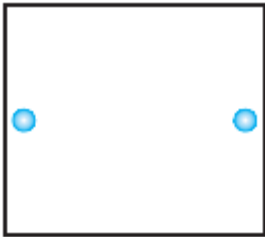


**EXERCISE 14.1**

**PAGE: 268**

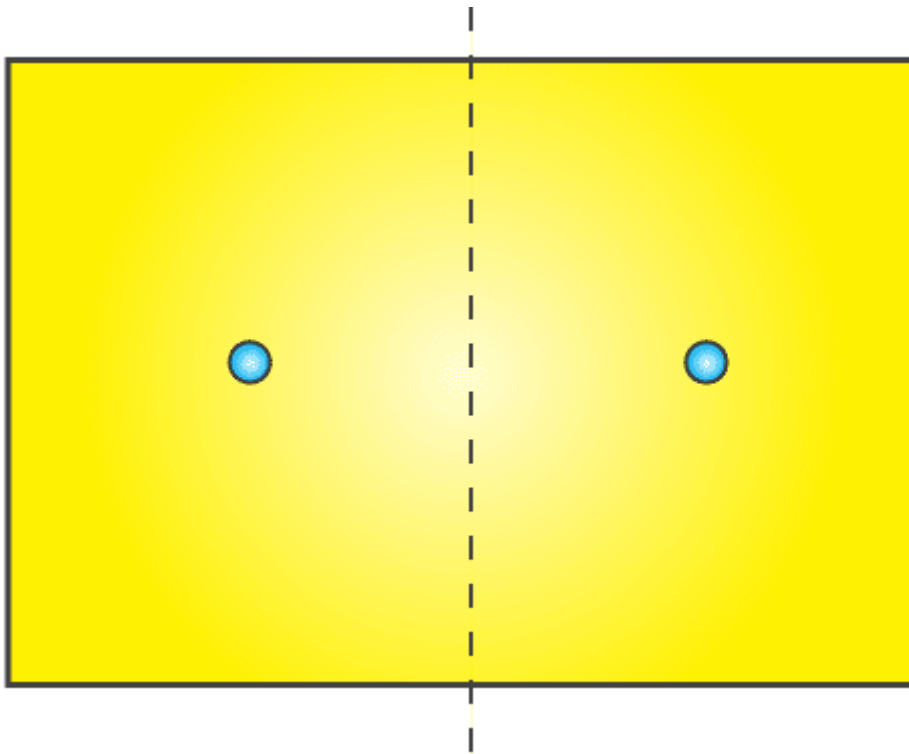
1. Copy the figures with punched holes and find the axes of symmetry for the following:

(a)



**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

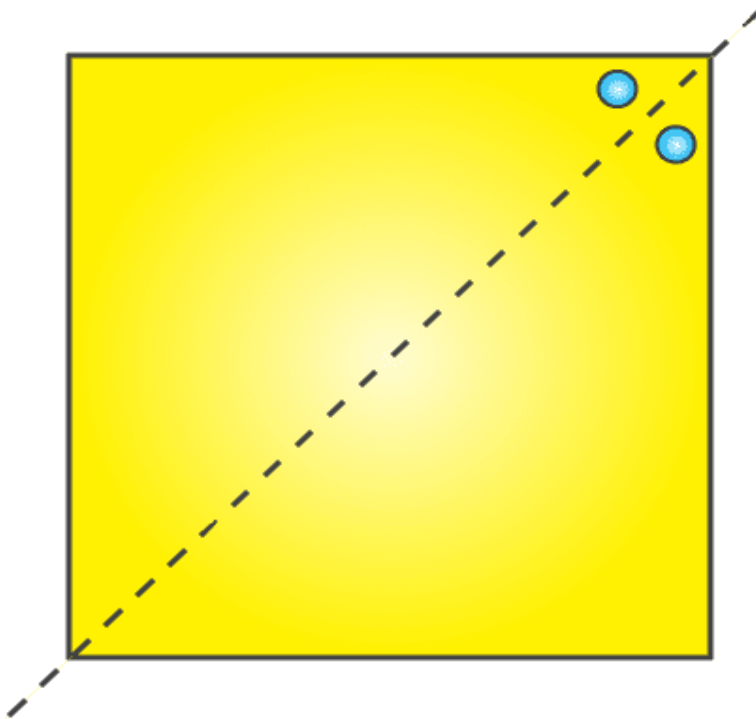


(b)



**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

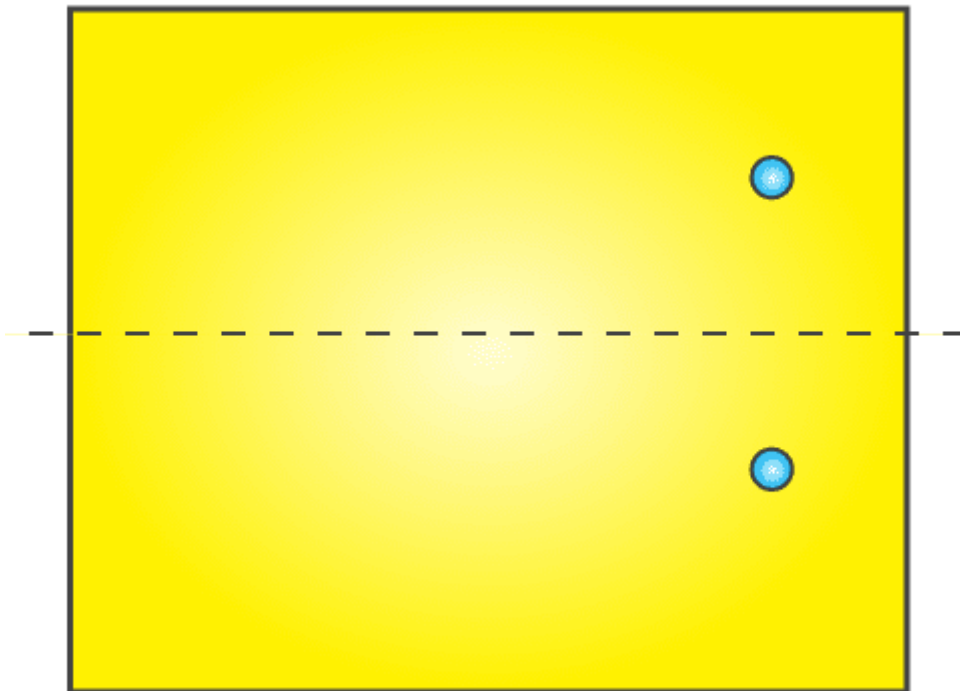


(c)

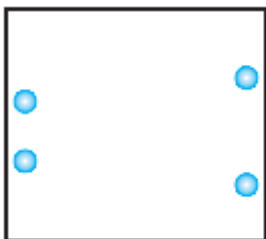


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

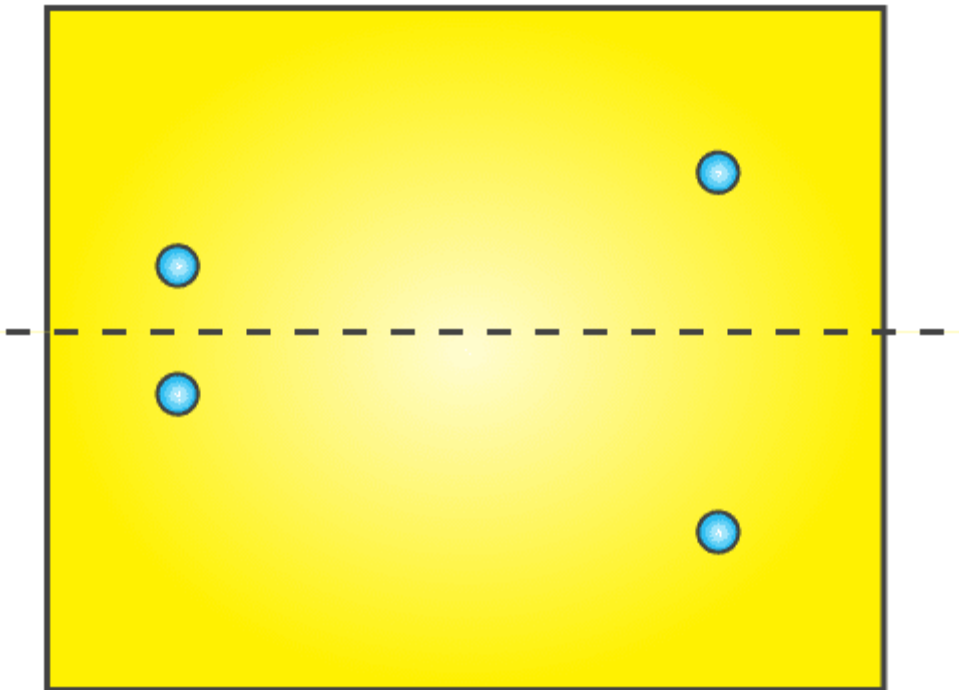


(d)

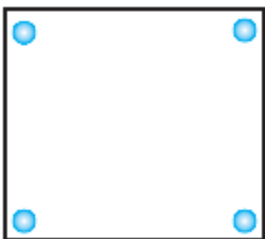


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

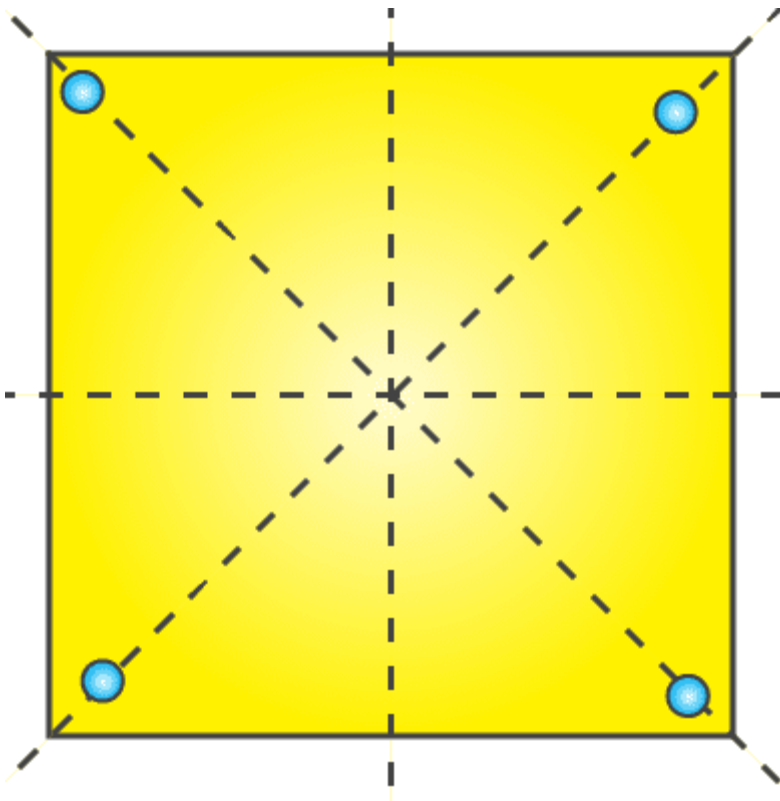


(e)

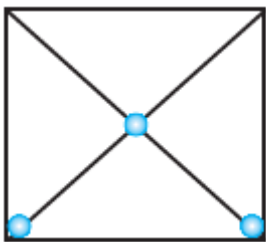


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

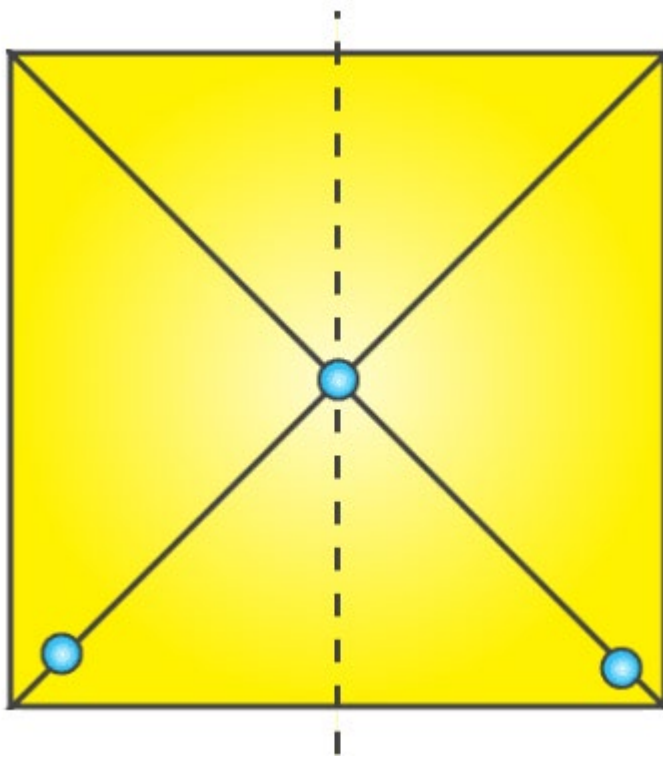


(f)

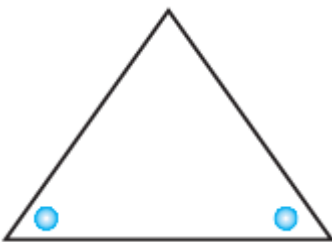


Solution:-

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

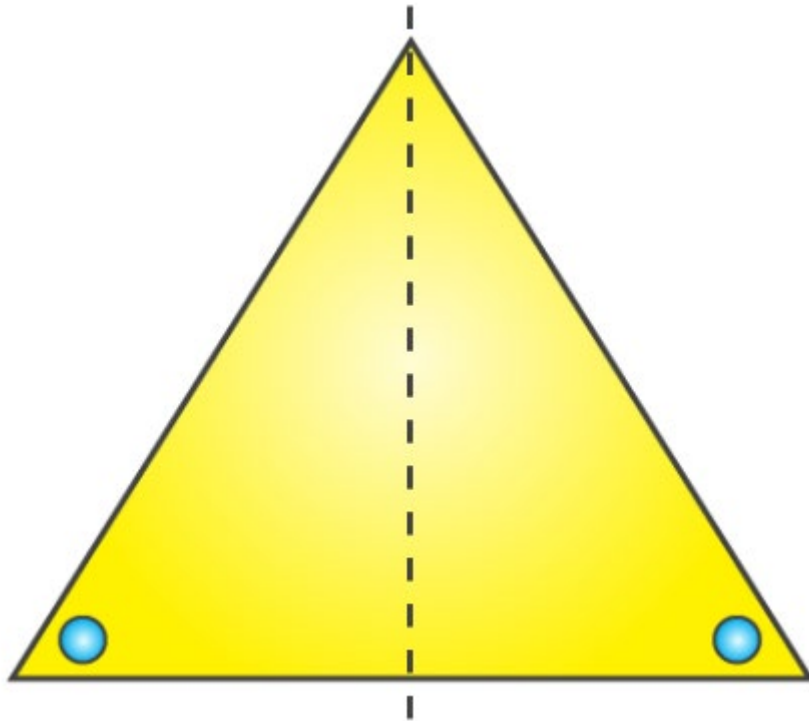


(g)

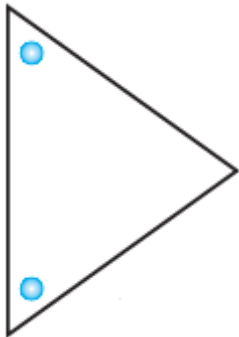


Solution:-

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

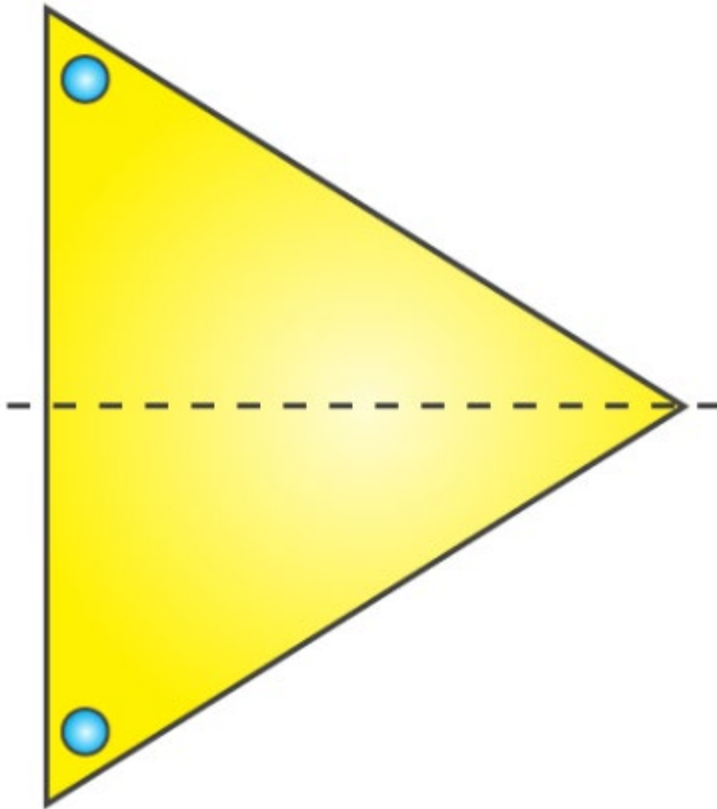


(h)

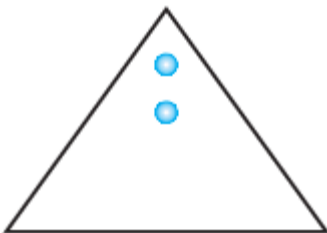


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.



