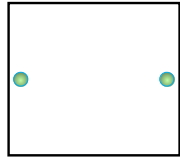# Mathematics

(Chapter – 14) (Symmetry)
(Class – VII)

Exercise 14.1

Question 1:

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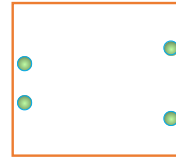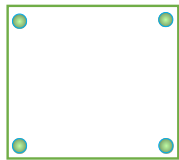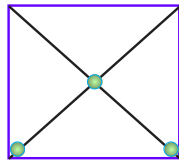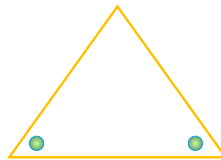

(a)   (b)   (c)   (d)

(e)   (f)   (g)   (h)
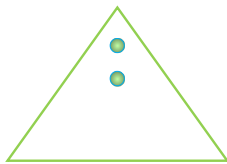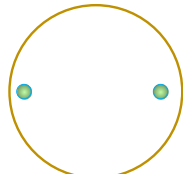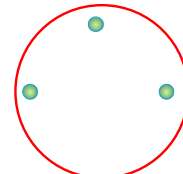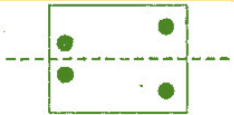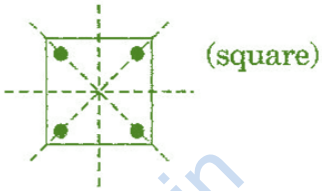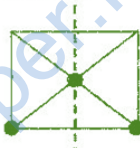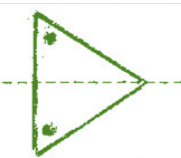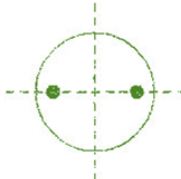
(i)   (j)   (k)   (l)

Answer 1:

S.No.	Punched holed figures	The axes of symmetry
(a)		(rectangle)
(b)		(square)

(c)		
(d)		
(e)		(square)
(f)		
(g)		
(h)		
(i)		
(j)		

(k)		
(l)		

Question 2:

Express the following in exponential form:

| (a) | (b) | (c) | (d) | (e) |
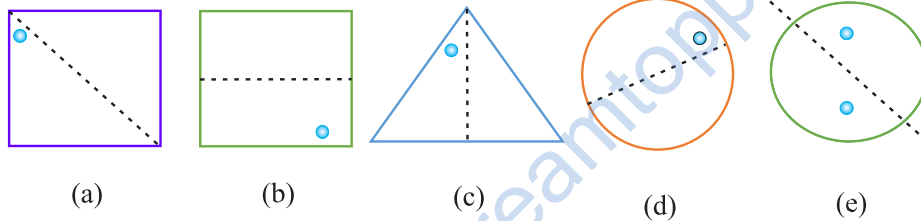
Answer 2:

S.No.	Line(s) of symmetry	Other holes on figures
(a)		
(b)		
(c)		
(d)		

(e)		
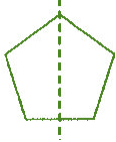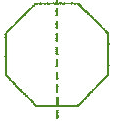
Question 3:

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) |
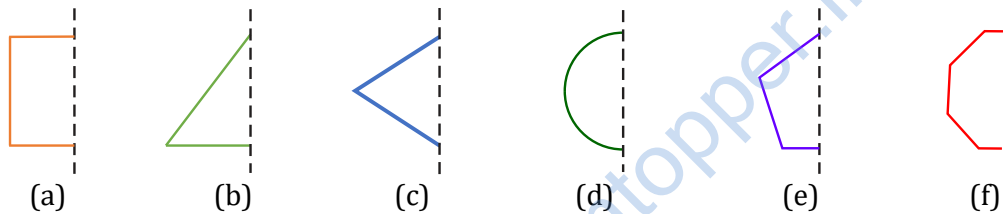
Answer 3:

S.No.	Question figures	Complete figures	Names of the figure
(a)			Square
(b)			Triangle
(c)			Rhombus
(d)			Circle

