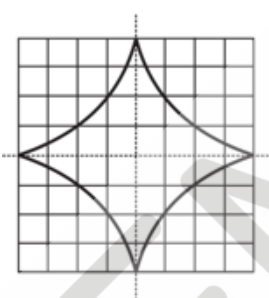
The given figure can be completed about the given mirror lines as follows.



- (B) The given figure can be completed about the given mirror lines as follows.



- (C) The given figure can be completed about the given mirror lines as follows.

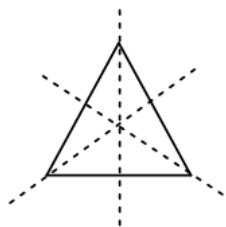


7. State the number of lines of symmetry for the following figures:

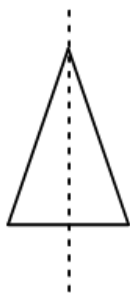
- (a) An equilateral triangle
- (b) An isosceles triangle
- (c) A scalene triangle
- (d) A square
- (e) A rectangle
- (f) A rhombus
- (g) A parallelogram
- (h) A quadrilateral
- (i) A regular hexagon
- (j) A circle

**Solution:**

- (a) There are 3 lines of symmetry in an equilateral triangle.



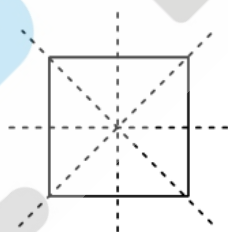
- (b) There is only 1 line of symmetry in an isosceles triangle.



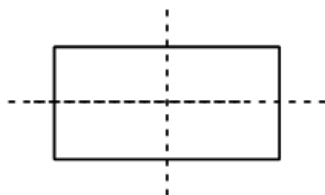
- (c) There is no line of symmetry in a scalene triangle.



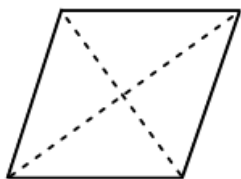
- (d) There are 4 lines of symmetry in a square.



- (e) There are 2 lines of symmetry in a rectangle.



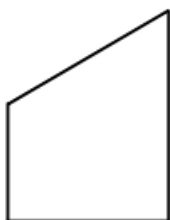
- (f) There are 2 lines of symmetry in a rhombus.



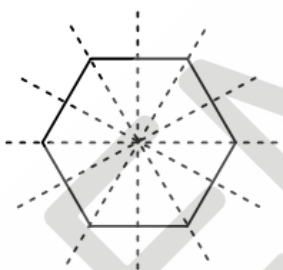
- (g) There is no line of symmetry in a parallelogram.



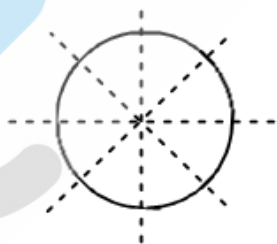
- (h) There is no line of symmetry in a quadrilateral.



- (i) There are 6 lines of symmetry in a regular hexagon.



- (j) There are infinite lines of symmetry in a circle. Some of these are represented as follows.



8. What letters of the English alphabet have reflectional symmetry (i.e., symmetry related to mirror reflection) about

- (a) a vertical mirror
- (b) a horizontal mirror

- (c) both horizontal and vertical mirrors

**Solution:**

- (a) A, H, I, M, O, T, U, V, W, X, Y are the letters having a reflectional symmetry about a vertical mirror.

A H I M  
O T U  
V W X  
Y

- (b) B, C, D, E, H, I, K, O, X are the letters having a reflectional symmetry about a horizontal mirror.

B C D  
E H I  
K O X

- (c) H, I, O, X are the letters having a reflectional symmetry about both the vertical mirror and the horizontal mirror.

H I O X

9. Give three examples of shapes with no line of symmetry.

**Solution:**

A scalene triangle, a parallelogram and a trapezium do not have any line of symmetry.



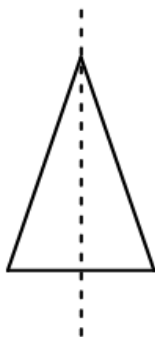
10. What other name can you give to the line of symmetry of

- (a) an isosceles triangle?

- (b) a circle?

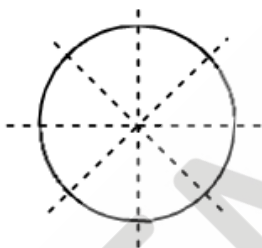
**Solution:**

- (a) An isosceles triangle has only 1 line of symmetry.



Therefore, this line of symmetry is the median and also the altitude of this isosceles triangle.

- (b) There are infinite lines of symmetry in a circle. Some of these are represented as follows.