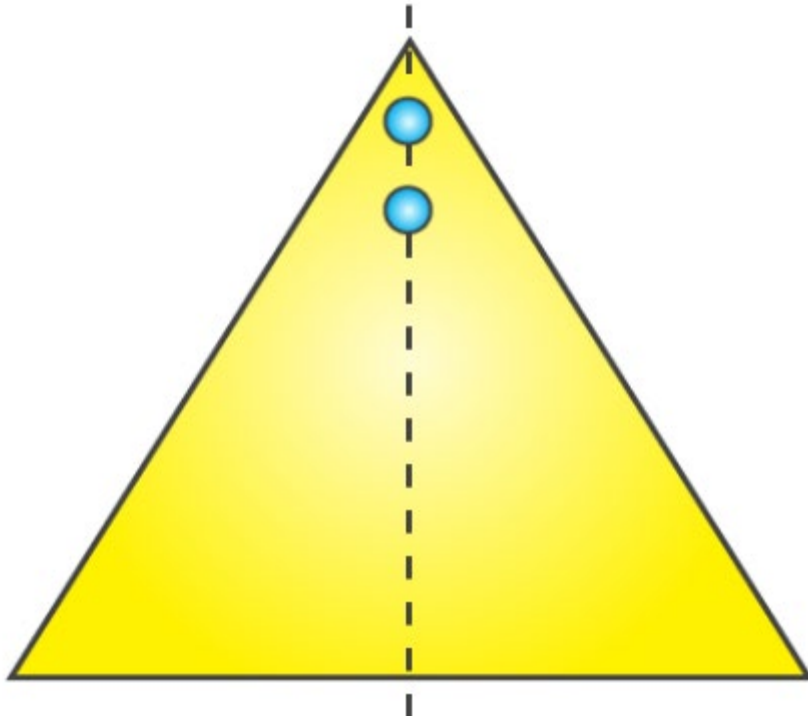
(i)



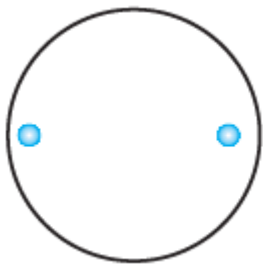
**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.



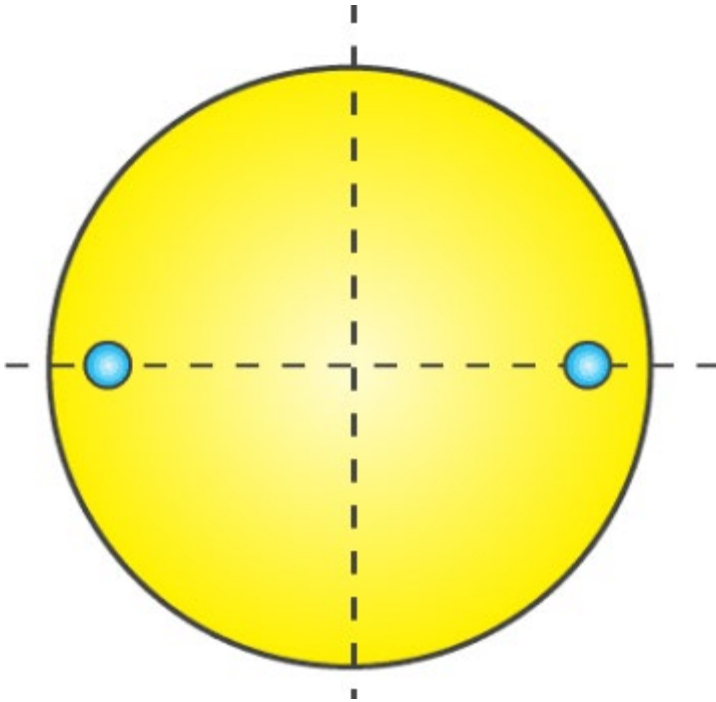


(j)

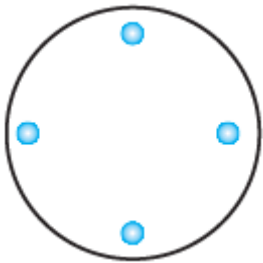


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

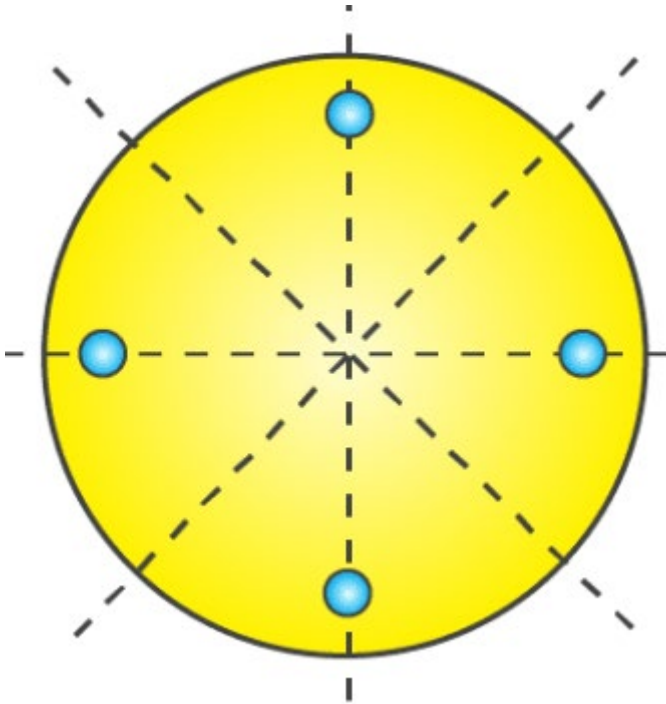


(k)

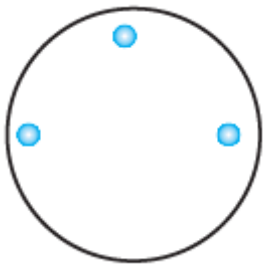


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

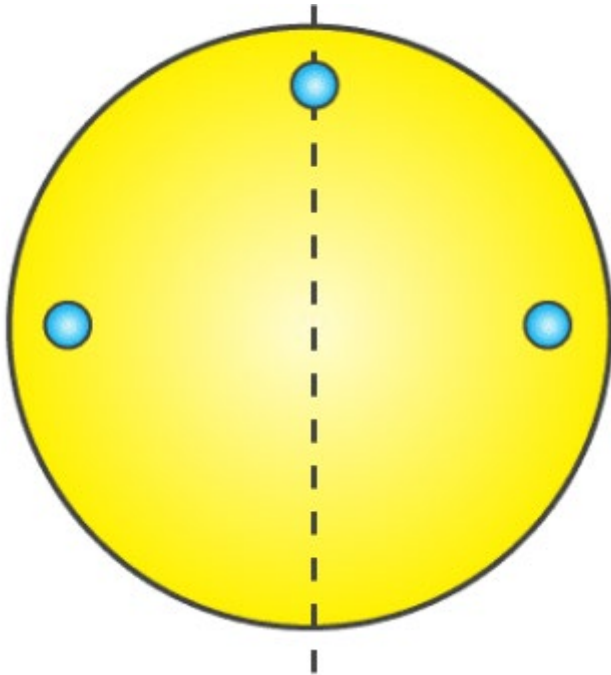


(i)



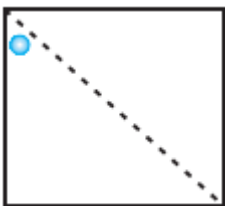
**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.



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

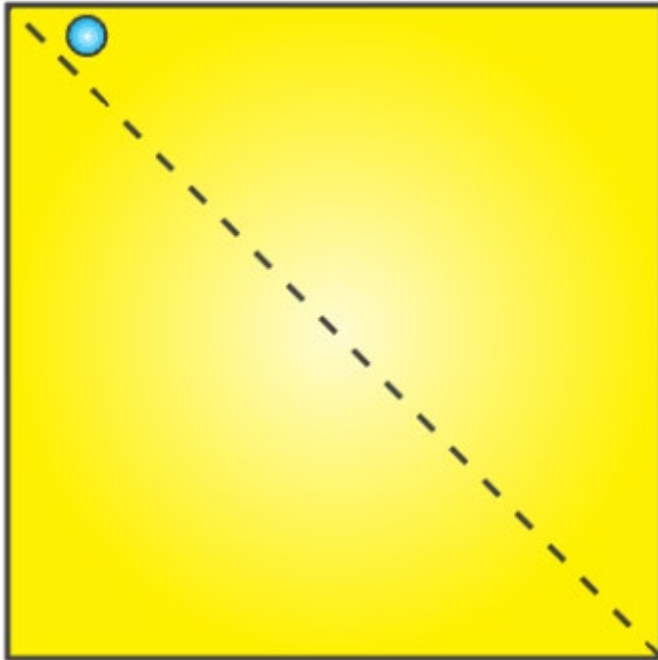
(a)



**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

So, other hole is shown in the figure below.



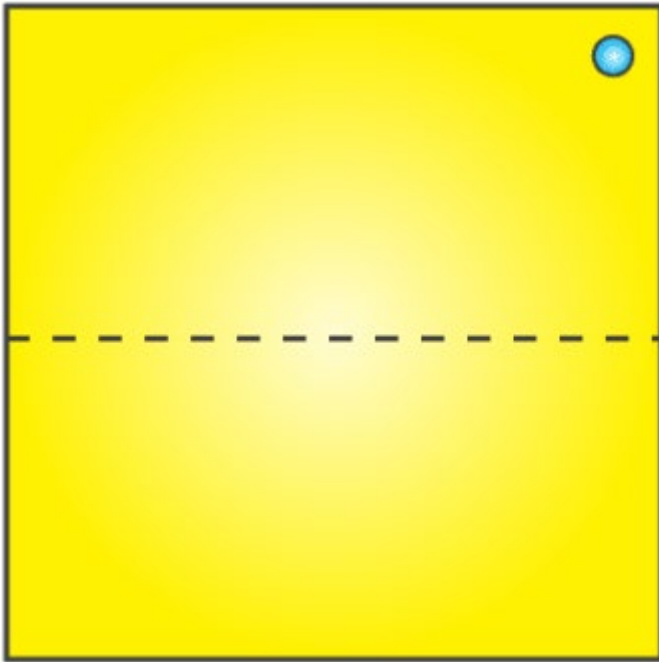
(b)



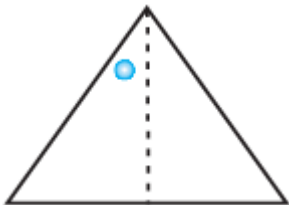
**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

So, other hole is shown in the figure below.



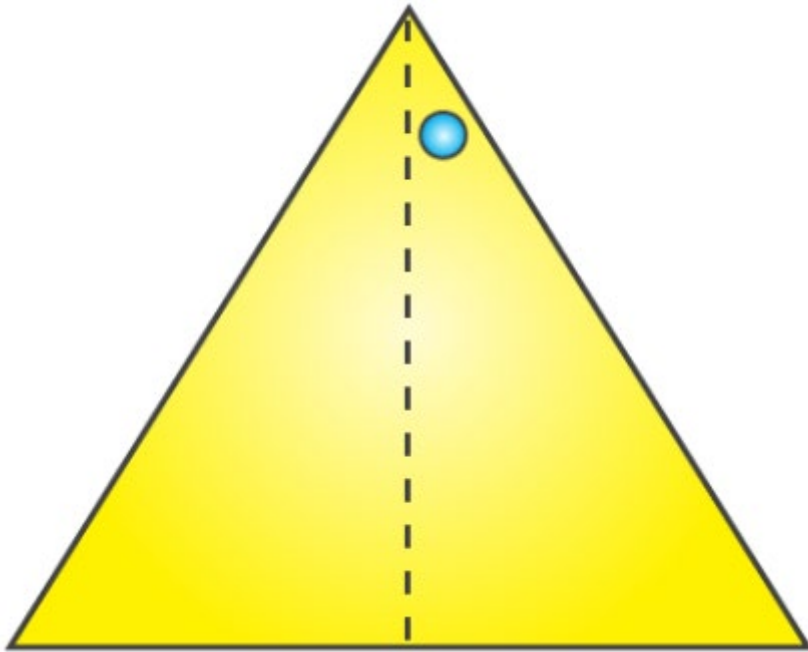
(c)



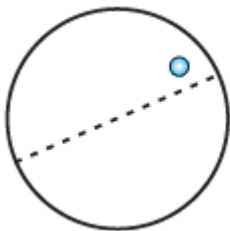
**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

So, other hole is shown in the figure below.



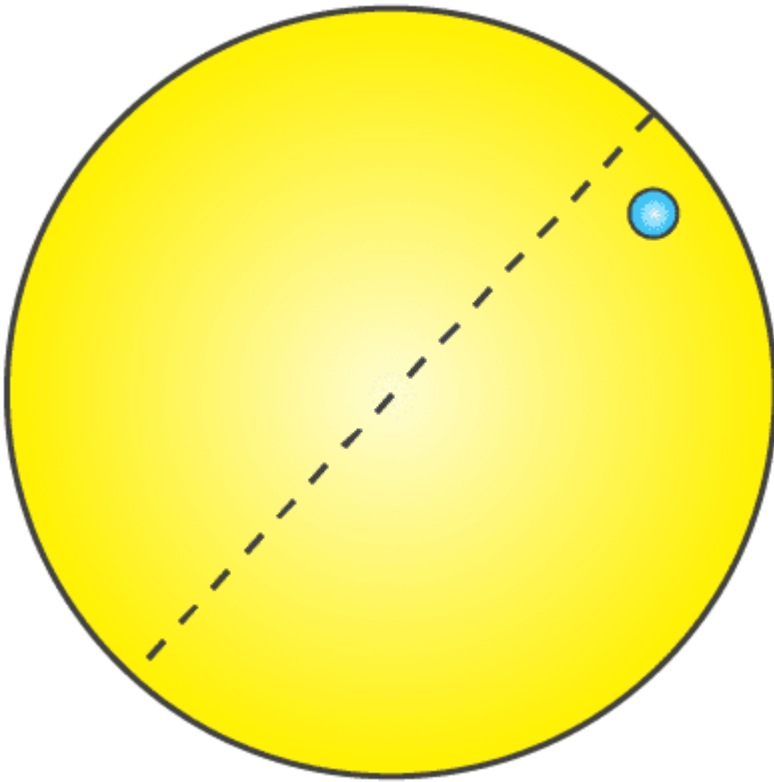
(d)



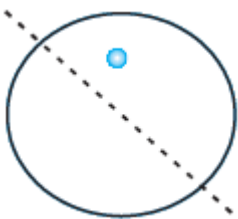
**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

So, other hole is shown in the figure below.