4

(e)			Pentagon
(f)			Octagon

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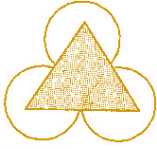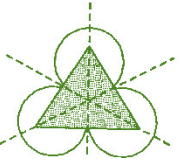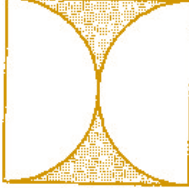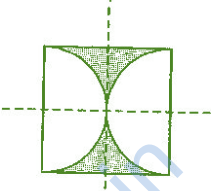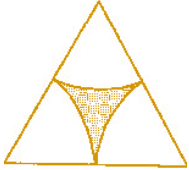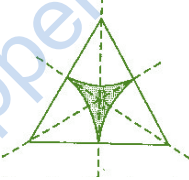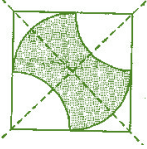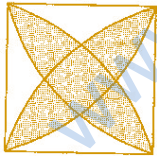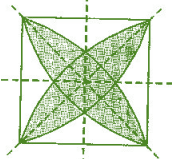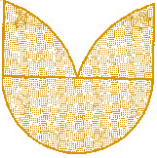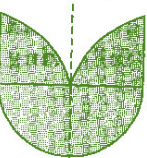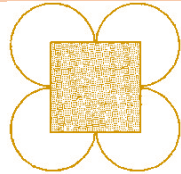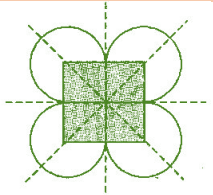
The following figures have more than one line of symmetry. Such figures are said to have multiple lines of symmetry:

(a)   (b)   (c)
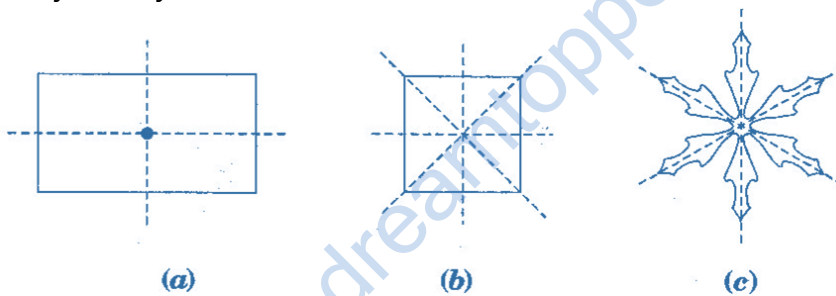
Identify multiple lines of symmetry, if any, in each of the following figures:
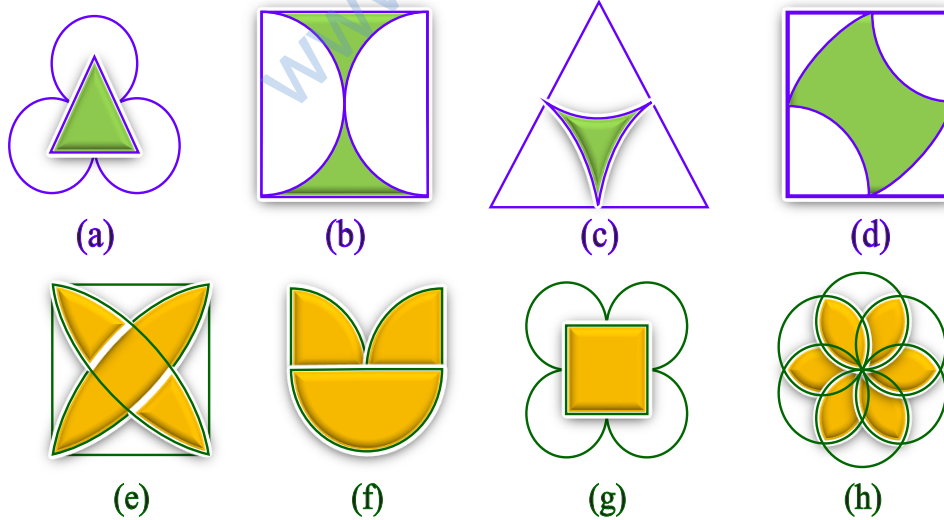
(a)   (b)   (c)   (d)