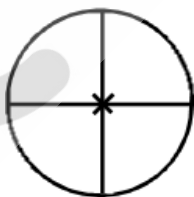


It can be concluded that each line of symmetry is the diameter for the circle.

### EXERCISE 14.2

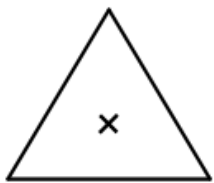
1. Which of the following figures have rotational symmetry of order more than 1:

(A)



(B)

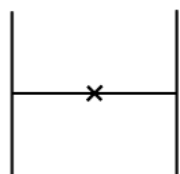




(C)



(D)



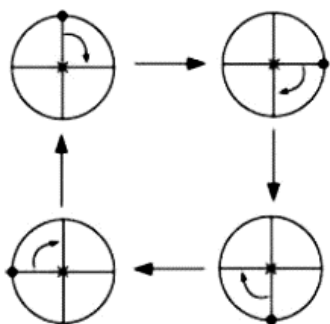
(E)



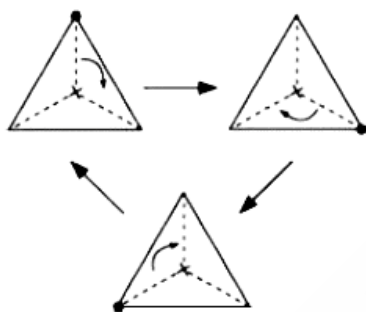
(F)

**Solution:**

- (a) The given figure has its rotational symmetry as 4.



- (b) The given figure has its rotational symmetry as 3.

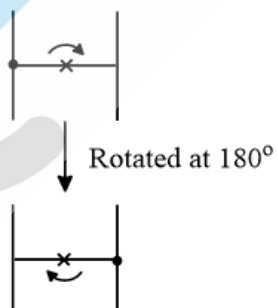


- (C)

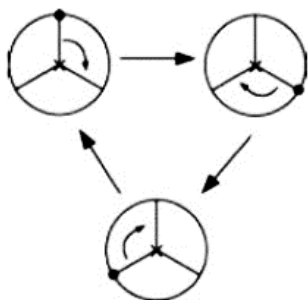


The given figure has its rotational symmetry as 1.

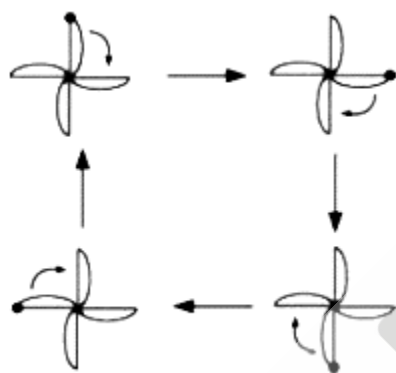
- (d) The given figure has its rotational symmetry as 2.



- (e) The given figure has its rotational symmetry as 3.



- (f) The given figure has its rotational symmetry as 4.



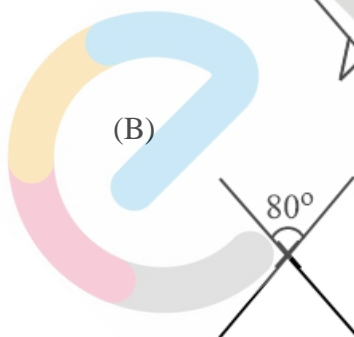
Hence, figures (A), (B), (D), (E), and (f) have rotational symmetry of order more than 1.

2. Give the order of rotational symmetry for each figure:

(A)

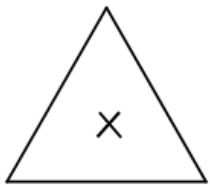


(B)

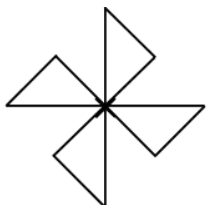


(C)

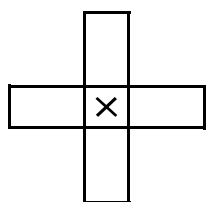




(D)



(E)



(F)



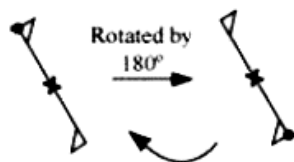
(G)



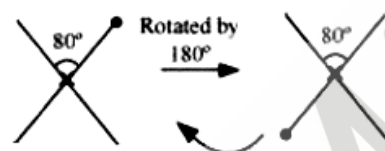
(H)

**Solution:**

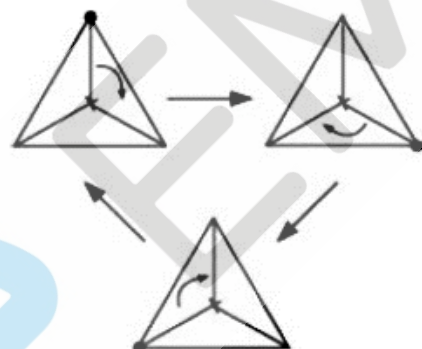
- (a) The given figure has its rotational symmetry as 2.