(e)

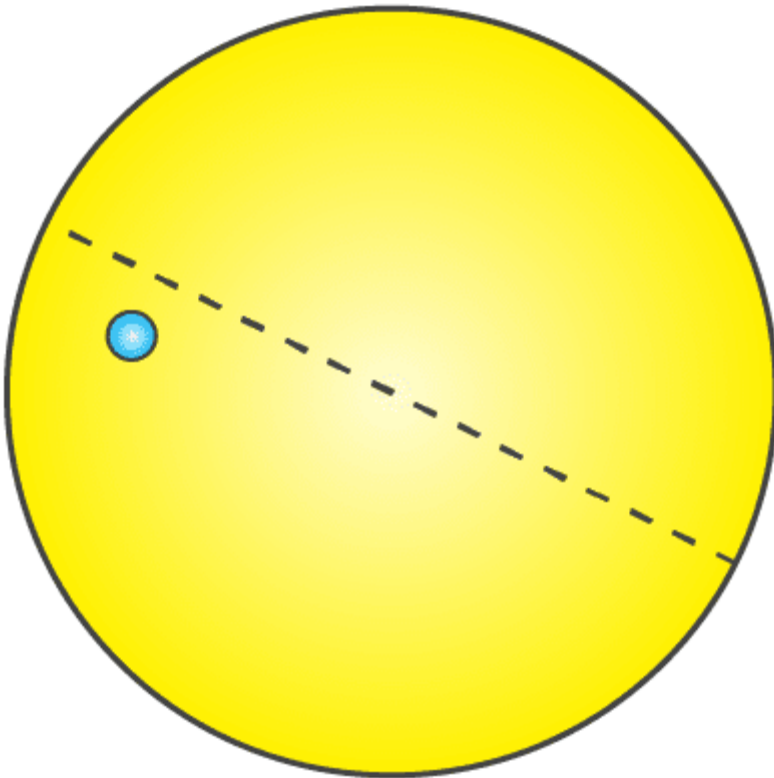


**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

So, other hole is shown in the figure below.





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?

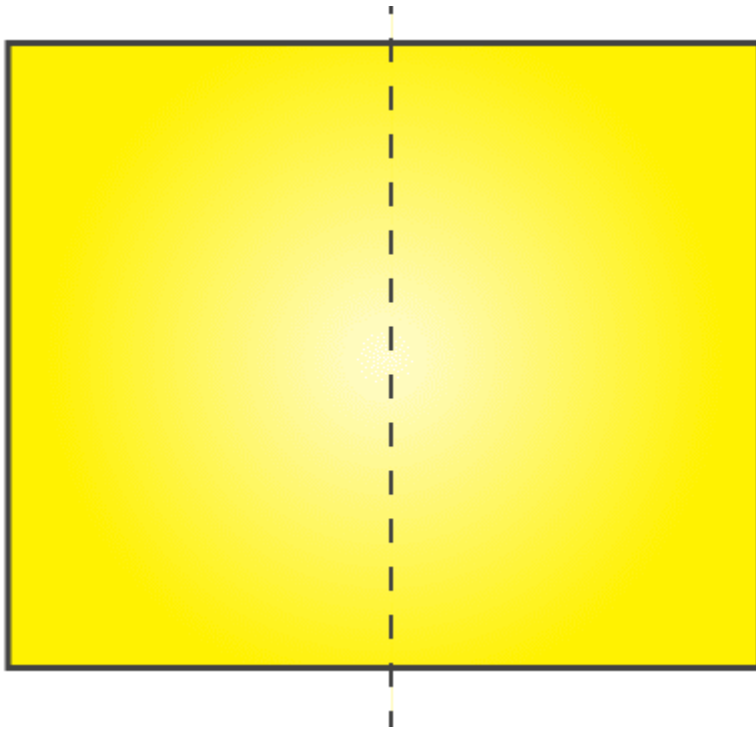
(a)



**Solution:-**

The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



Name of the figure is square.

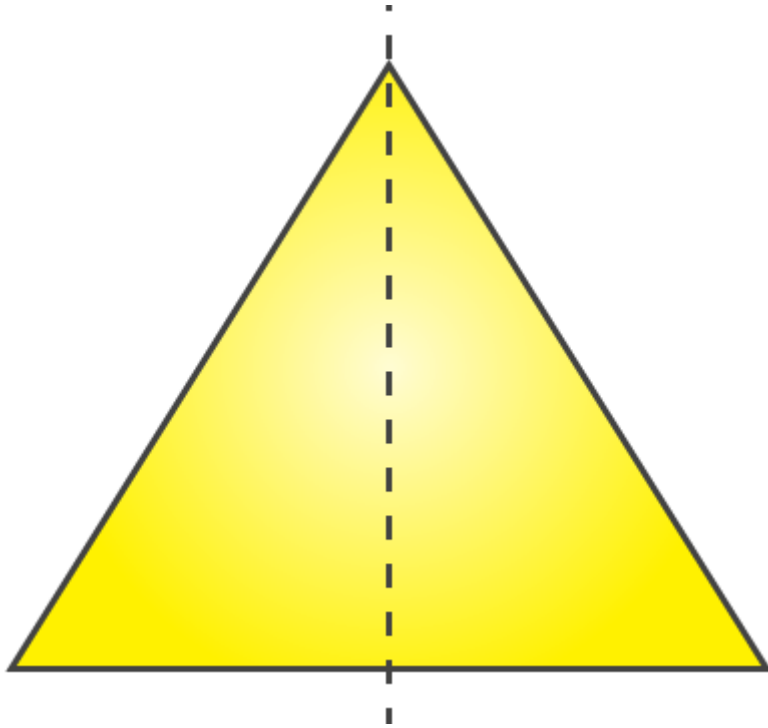
(b)



**Solution:-**

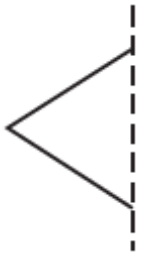
The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



Name of the figure is triangle.

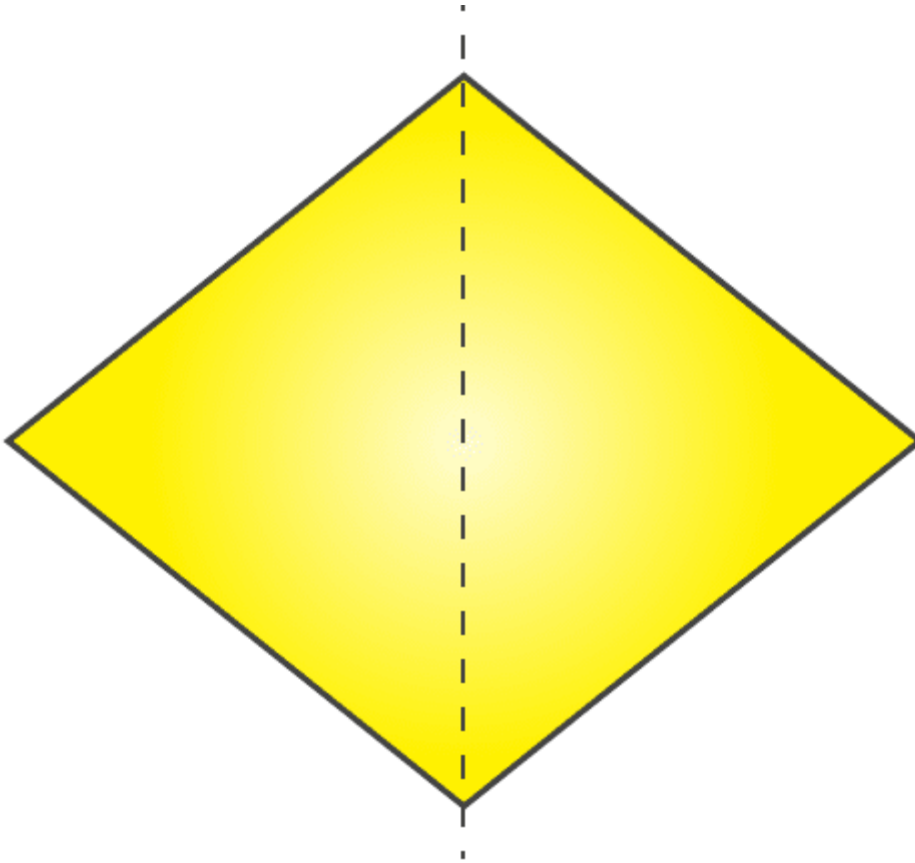
(c)



**Solution:-**

The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



Name of the figure is rhombus.

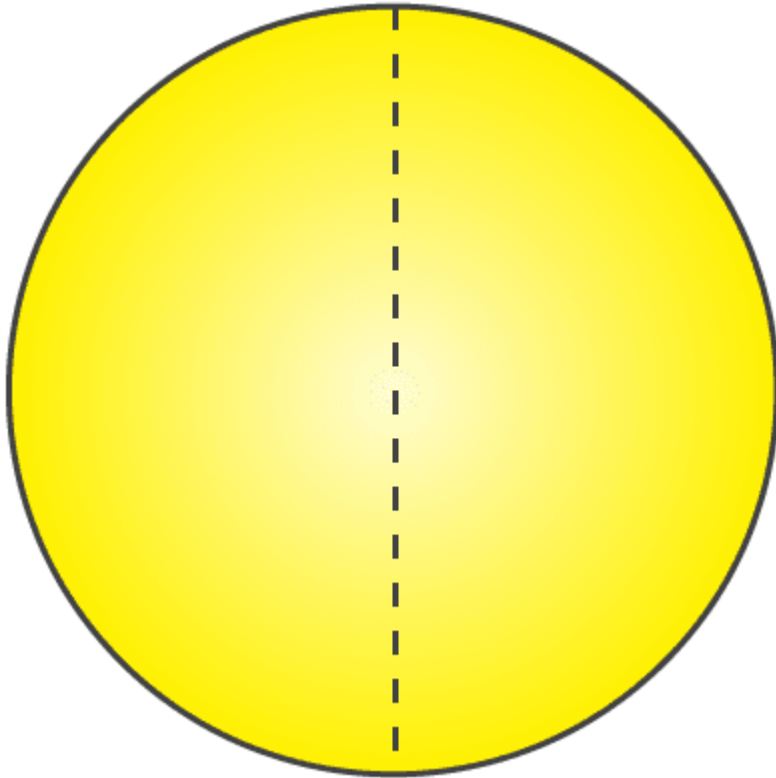
(d)



**Solution:-**

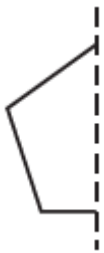
The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



Name of the figure is circle.

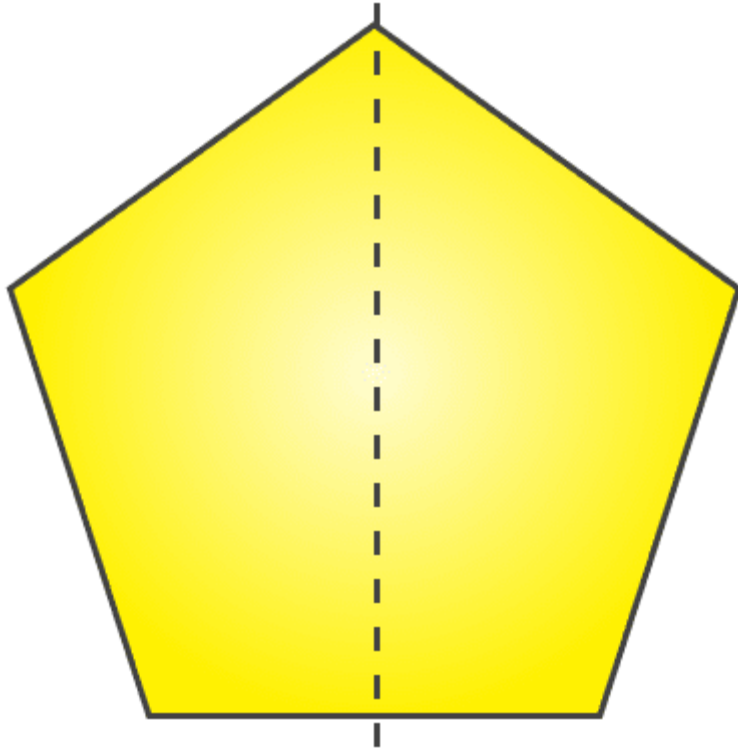
(e)



**Solution:-**

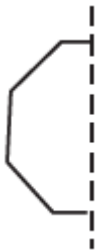
The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



Name of the figure is pentagon.

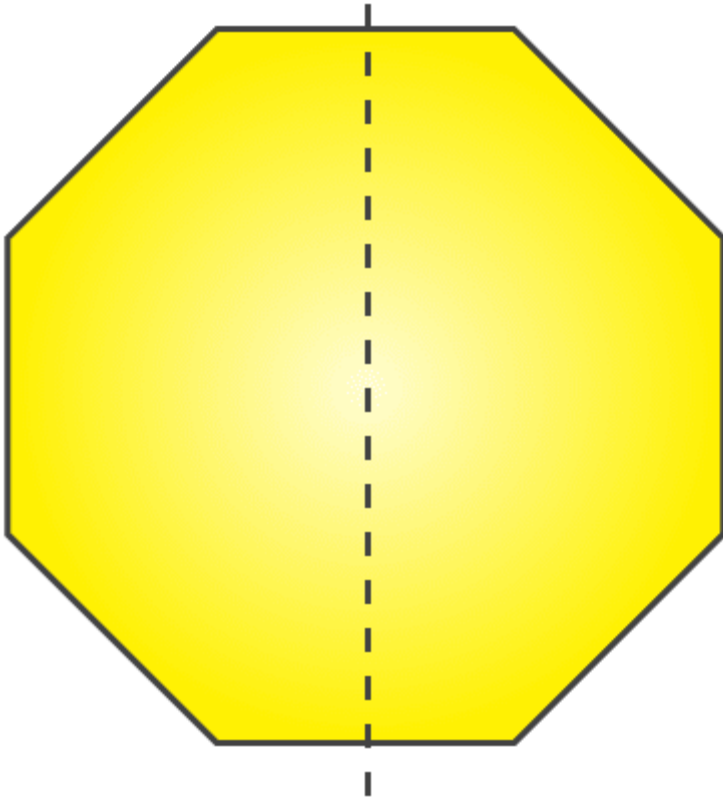
(f)



**Solution:-**

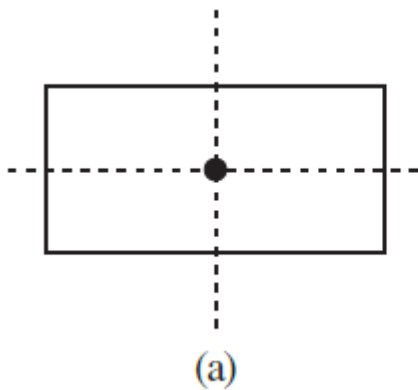
The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.

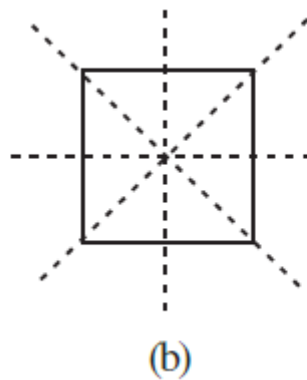


Name of the figure is octagon.