(e)   (f)   (g)   (h)

Answer 4:

S.No.	Problem Figures	Lines of symmetry
(a)		
(b)		
(c)		
(d)		
(e)		
(f)		
(g)		

(h)
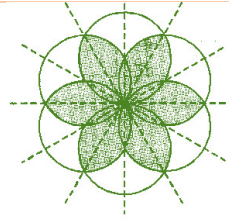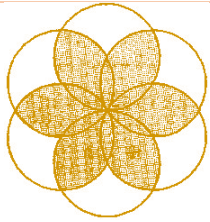
Question 5:

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?
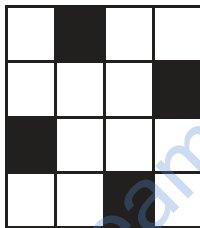
<img> Answer 5:

Answer figures are:
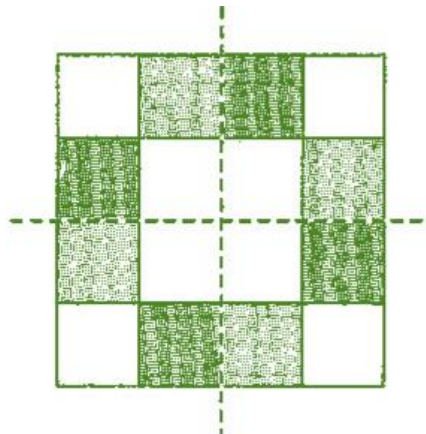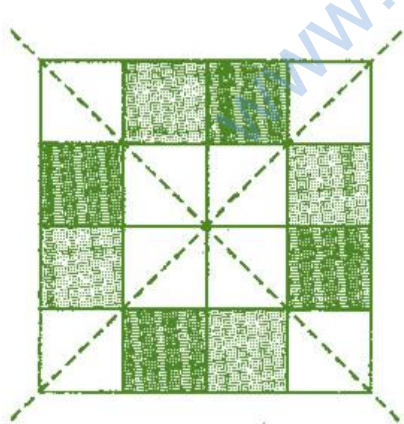
Yes, there is more than one way.

Yes, this figure will be symmetric about both the diagonals.

Question 6:

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

(a) (b) (c) (d)

Answer 6:

(a) (b)