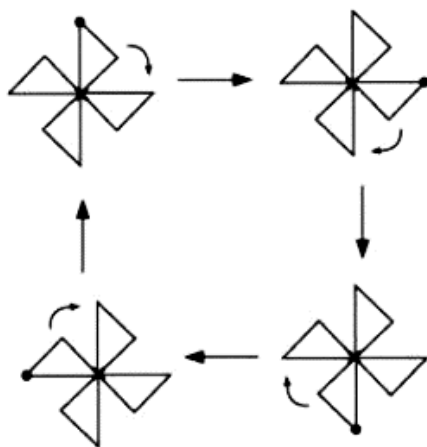
- (b) The given figure has its rotational symmetry as 2.



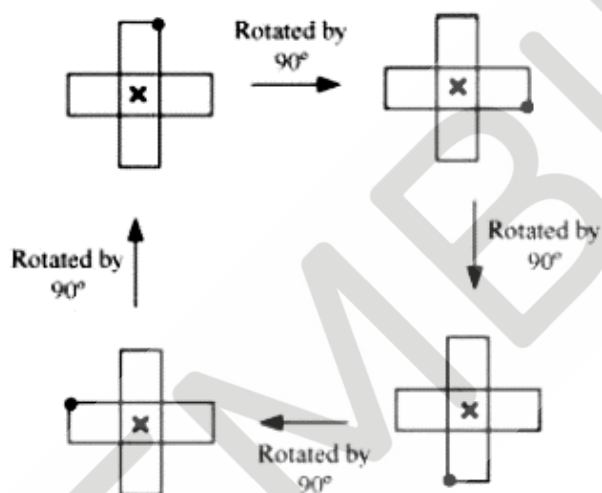
- (c) The given figure has its rotational symmetry as 3.



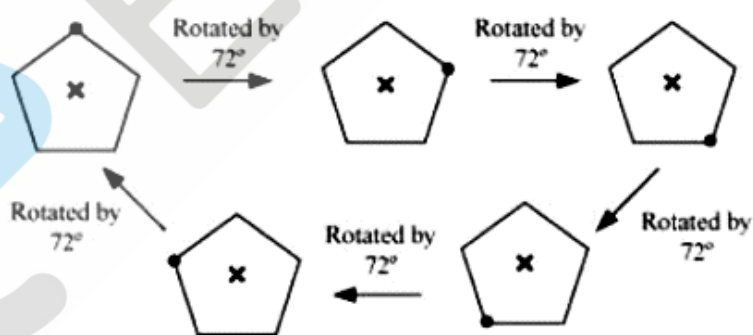
- (d) The given figure has its rotational symmetry as 4.



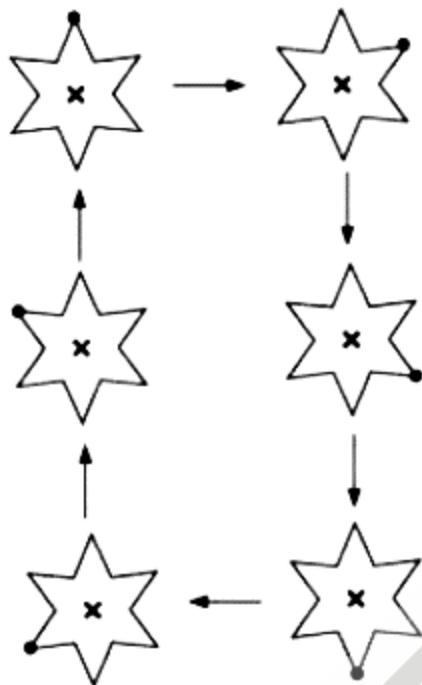
- (e) The given figure has its rotational symmetry as 4.



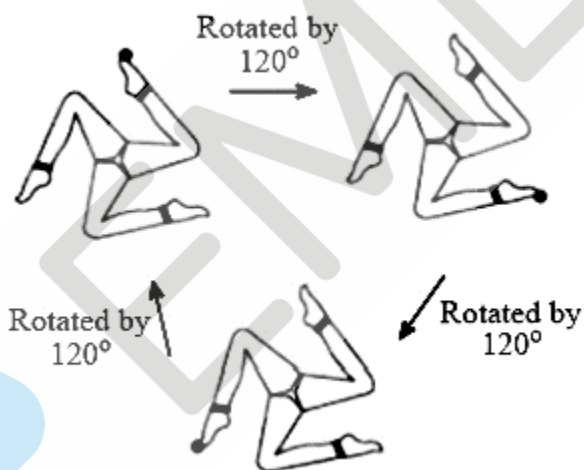
- f) The given figure has its rotational symmetry as 5.