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:

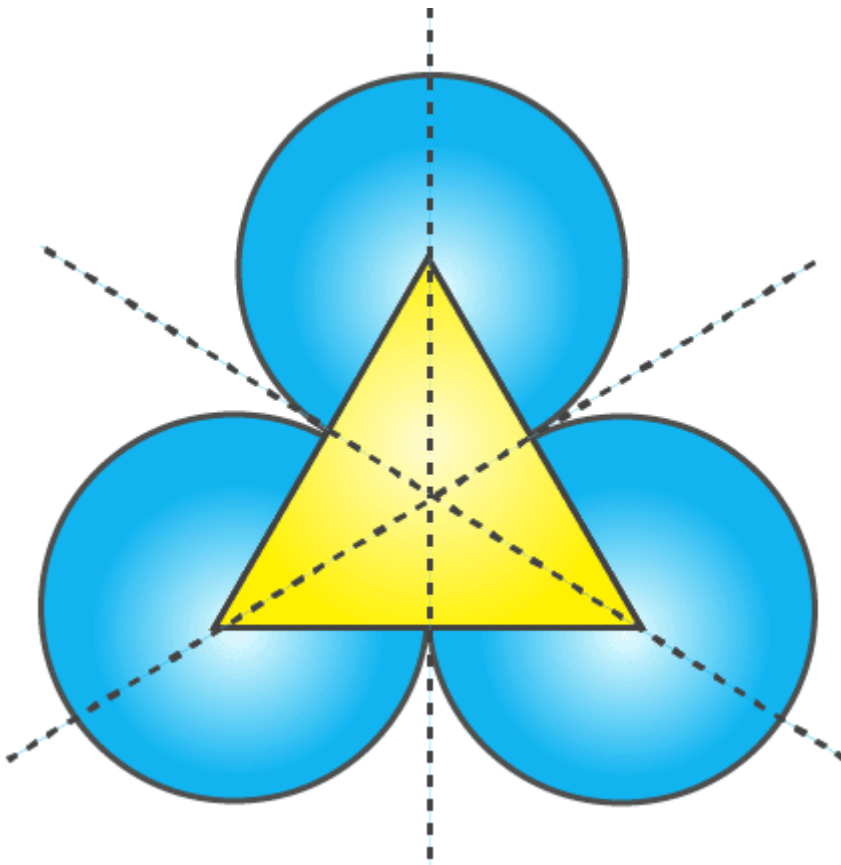
(a)



**Solution:-**

Figure given has 3 lines of symmetry.

So, it has multiple lines of symmetry.



(b)

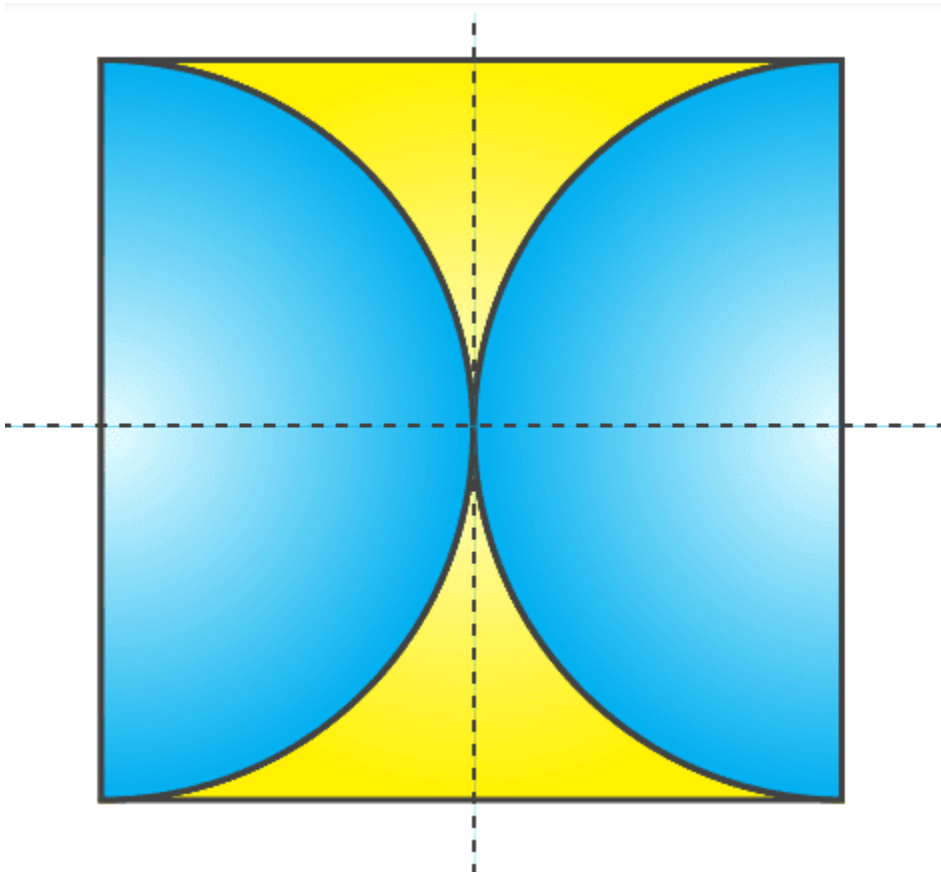




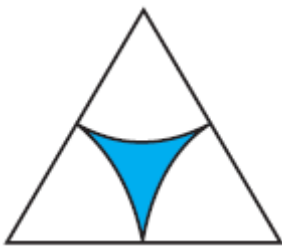
**Solution:-**

Figure given has 2 lines of symmetry.

So, it has multiple lines of symmetry.



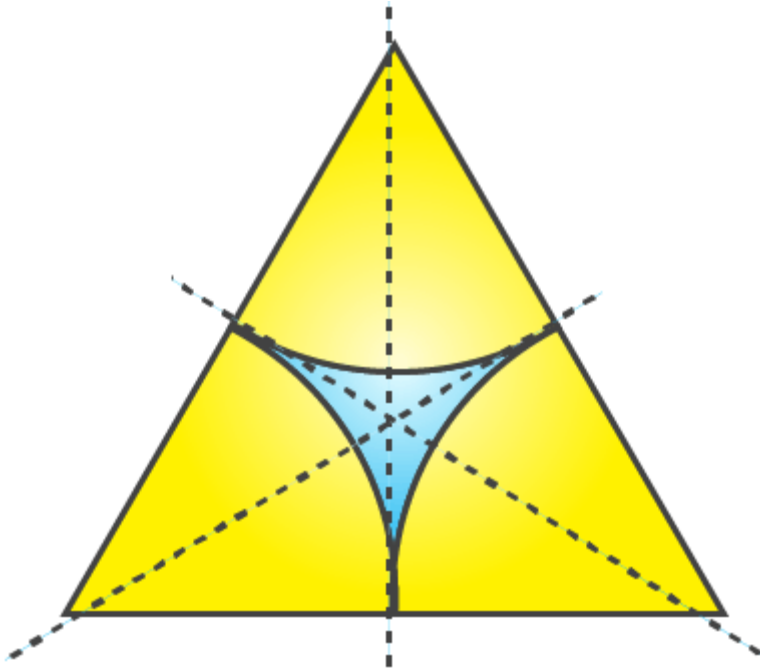
(c)



**Solution:-**

Figure given has 3 lines of symmetry.

So, it has multiple lines of symmetry.



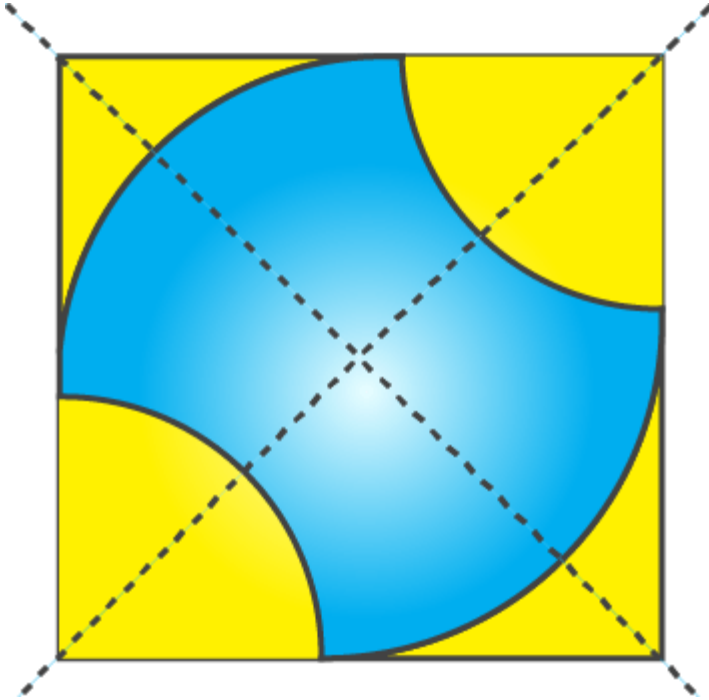
(d)



**Solution:-**

Figure given has 2 lines of symmetry.

So, it has multiple lines of symmetry.



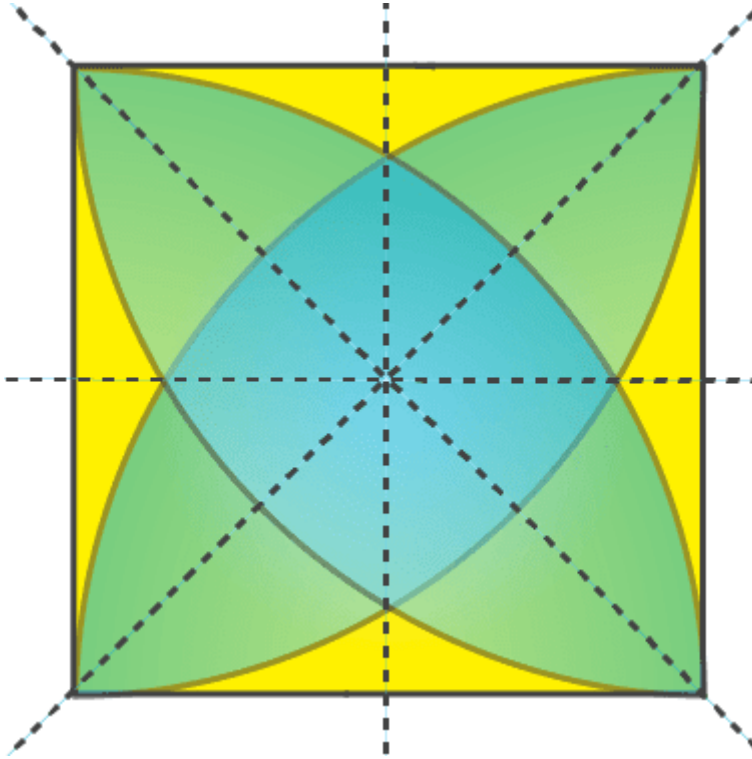
(e)



**Solution:-**

Figure given has 4 lines of symmetry.

So, it has multiple lines of symmetry.

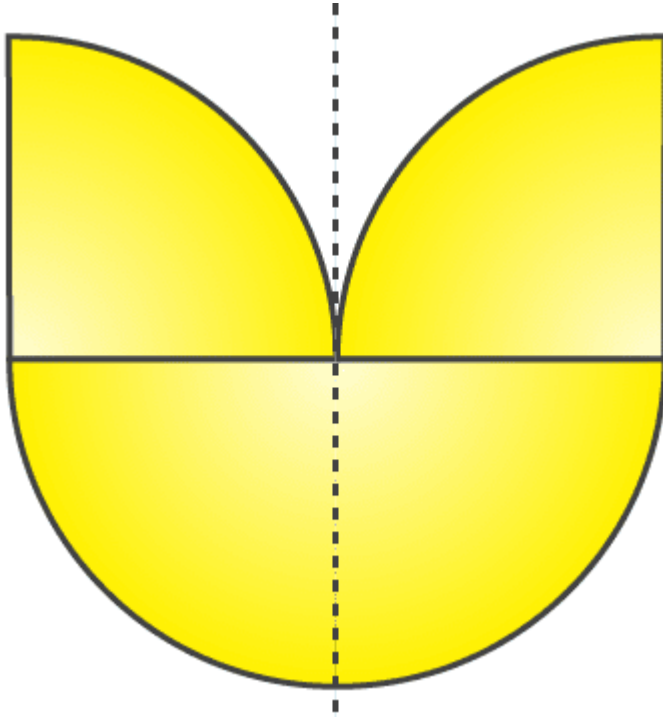


(f)

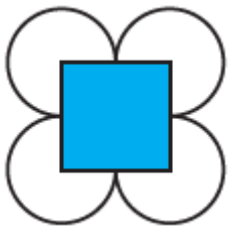


**Solution:-**

Figure given has only 1 line of symmetry.



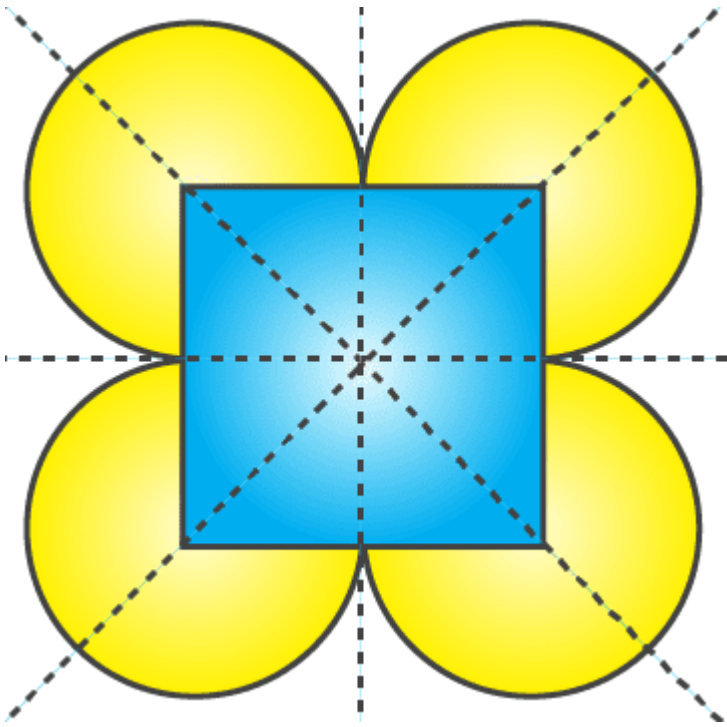
(g)



**Solution:-**

Figure given has 4 lines of symmetry.

So, it has multiple lines of symmetry.



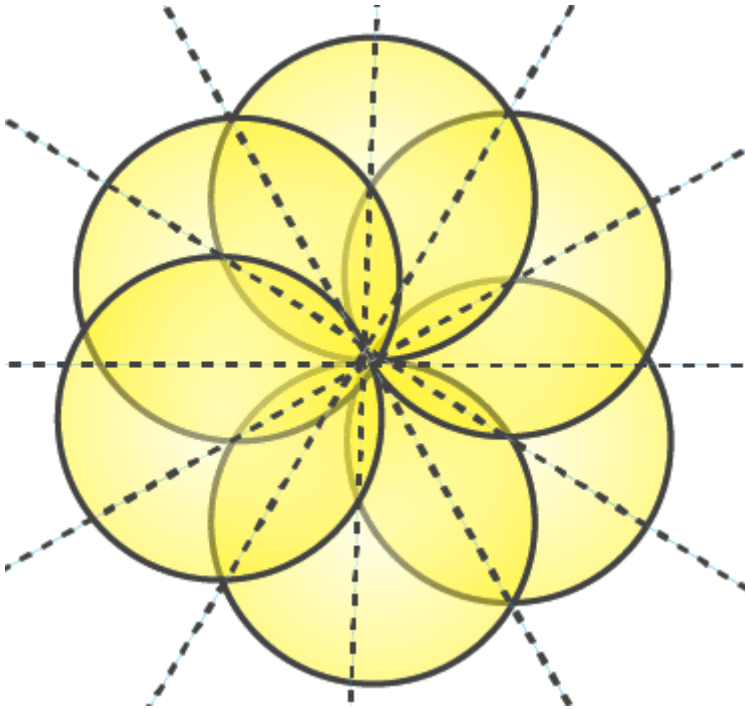
(h)



**Solution:-**

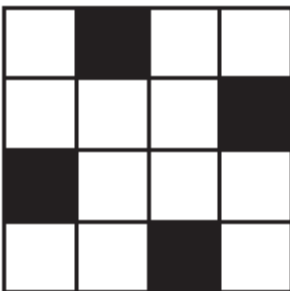
Figure given has 6 lines of symmetry.