(c) (d)
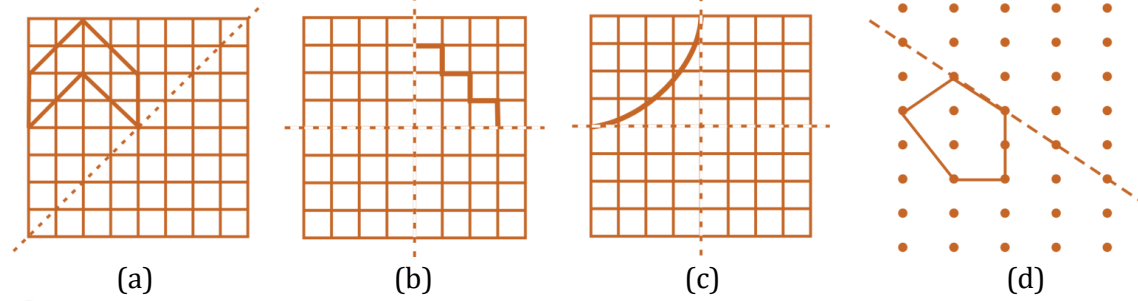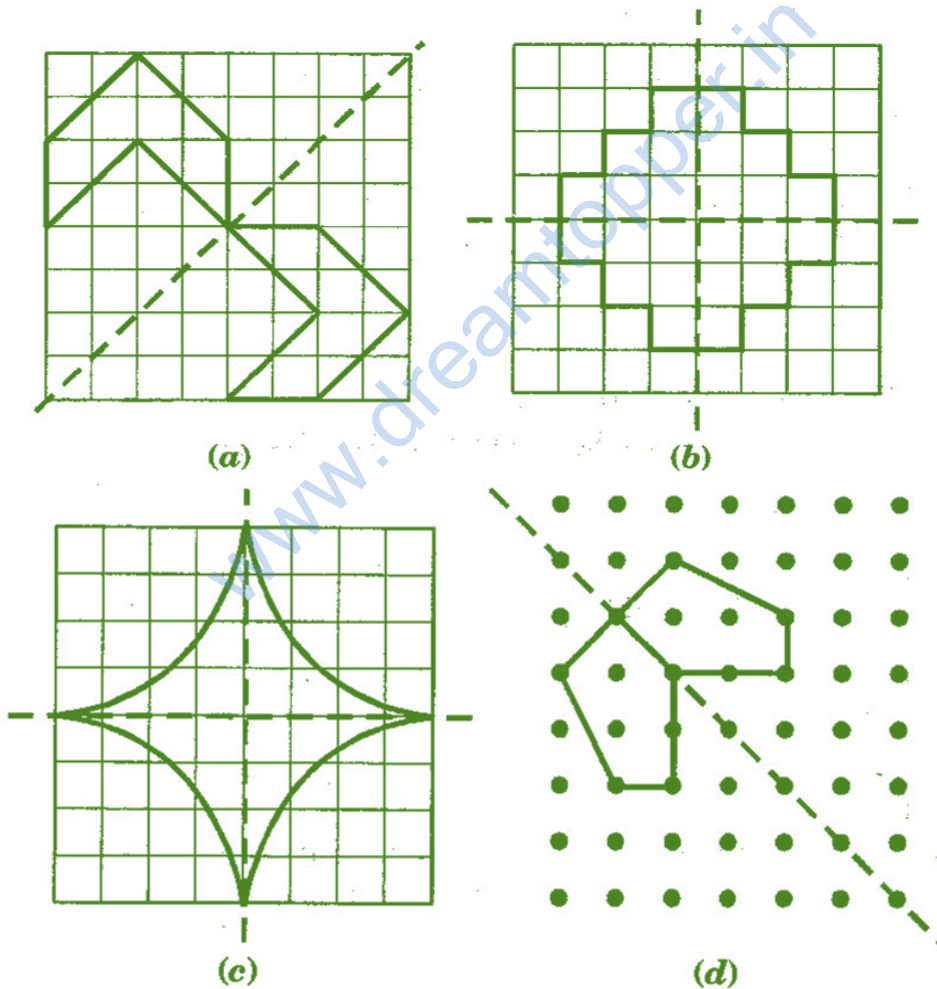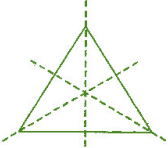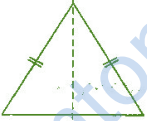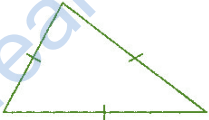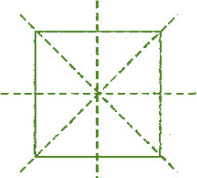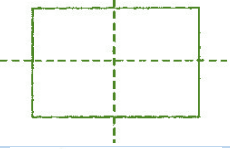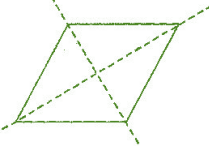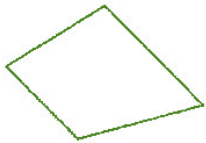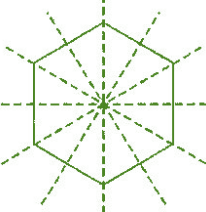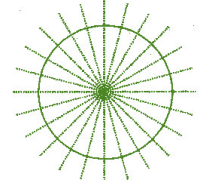
Question 7:

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

Answer 7:

S.No.	Figure's name	Diagram with symmetry	Number of lines
(a)	Equilateral triangle		3
(b)	Isosceles triangle		1
(c)	Scalene triangle		0
(d)	Square		4
(e)	Rectangle		2
(f)	Rhombus		2
(g)	Parallelogram		0

(h)	Quadrilateral		0
(i)	Regular Hexagon		6
(j)	Circle		Infinite

Question 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

Answer 8:

(a) Vertical mirror – A, H, I, M, O, T, U, V, W, X and Y

```
  mirror                    mirror
A │ A                   U │ U
H │ H                   V │ V
I │ I                   W │ W
M │ M                   X │ X
O │ O                   Y │ Y
T │ T
```

(b) Horizontal mirror – B, C, D, E, H, I, O and X

```
        B   C   D   E   H   I   O   X
mirror  ─────────────────────────────────
        B   C   D   E   H   I   O   X
```

(c) Both horizontal and vertical mirror – H, I, O and X

Question 9:

Give three examples of shapes with no line of symmetry.