- (G) The given figure has its rotational symmetry as 6.



(H) The given figure has its rotational symmetry as 3.



### EXERCISE 14.3

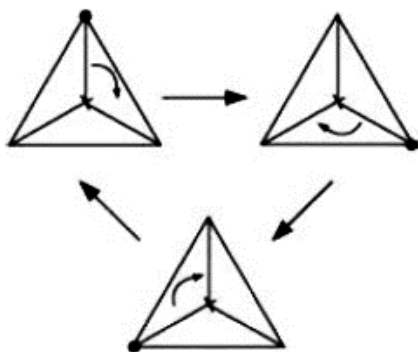
1. Name any two figures that have both line symmetry and rotational symmetry.

**Solution:**

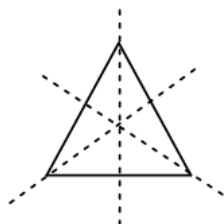
Equilateral triangle and regular hexagon have both line of symmetry and rotational symmetry.

**Equilateral triangle:**

**Rotational Symmetry:**

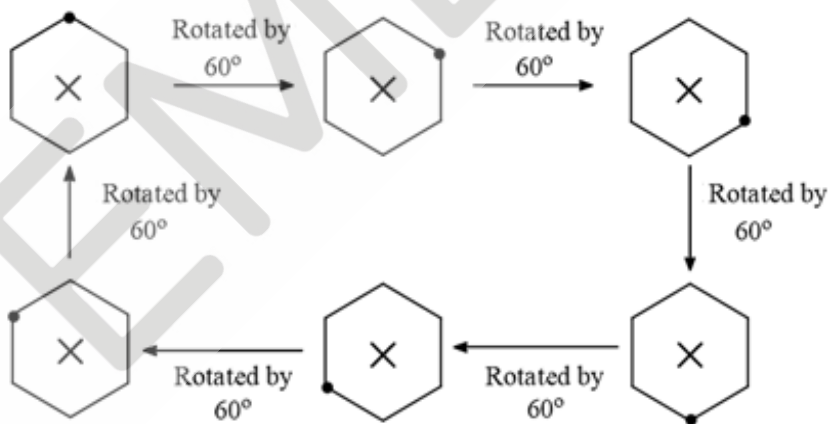


Line of Symmetry:

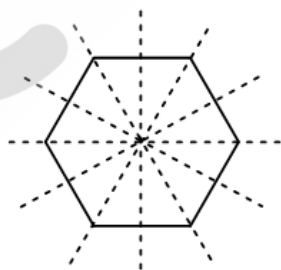


**Regular Hexagon:**

Rotational Symmetry:



Line of Symmetry:



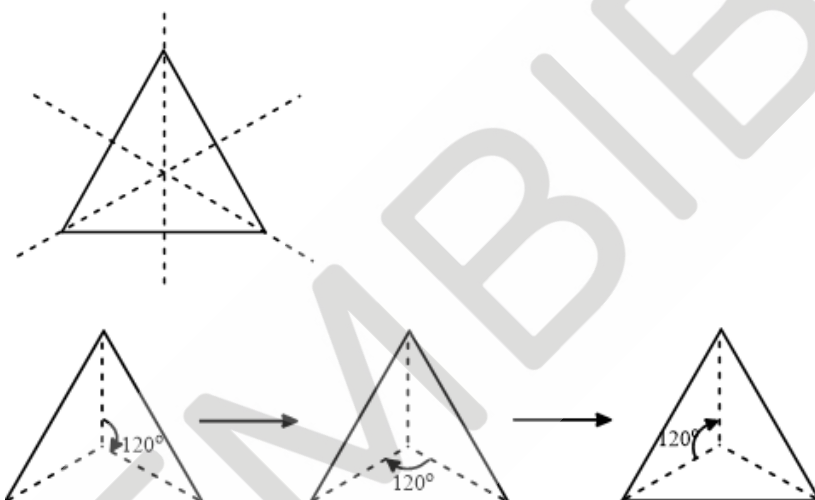
2. Draw, wherever possible, a rough sketch of



- (i) a triangle with both line and rotational symmetries of order more than 1.
- (ii) a triangle with only line symmetry and no rotational symmetry of order more than 1.
- (iii) a quadrilateral with a rotational symmetry of order more than 1 but not a line symmetry.
- (iv) a quadrilateral with line symmetry but not a rotational symmetry of order more than 1.