So, it has multiple lines of symmetry.

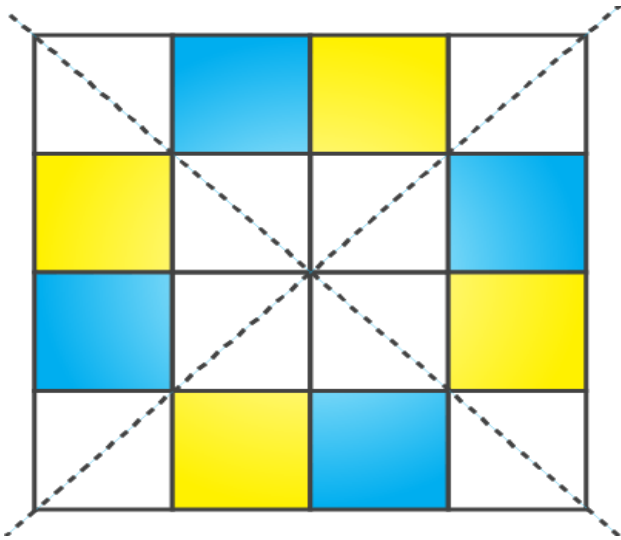


5. Copy the figure given here.

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?

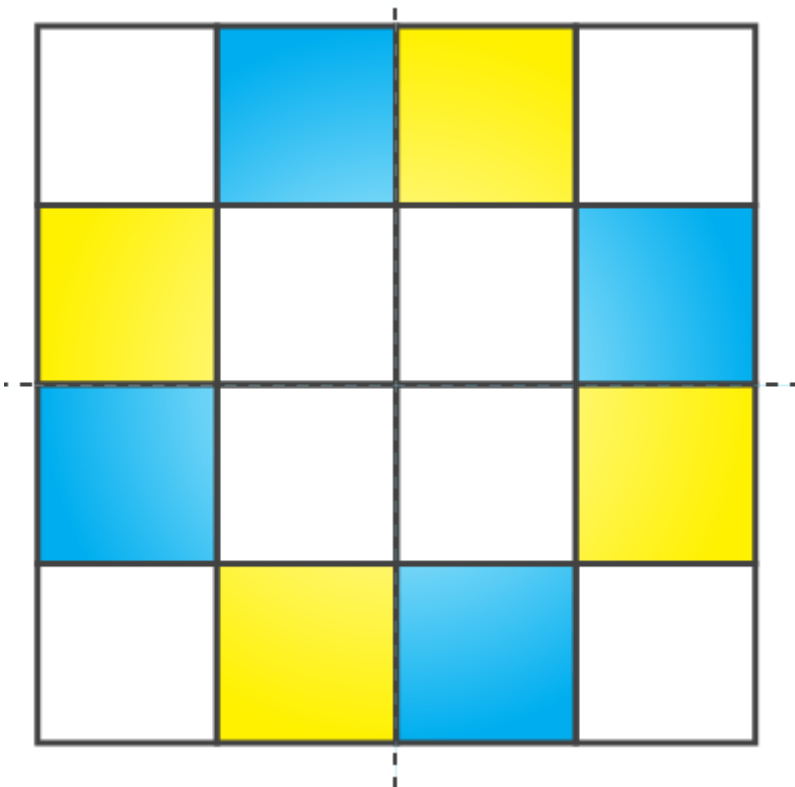


Solution:-



By observing the above figure,

Yes, the figure will be symmetrical about both diagonals.



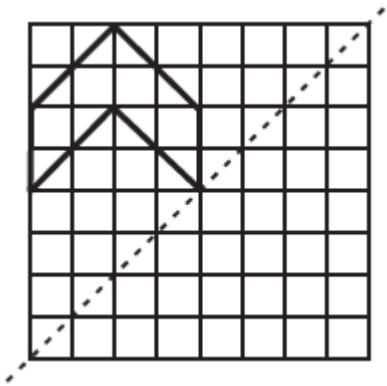
By observing the above figure,



Yes, the figure can be made symmetrical by more than one way.

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

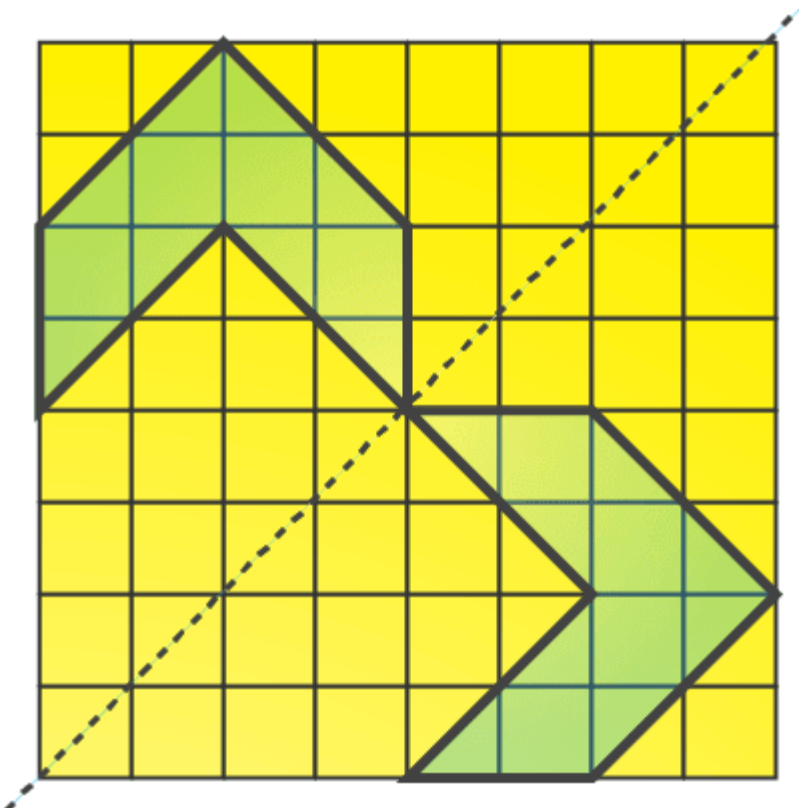
(a)



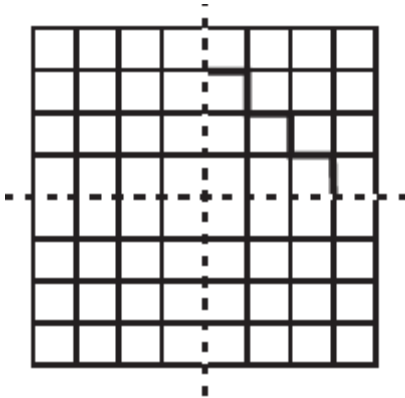
**Solution:-**

The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



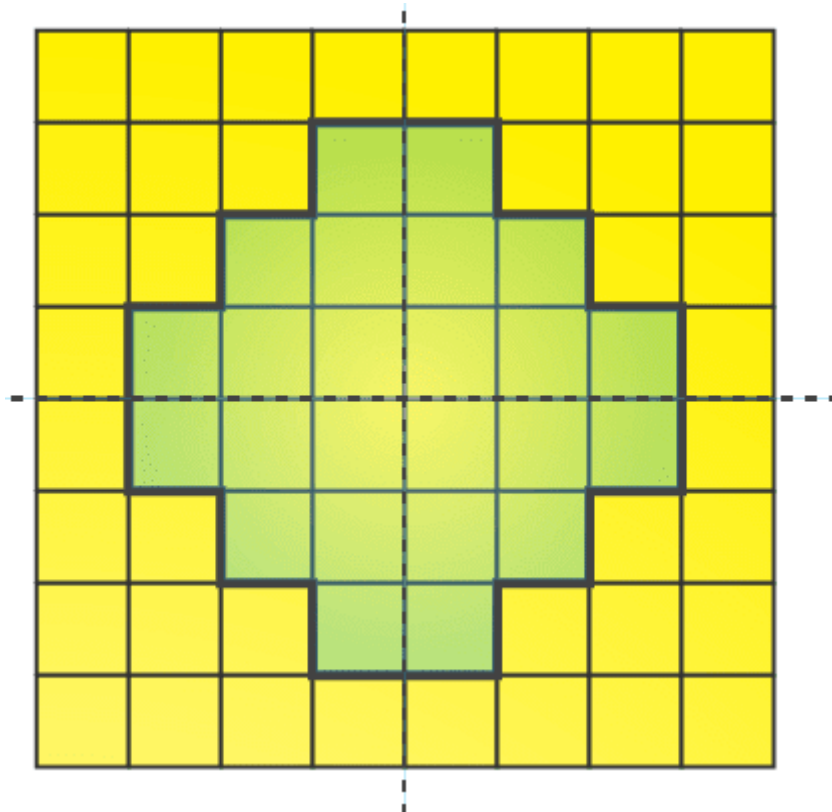
(b)



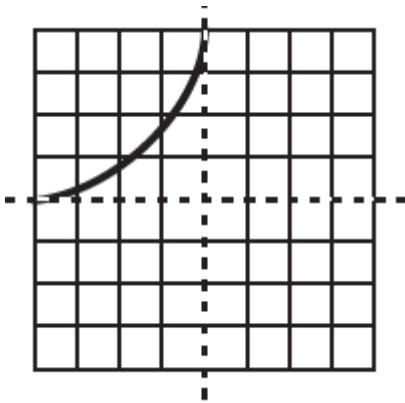
**Solution:-**

The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



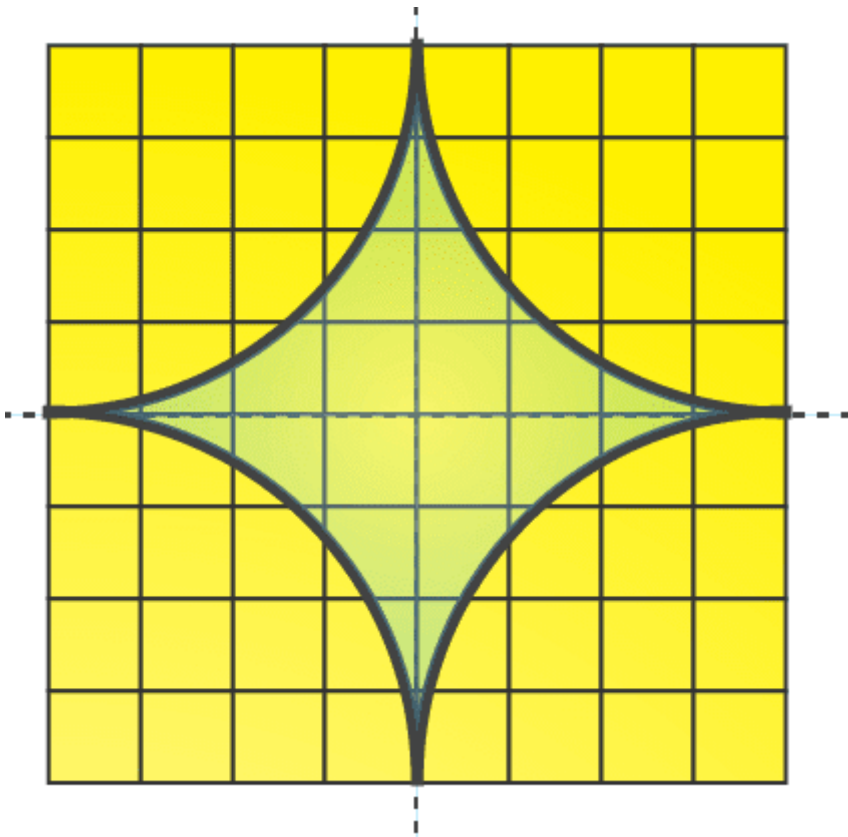
(c)



**Solution:-**

The concept of line of symmetry is closely related to mirror reflection. A shape has line symmetry when one half of it is the mirror image of the other half. A mirror line, thus helps to visualise a line of symmetry.

While dealing with mirror reflection, care is needed to note down the left-right changes in the orientation.



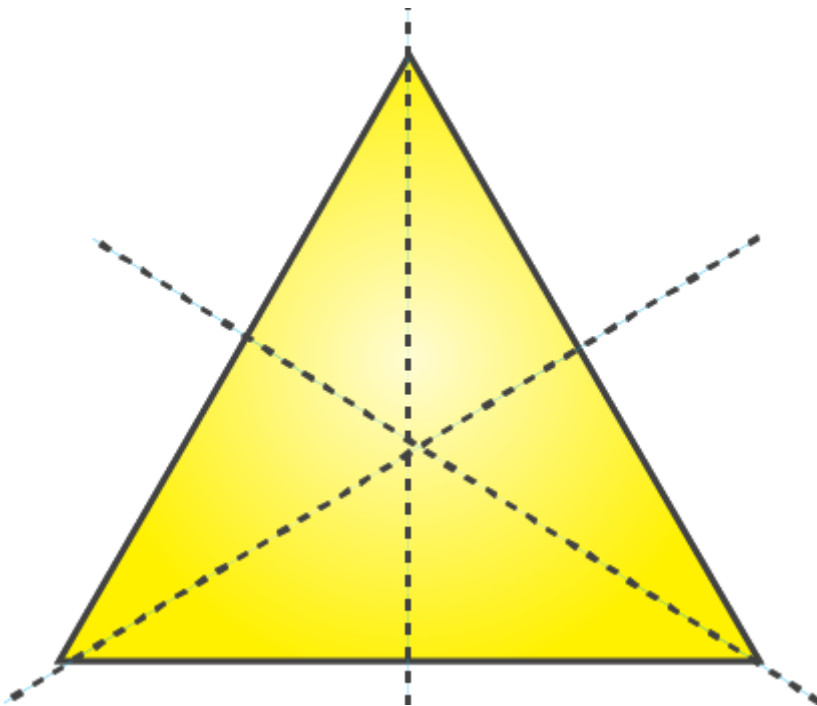
7. State the number of lines of symmetry for the following figures:

(a) An equilateral triangle

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

An equilateral triangle has 3 lines of symmetry is shown in the figure below,

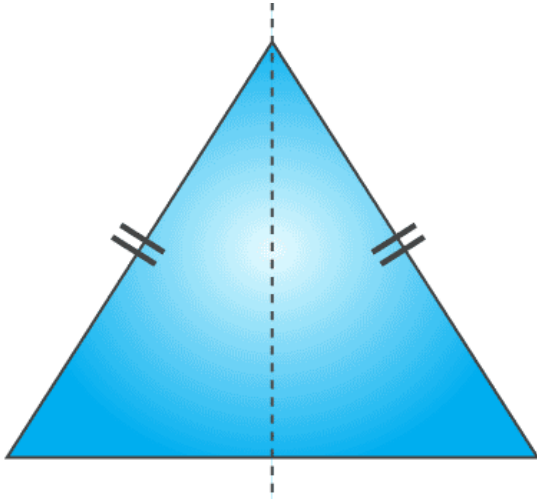


(b) An isosceles triangle

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

An isosceles triangle has 1 lines of symmetry is shown in the figure below,

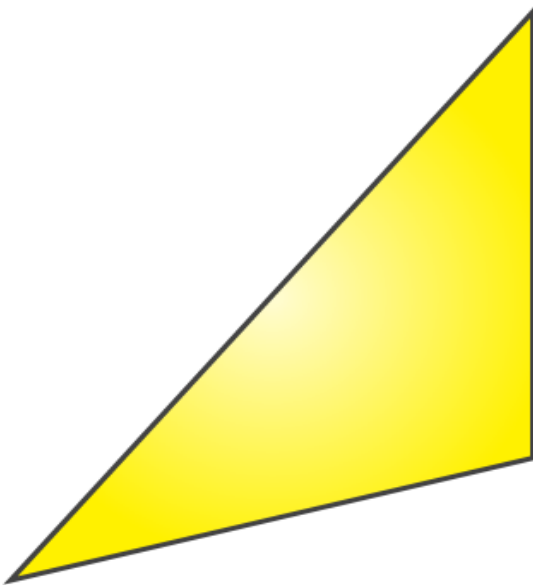


(c) A scalene triangle

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A scalene triangle has no line of symmetry is shown in the figure below,

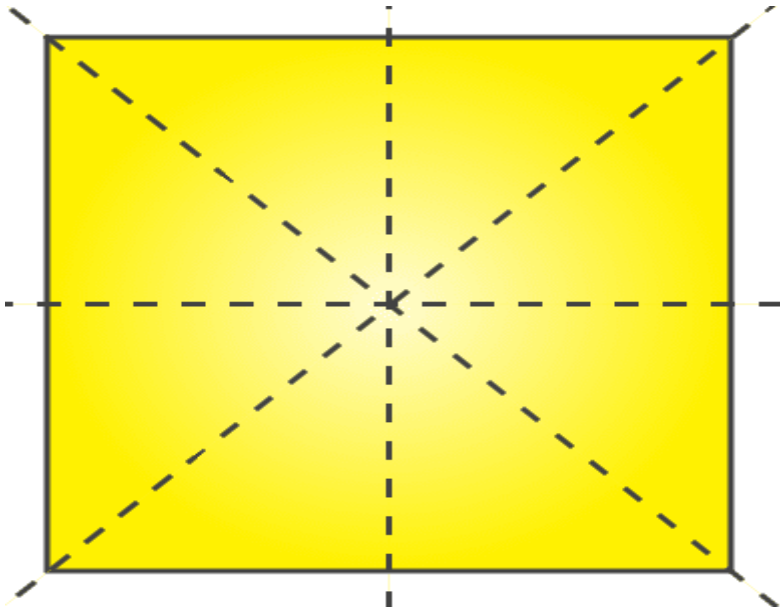


(d) A square

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A square has 4 lines of symmetry is shown in the figure below,

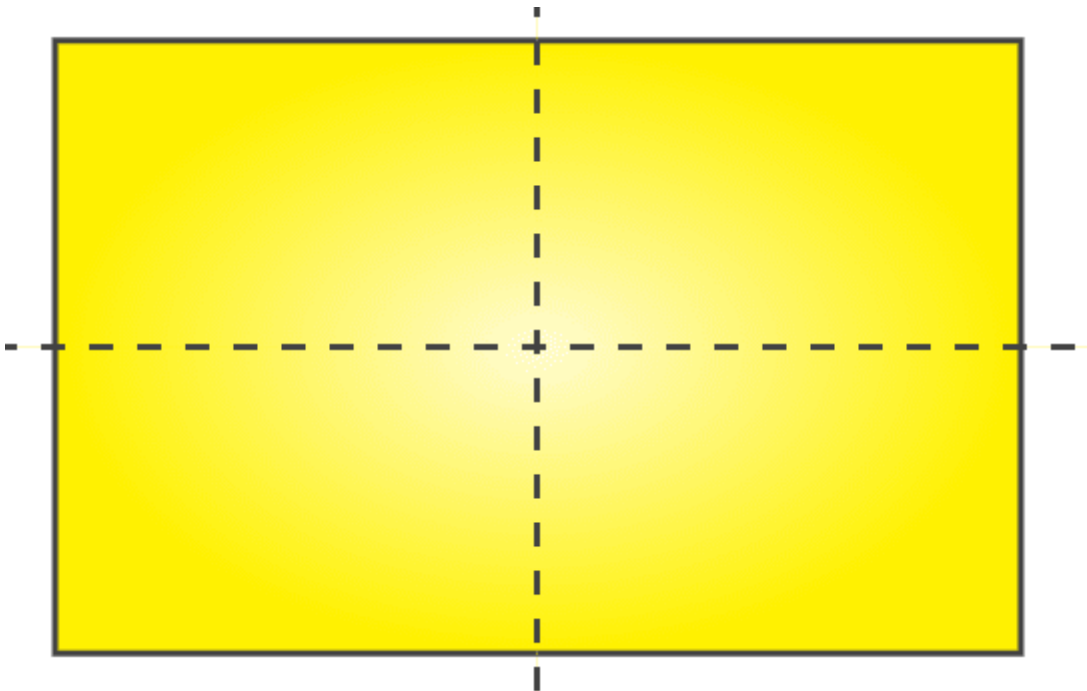


(e) A rectangle

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A rectangle has 2 lines of symmetry is shown in the figure below,

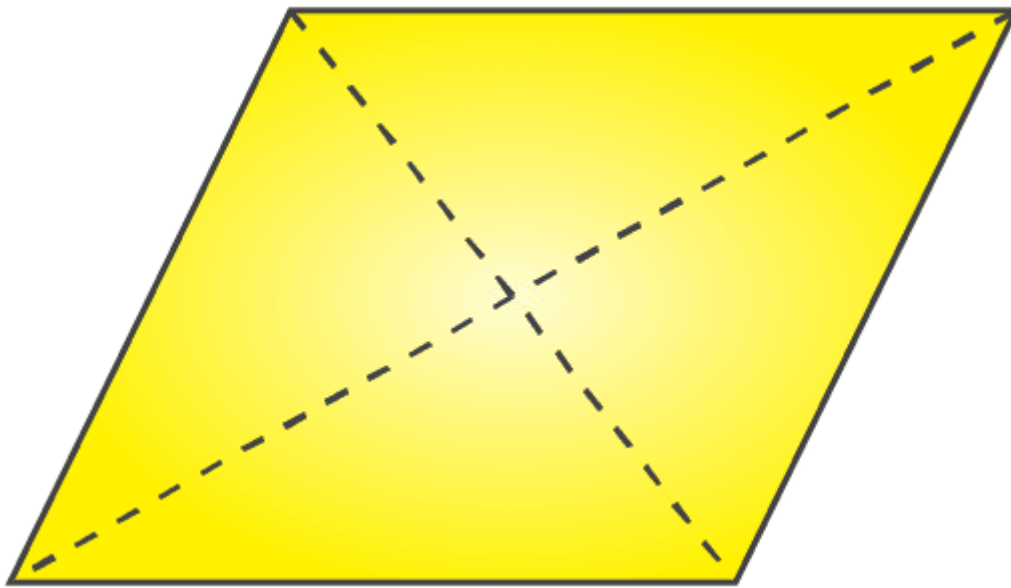


(f) A rhombus

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A rhombus has 2 lines of symmetry is shown in the figure below,

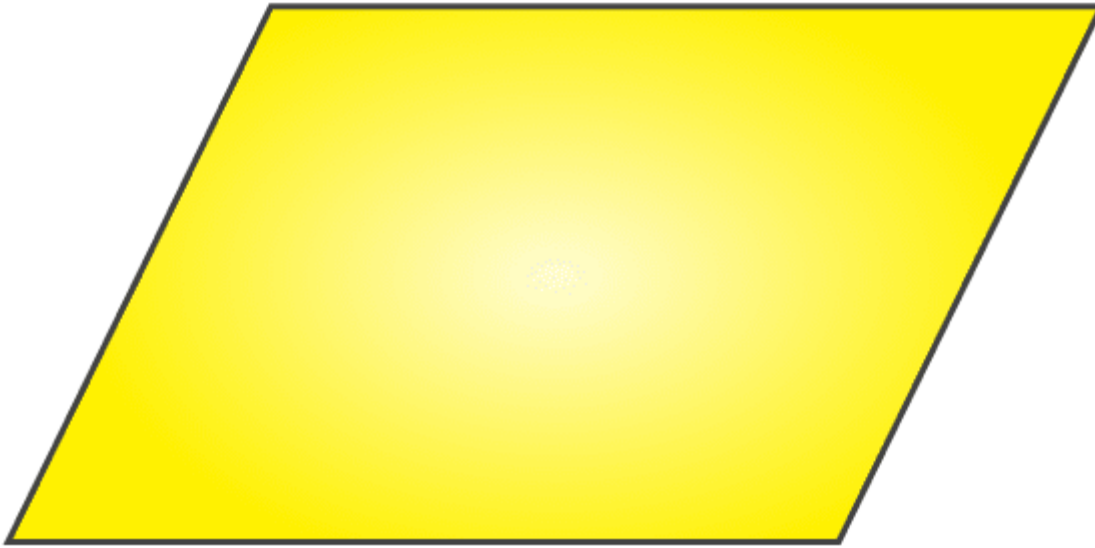


(g) A parallelogram

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A parallelogram has no line of symmetry is shown in the figure below,

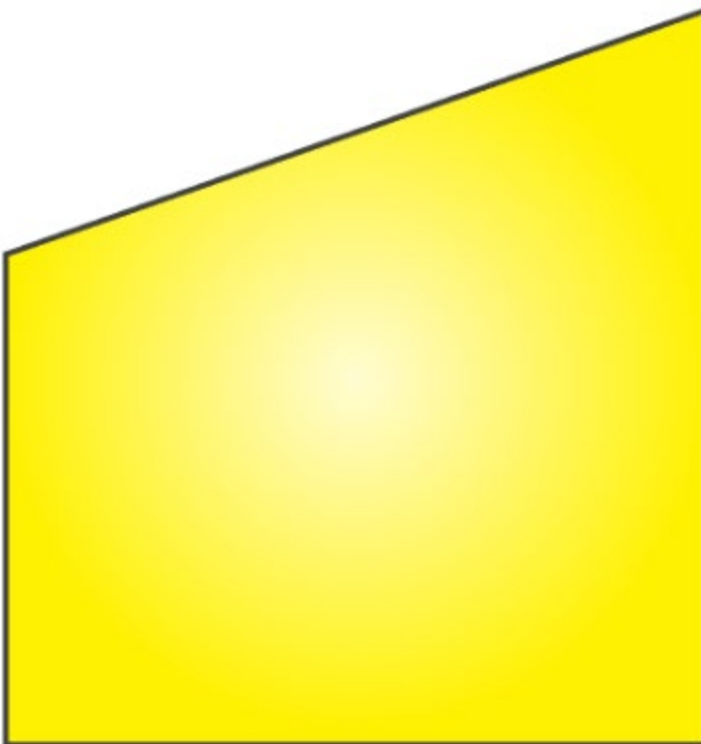


(h) A quadrilateral

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A quadrilateral has no line of symmetry is shown in the figure below,



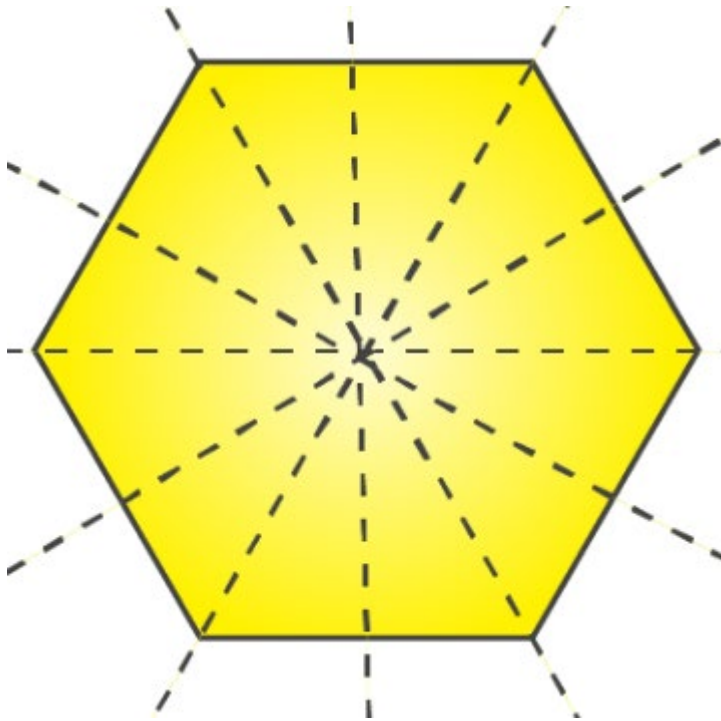


(i) A regular hexagon

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A regular hexagon has 6 lines of symmetry is shown in the figure below,

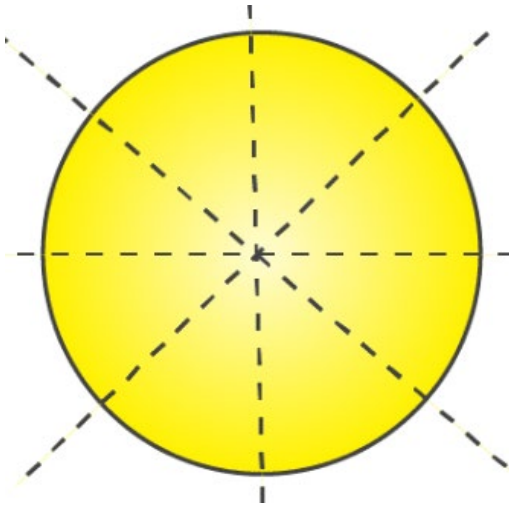


(j) A circle

**Solution:-**

A figure has a line of symmetry, if there is a line about which the figure may be folded so that the two parts of the figure will coincide.