Answer 9:

The three examples are:

- ➢ Quadrilateral
- ➢ Scalene triangle
- ➢ Parallelogram

Question 10:

What other name can you give to the line of symmetry of:

(a) an isosceles triangle?

(b) a circle?

Answer 10:

(a) The line of symmetry of an isosceles triangle is median or altitude.

(b) The line of symmetry of a circle is diameter.

Exercise 14.2

Question 1:

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

(a)   (b)   (c)   (d)   (e)   (f)
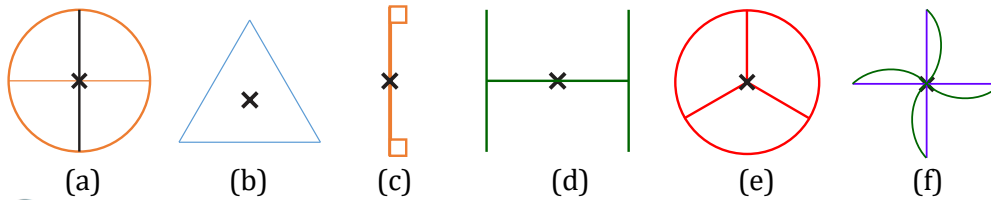
Answer 1:

Rotational symmetry of order more than 1 are $(a), (b), (d), (e)$ and (f) because in these figures, a complete turn, more than 1 number of times, an object looks exactly the same.
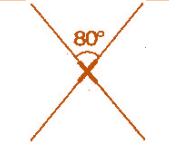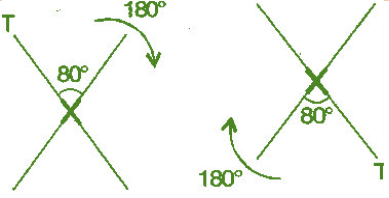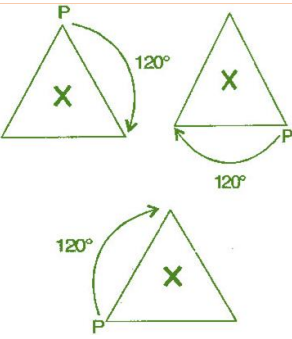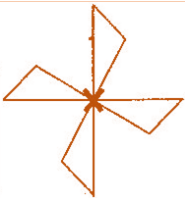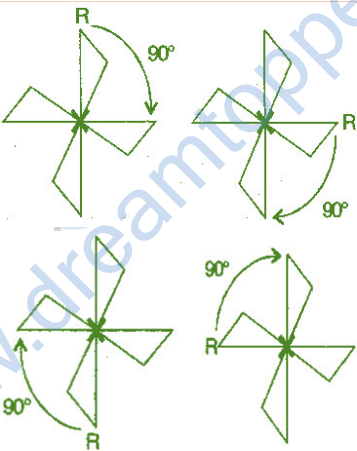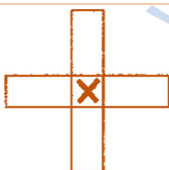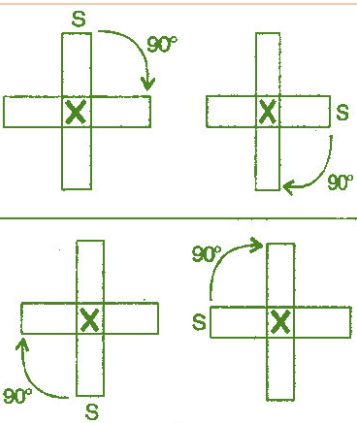
Question 2:
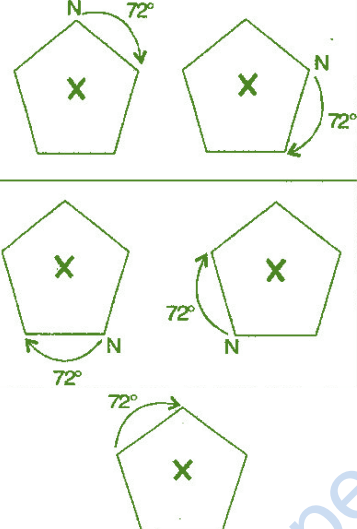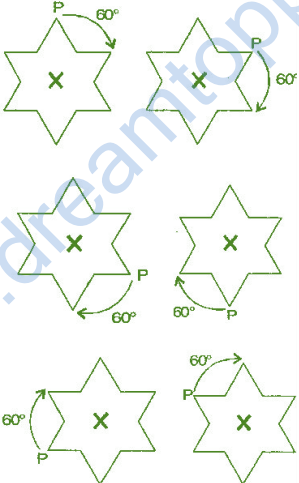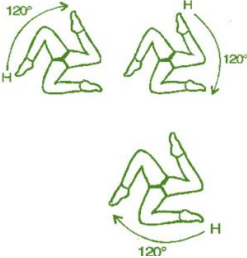
Give the order the rotational symmetry for each figure:

(a)   (b)   (c)   (d)

(e)   (f)   (g)   (h)
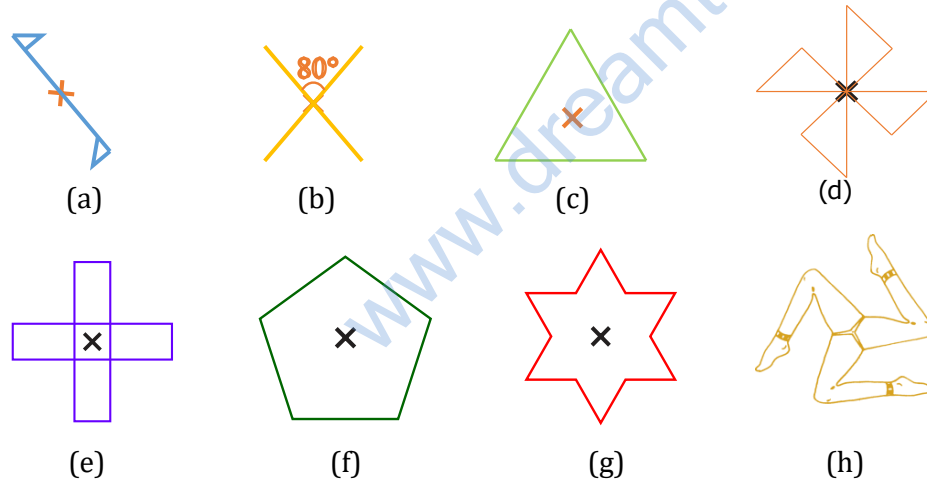
Answer 2:

S.No.	Problem figures	Rotational figures	Order of rotational symmetry
(a)			2

(b)			2
(c)			3
(d)			4
(e)			4

(f)			5
(g)			6
(h)			3

Exercise 14.3

Question 1:

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

Answer 1:

Circle and Square.

Question 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.

Answer 2:

     (i)   An equilateral triangle has both line and rotational symmetries of order more than 1.
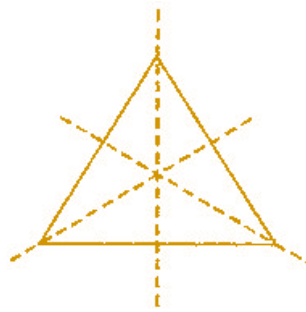
Line symmetry:

Rotational symmetry:
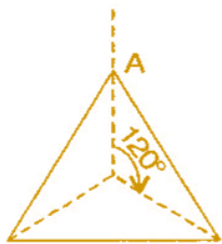
(ii)   An isosceles triangle has only one line of symmetry and no rotational symmetry of order more than 1.
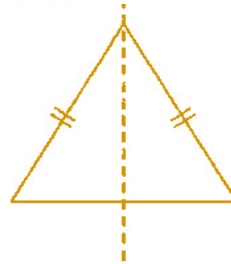
Line symmetry:

Rotational symmetry:
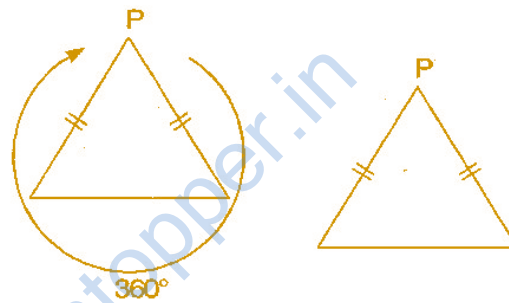
(iii)   It is not possible because order of rotational symmetry is more than 1 of a figure, most acertain the line of symmetry.

(iv)   A trapezium which has equal non-parallel sides, a quadrilateral with line symmetry but not a rotational symmetry of order more than 1.
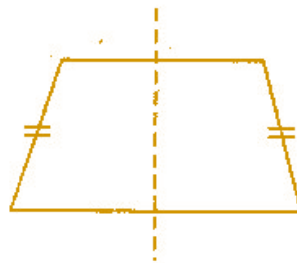
Line symmetry:

Rotational symmetry:
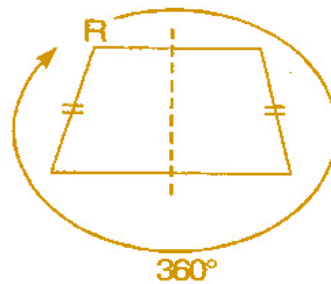
Question 3:

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

Answer 3:

Yes, because every line through the centre forms a line of symmetry and it has rotational symmetry around the centre for every angle.

Question 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			

Answer 4:

Shape	Centre of Rotation	Order of Rotation	Angle of Rotation
Square	Intersecting point of diagonals.	4	90°
Rectangle	Intersecting point of diagonals.	2	180°
Rhombus	Intersecting point of diagonals.	2	180°
Equilateral triangle	Intersecting point of medians.	3	120°
Regular hexagon	Intersecting point of diagonals.	6	60°
Circle	Centre	infinite	At every point
Semi-circle	Mid-point of diameter	1	360°

Question 5:

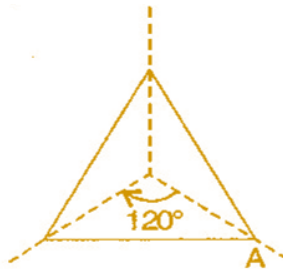Name the quadrilateral which has both line and rotational symmetry of order more than 1.

Answer 5:

Square has both line and rotational symmetry of order more than 1.

Line symmetry:

Rotational symmetry:


Question 6:

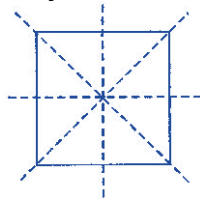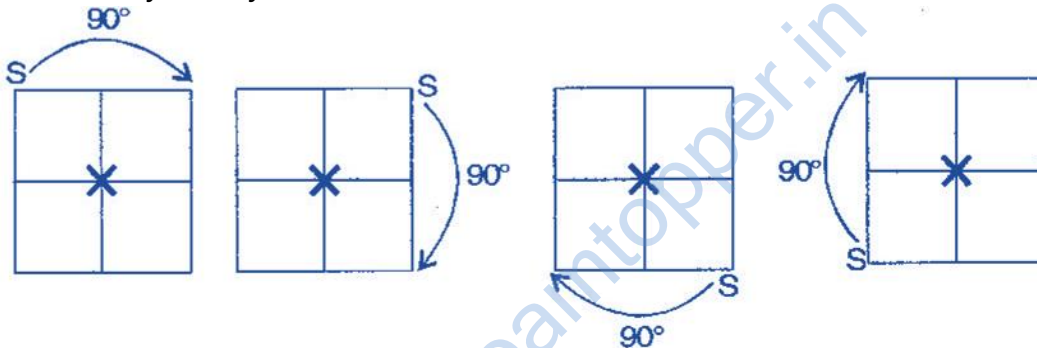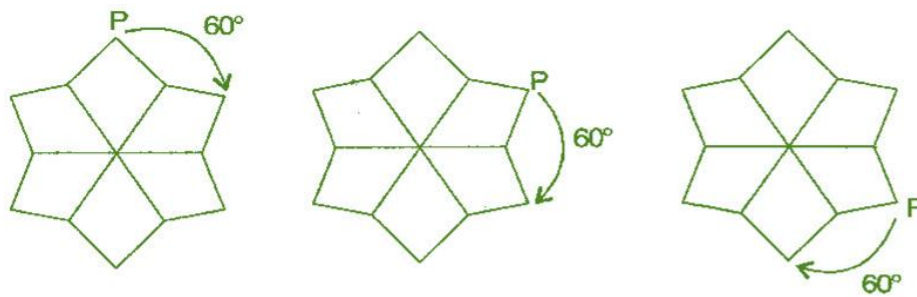After rotating by $60°$ about a centre, a figure looks exactly the same as its original position. At what other angles will this happen for the figure?