**Solution:**

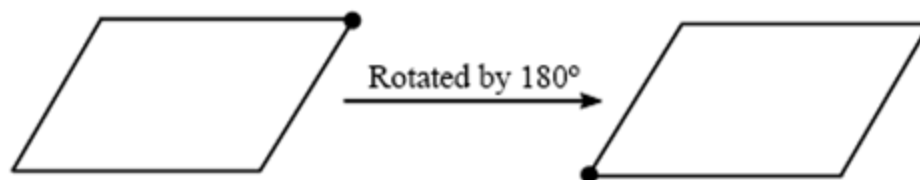
- (i) Equilateral triangle has 3 lines of symmetry and rotational symmetry of order 3.



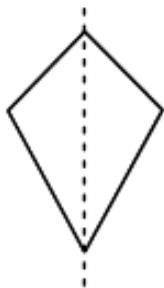
- (ii) Isosceles triangle has only 1 line of symmetry and no rotational symmetry of order more than 1.



- (iii) A parallelogram is a quadrilateral which has no line of symmetry but a rotational symmetry of order 2.



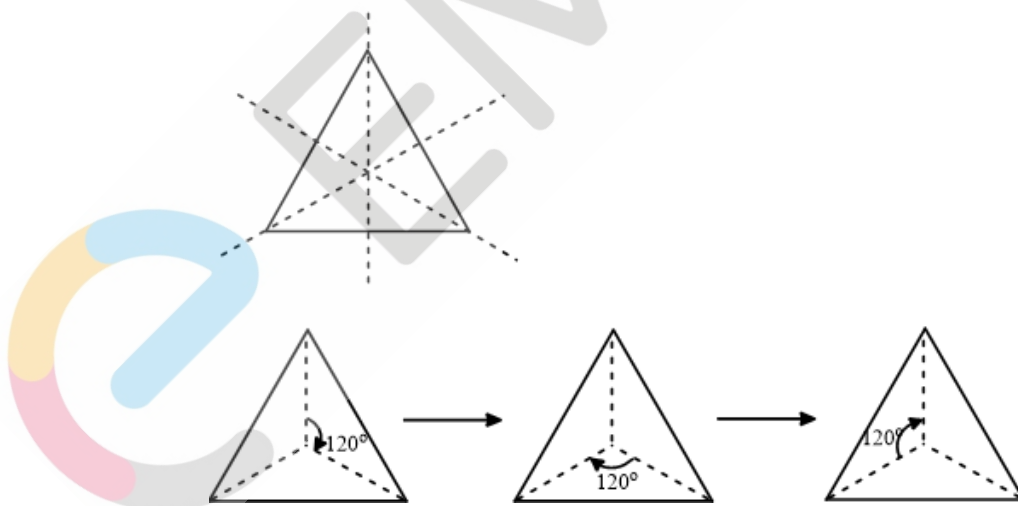
- (iv) A kite is a quadrilateral which has only 1 line of symmetry and no rotational symmetry of order more than 1.



3. If a figure has two or more lines of symmetry, should it have rotational symmetry of order more than 1?

**Solution:**

Yes. If a figure has two or more lines of symmetry, then it will definitely have its rotational symmetry of order more than 1.



4. Fill in the blanks:

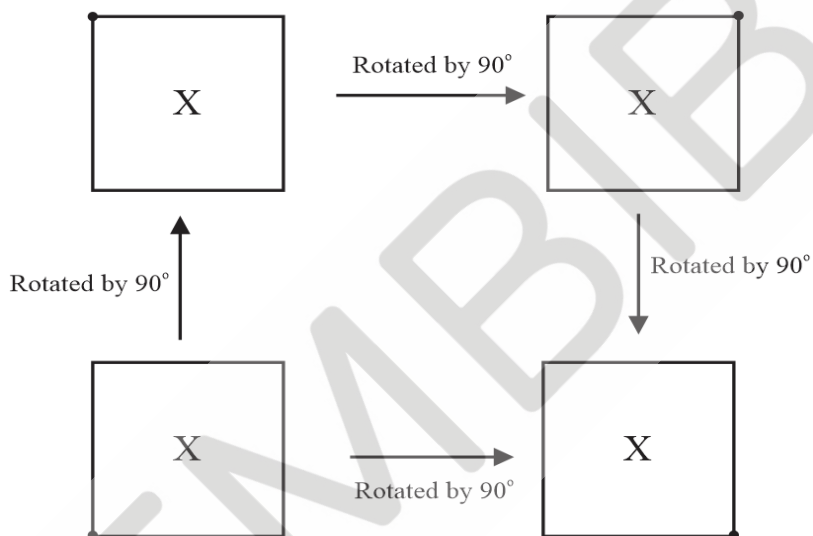
Shape	Centre of Rotation	Order of Rotation	Angle of Rotation
Square	-	-	-
Rectangle	-	-	-
Rhombus	-	-	-