A circle has infinite lines of symmetry,



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:-**

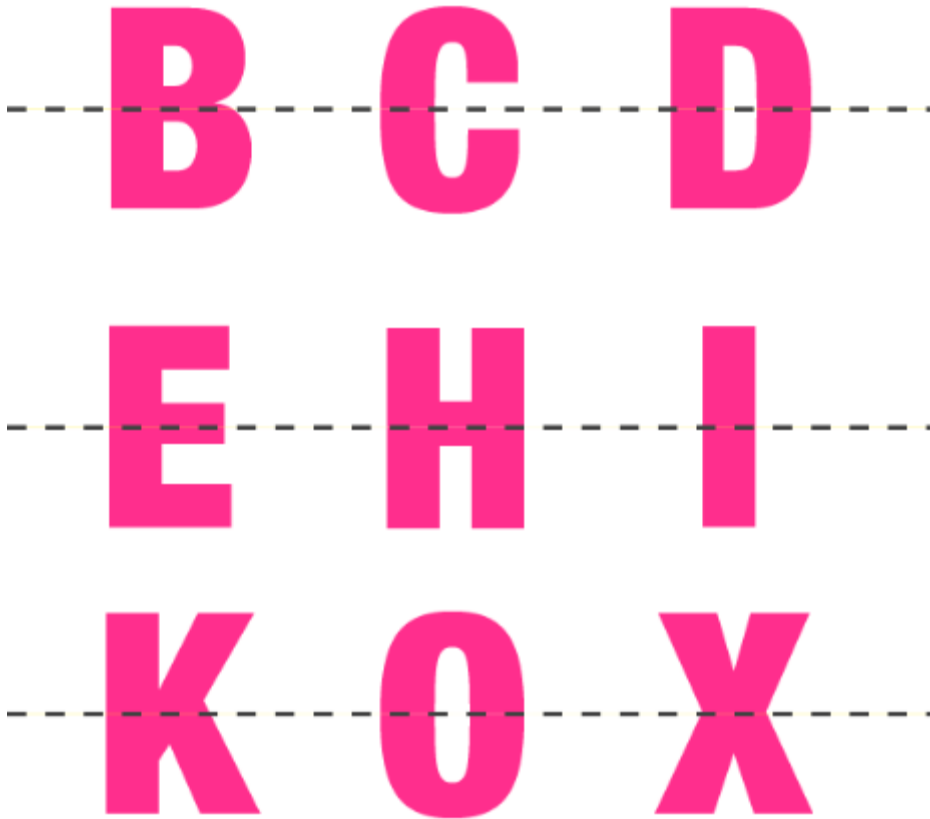
- (a) a vertical mirror

The English alphabet have reflection symmetry about a vertical mirror are, A, H, I, M, O, T, U, V, W, X, Y



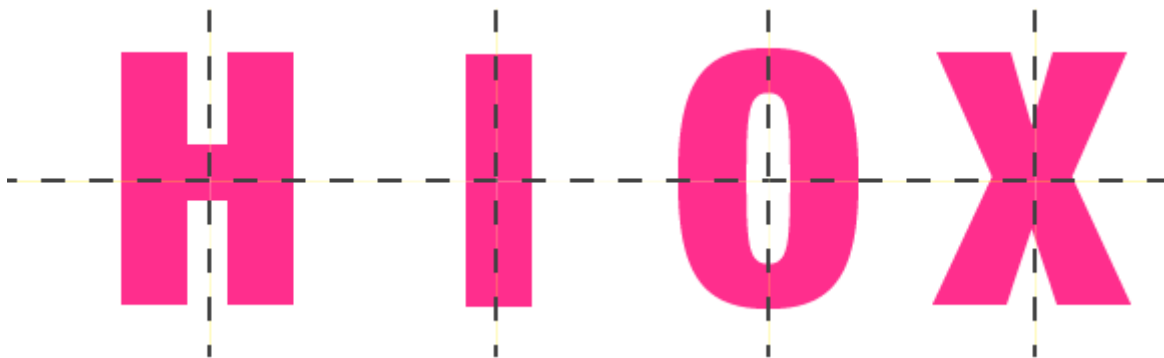
(b) a horizontal mirror

The English alphabet have reflection symmetry about a horizontal mirror are, B, C, D, E, H, I, K, O, X



(c) both horizontal and vertical mirrors

The English alphabet have reflection symmetry about both horizontal and vertical mirrors are, H, I, O, X

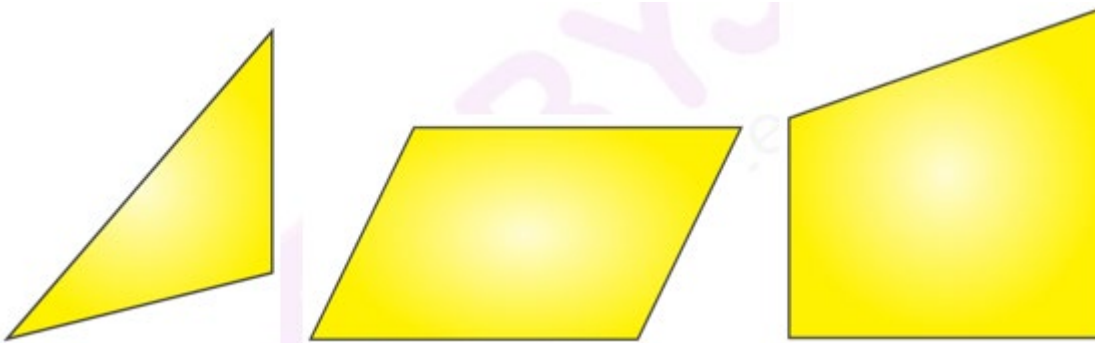


9. Give three examples of shapes with no line of symmetry.

**Solution:-**

A shape has a no line of symmetry, if there is no line about which the figure may be folded and also parts of the figure will not coincide.

A scalene triangle, a quadrilateral and a parallelogram



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

**(a) an isosceles triangle?**

**Solution:-**

The other name to the line of symmetry of an isosceles triangle is median or altitude.

**(b) a circle?**

The other name to the line of symmetry of a circle is diameter.

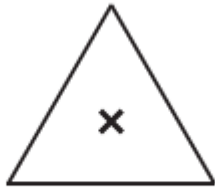
**EXERCISE 14.2**

**PAGE: 274**

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



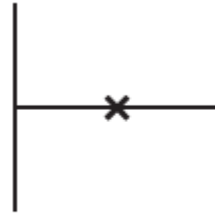
(a)



(b)



(c)



(d)



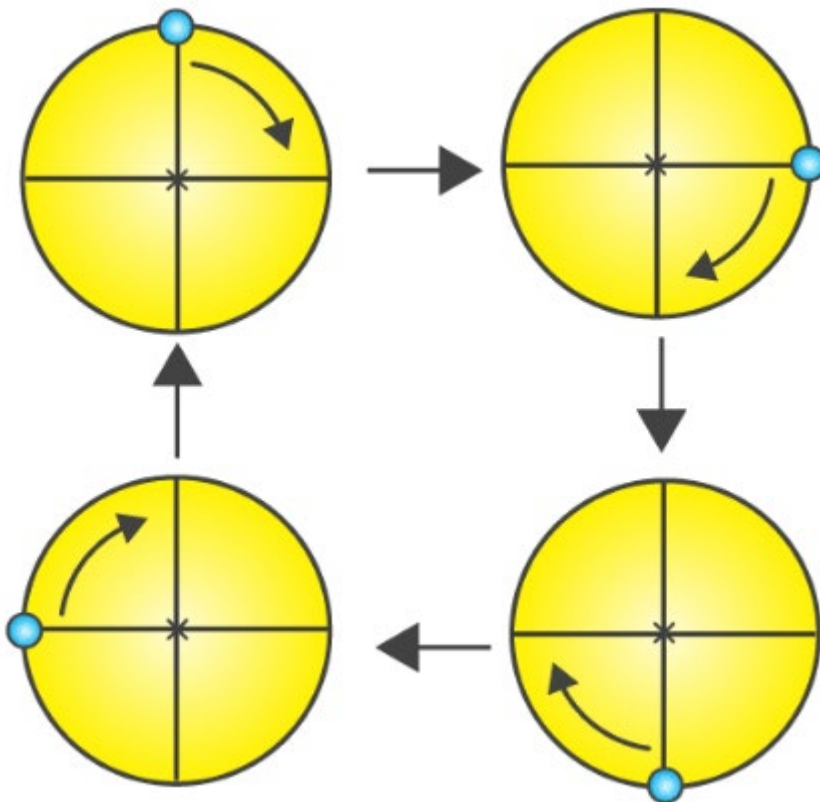
(e)



(f)

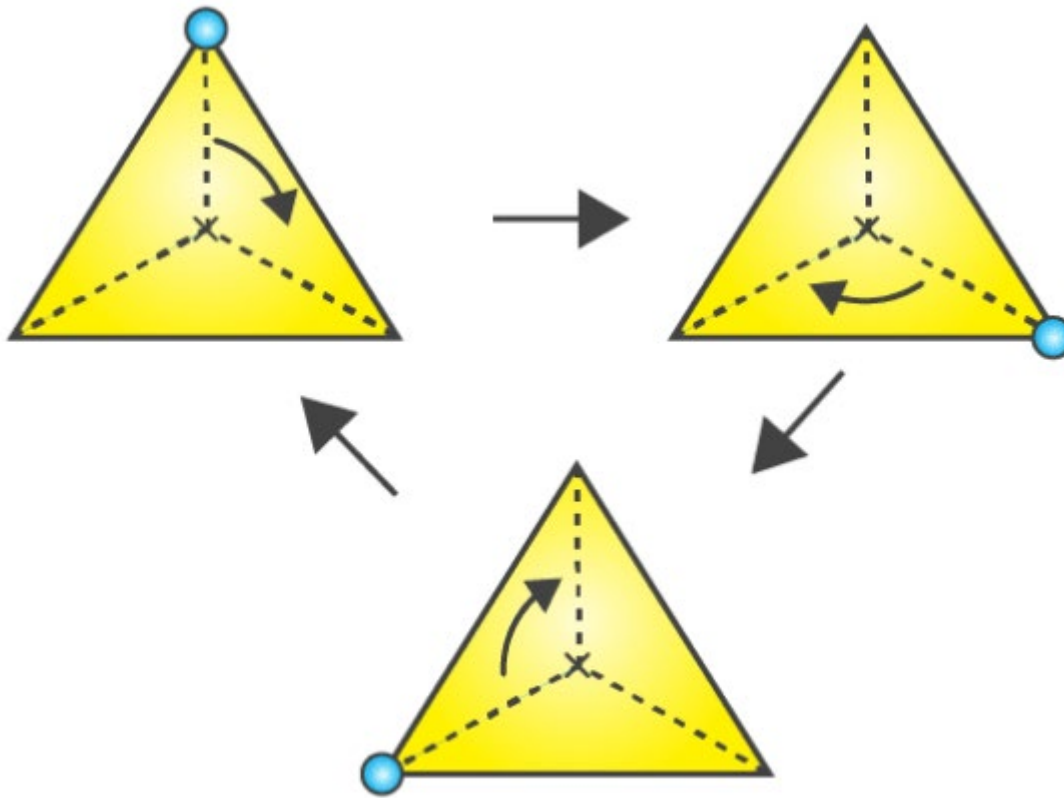
Solution:-

(a)



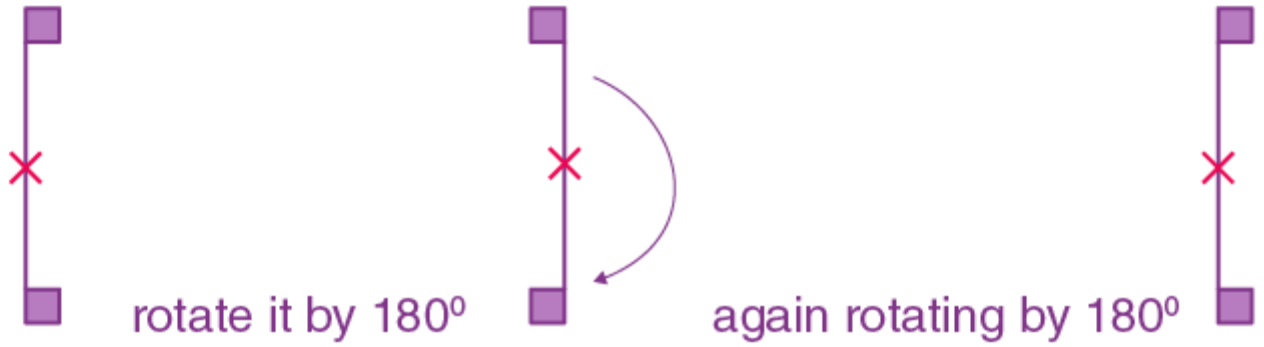
So, the above figure has its rotational symmetry as 4.

(b)

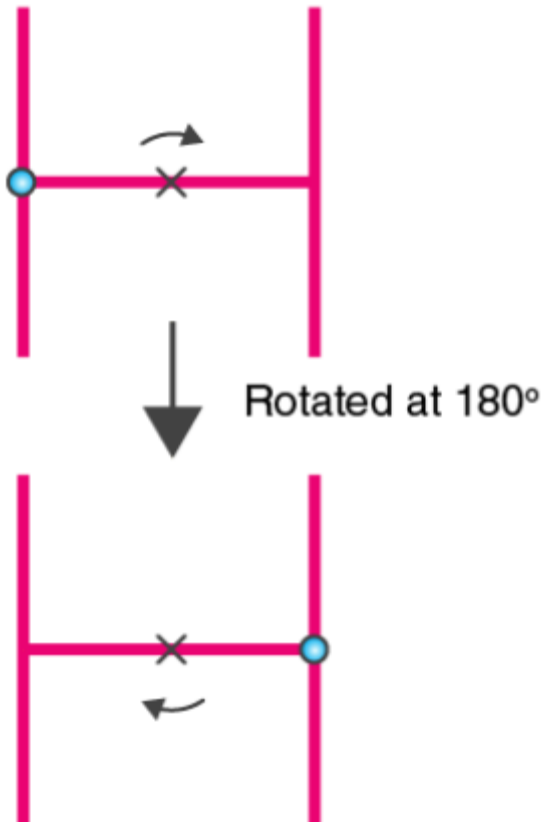


So, the above figure has its rotational symmetry as 3.

(c) So, the given figure has only one rotational symmetry.

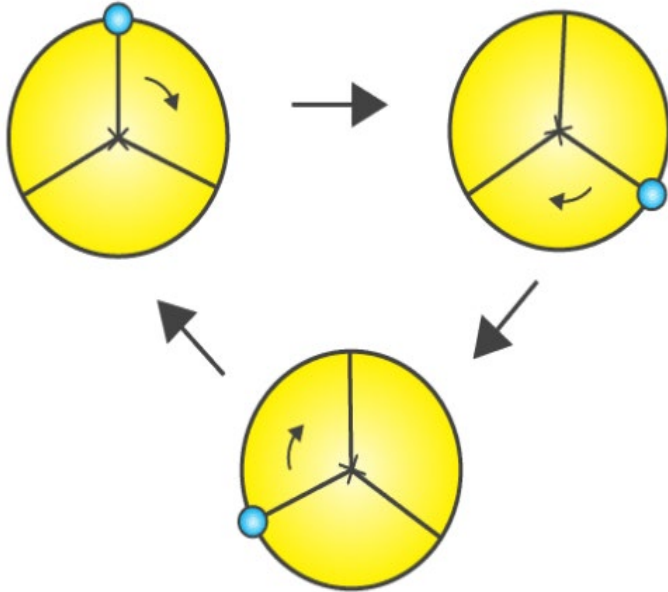


(d)



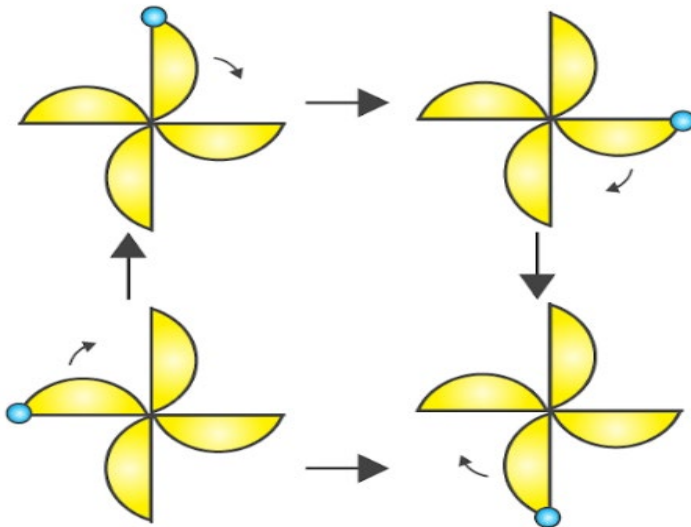
So, the above figure has its rotational symmetry as 2.

(e)



So, the above figure has its rotational symmetry as 3.

(f)



So, the above figure has its rotational symmetry as 4.