Answer 6:
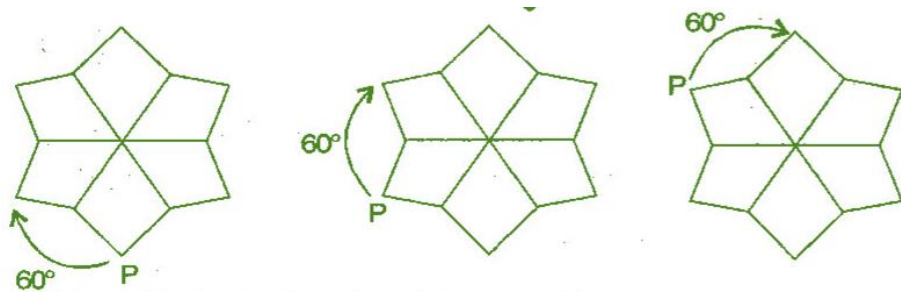
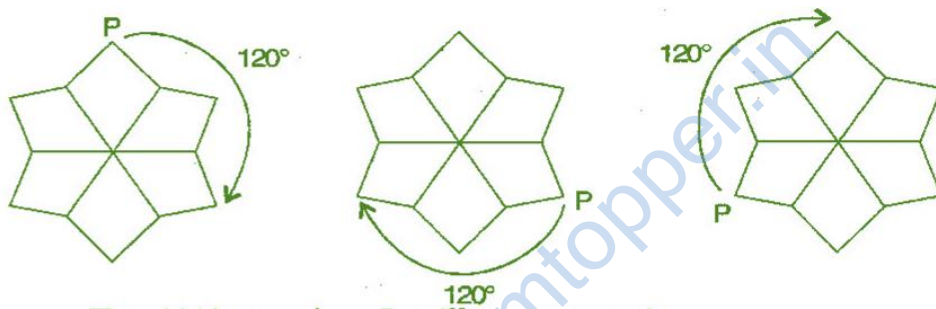Other angles will be $120°, 180°, 240°, 300°, 360°$.

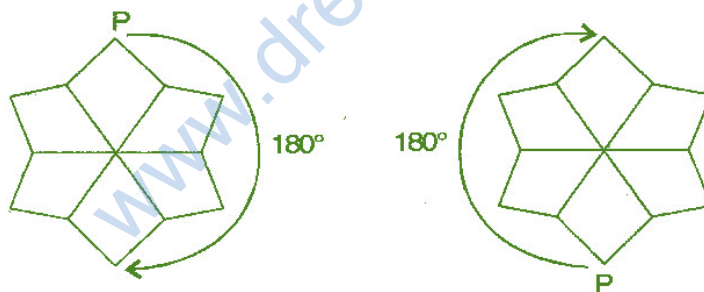For $60°$ rotation:
It will rotate six times.

For 120° rotation:
It will rotate three times.

For 180° rotation:
It will rotate two times.

For 360° rotation:
It will rotate one time.

Question 7:

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

(i) $45°$ (ii) $17°$?

Answer 7:

(i)   If the angle of rotation is $45°$, then symmetry of order is possible and would be 8 rotations.

(ii)   If the angle of rotational is $17°$, then symmetry of order is not possible because $360°$ is not complete divided by $17°$.