Equilateral Triangle	-	-	-
Regular Hexagon	-	-	-
Circle	-	-	-
Semi-circle	-	-	-

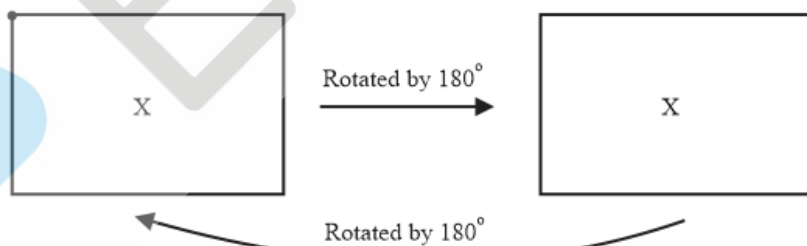
**Solution:**

The given table can be completed as follows.

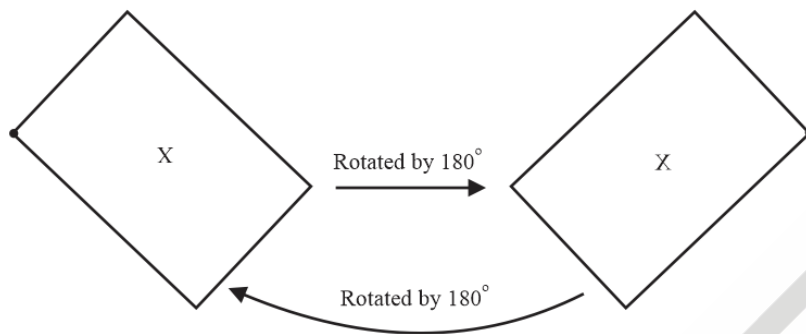
Square:



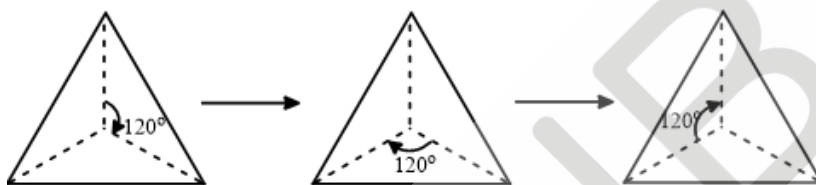
Rectangle:



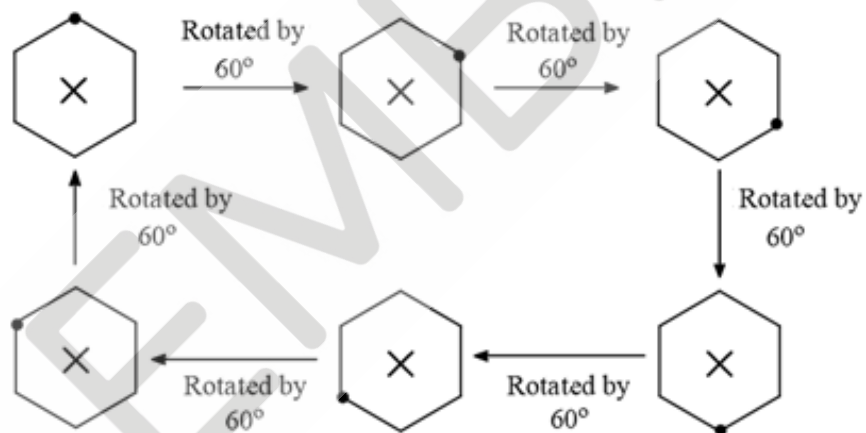
Rhombus:



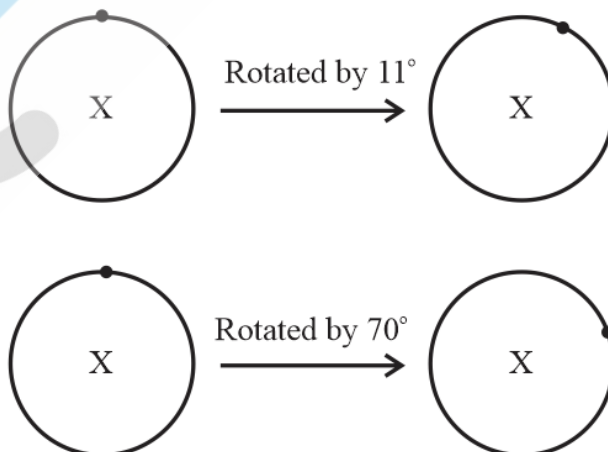
Equilateral triangle:



Regular Hexagon:

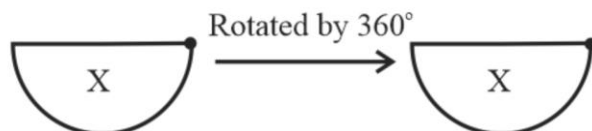


Circle:



Hence, we can rotate circle in any angle of rotation and all shapes are symmetrical.

Semi-circle:



Shape	Centre of Rotation	Order of Rotation	Angle of Rotation
Square	Intersection point of diagonals	4	$90^\circ$
Rectangle	Intersection point of diagonals	2	$180^\circ$
Rhombus	Intersection point of diagonals	2	$180^\circ$
Equilateral Triangle	Intersection point of median (Centroid)	3	$120^\circ$
Regular Hexagon	Intersection point of diagonals	6	$60^\circ$
Circle	Centre of circle	Infinite	Any angle
Semi-circle	Any point in the plane of semi-circle	1	$360^\circ$

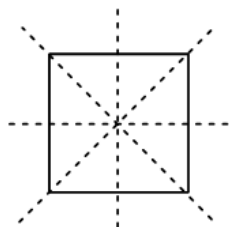
5. Name the quadrilaterals which have both line and rotational symmetry of order more than 1.

**Solution:**

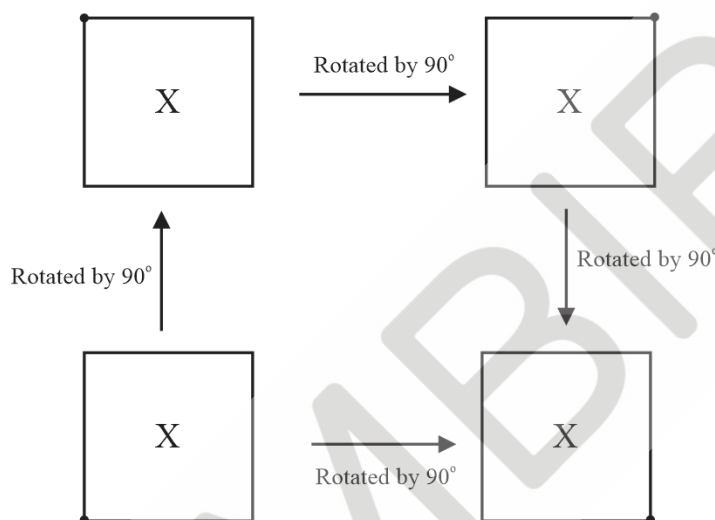
Square, rectangle, and rhombus are the quadrilaterals which have both line and rotational symmetry of order more than 1.

**Square:**

Line symmetry:

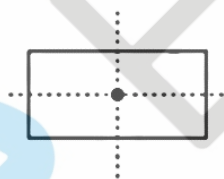


Rotational symmetry:

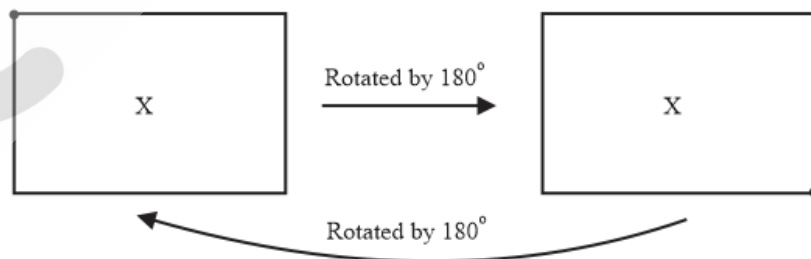


**Rectangle:**

Line symmetry:

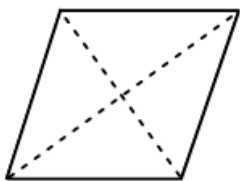


Rotational symmetry:

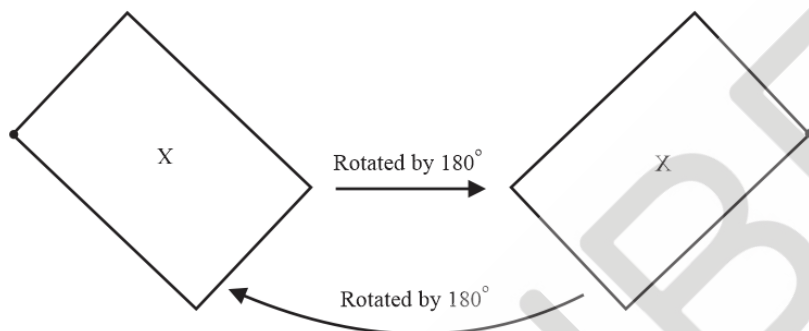


**Rhombus:**

Line symmetry:



Rotational symmetry:



A square has 4 lines of symmetry and rotational symmetry of order 4.

A rectangle has 2 lines of symmetry and rotational symmetry of order 2.

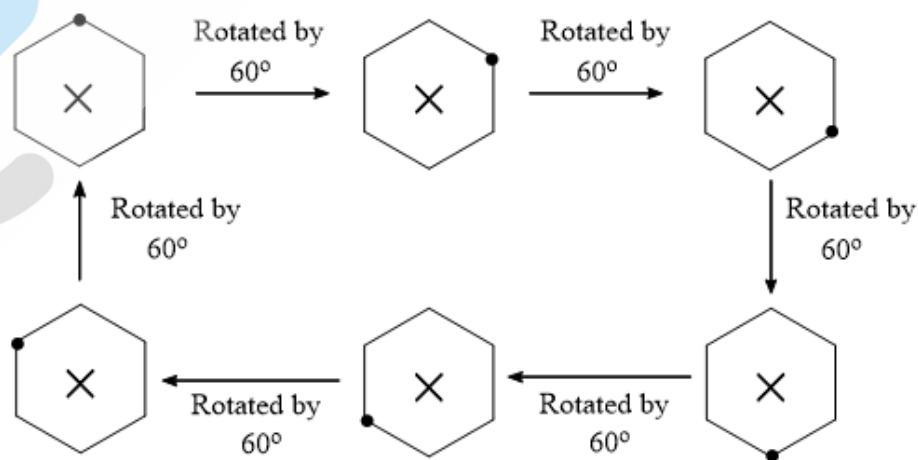
A rhombus has 2 lines of symmetry and rotational symmetry of order 2.

6. After rotating by  $60^\circ$  about a centre, a figure looks exactly the same as its original position. At what other angles will this happen for the figure?

**Solution:**

It can be observed that if a figure looks symmetrical on rotating by  $60^\circ$ , then it will also look symmetrical on rotating by  $120^\circ, 180^\circ, 240^\circ, 300^\circ$  and  $360^\circ$  i.e., further multiples of  $60^\circ$ .

Example: Regular hexagon after rotating  $60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ, 360^\circ$  about a centre, it looks exactly the same as its original position.



7. Can we have a rotational symmetry of order more than 1 whose angle of rotation is

(i)  $45^\circ$ ?

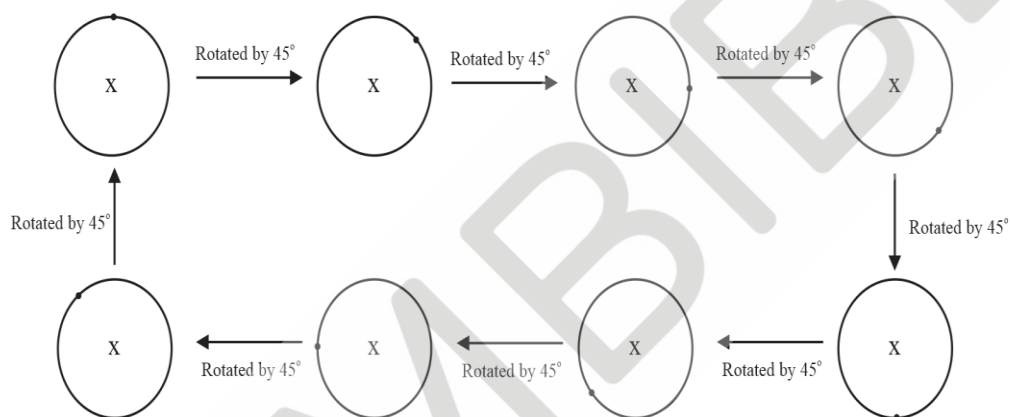
(ii)  $17^\circ$ ?

**Solution:**

It can be observed that if the angle of rotation of a figure is a factor of  $360^\circ$ , then it will have a rotational symmetry of order more than 1.

(i)

$45^\circ$  is a factor of  $360^\circ$ .



Hence, we can have a rotational symmetry of order more than 1 with angle of rotation as  $45^\circ$ .

(ii)

Clearly 17 is not a factor of 360.

Hence, we cannot have a rotational symmetry of order more than 1 with angle of rotation as  $17^\circ$ .