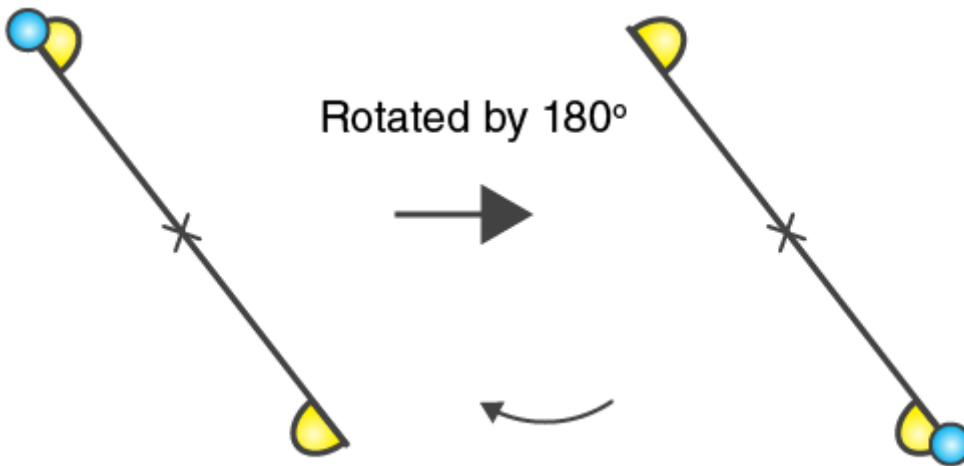
By observing all the figures (a), (b), (c), (d), (e) and (f) have rotational symmetry of order more than 1.

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

(a)



Solution:-

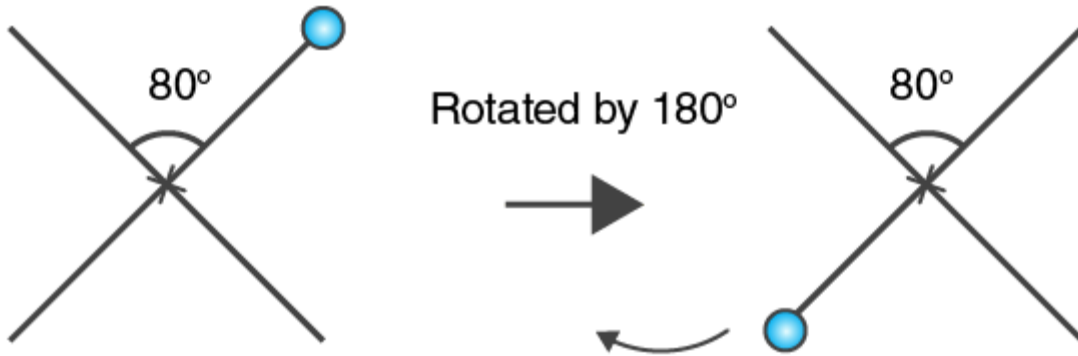


The above figure has its rotational symmetry as 2.

(b)

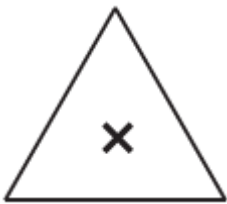


Solution:-

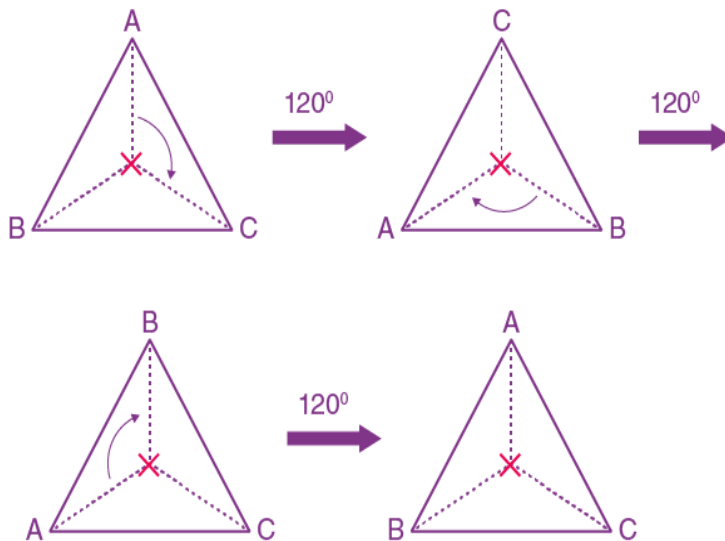


The above figure has its rotational symmetry as 2.

(c)



Solution:-

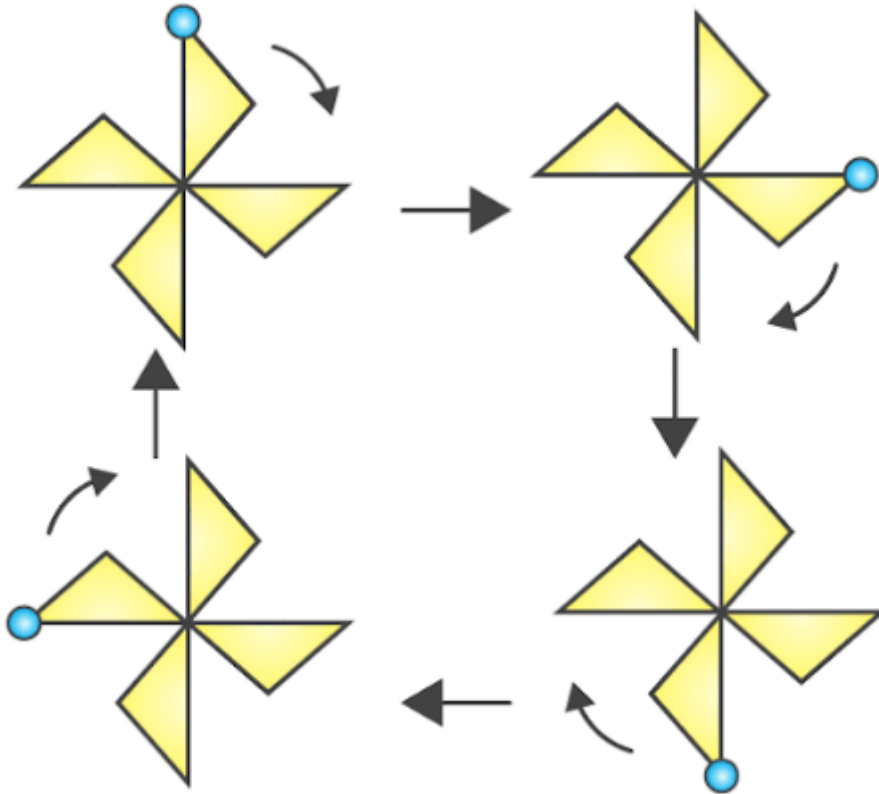


The above figure has its rotational symmetry as 3.

(d)

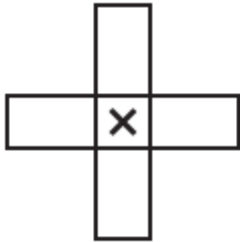


Solution:-

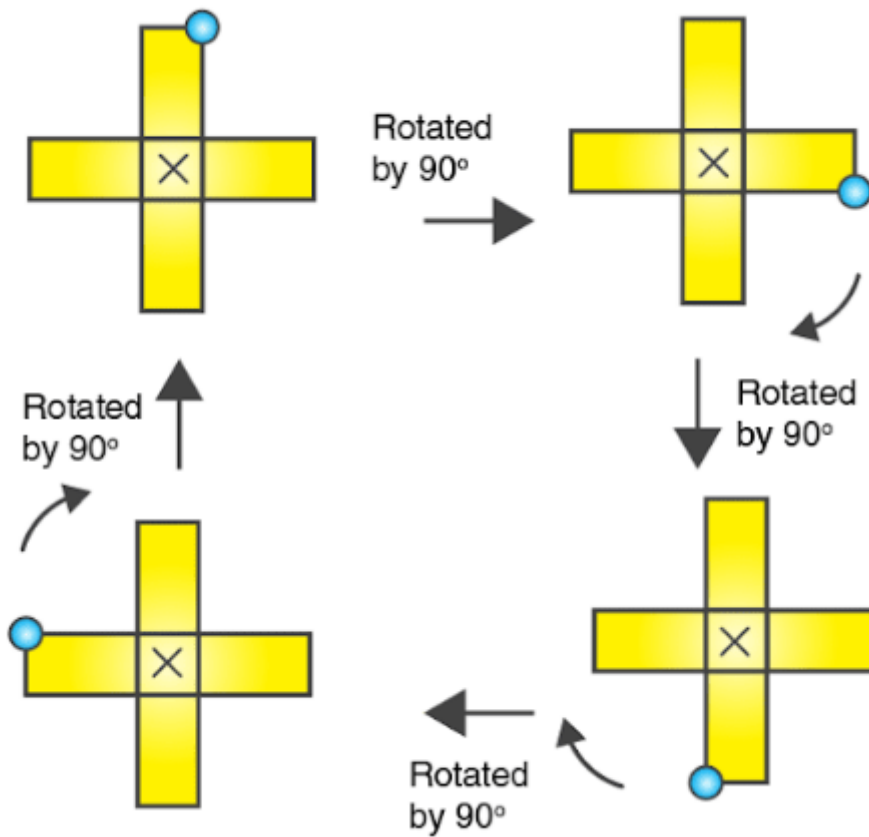


The above figure has its rotational symmetry as 4.

(e)



Solution:-

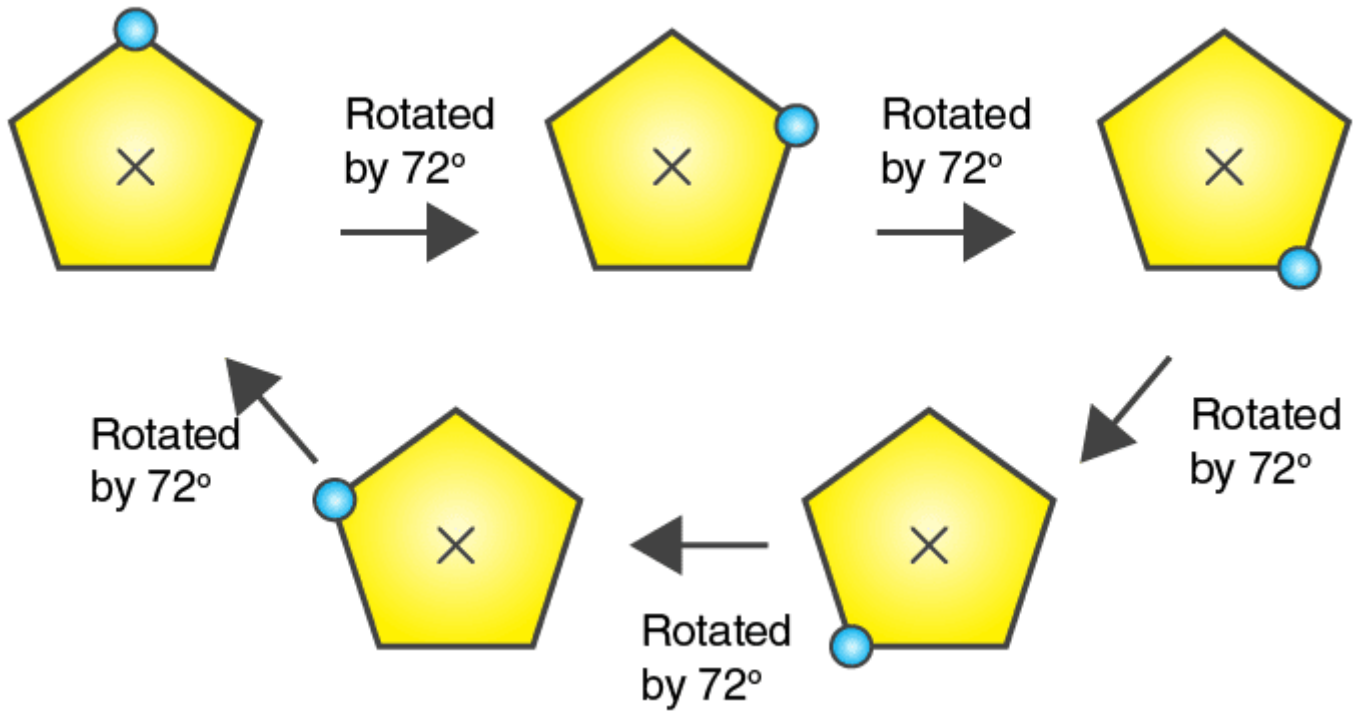


The above figure has its rotational symmetry as 4.

(f)



Solution:-

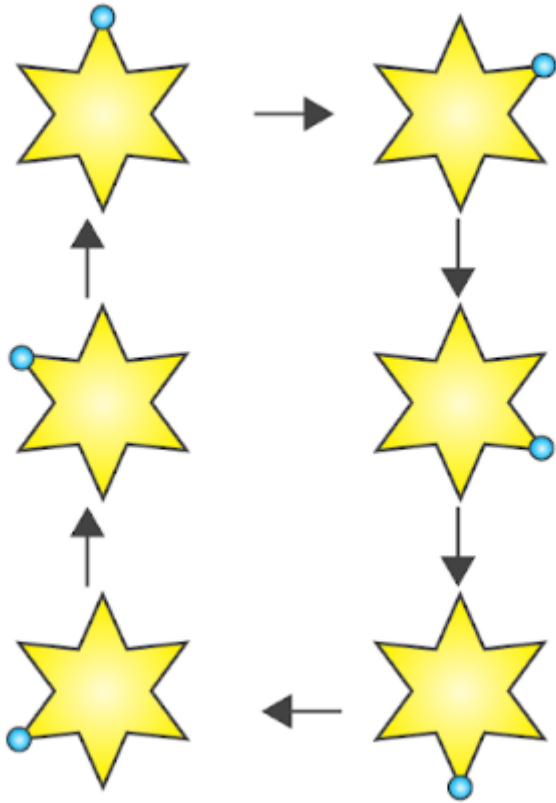


The above figure has its rotational symmetry as 5.

(g)



Solution:-

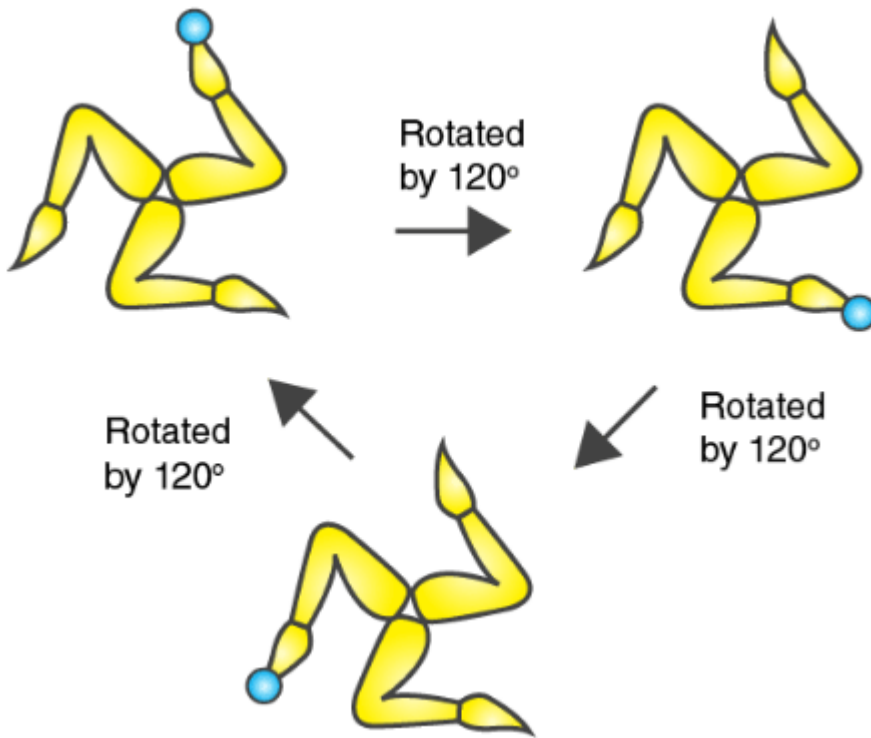


The above figure has its rotational symmetry as 6.

(h)



Solution:-



The above figure has its rotational symmetry as 3.

## EXERCISE 14.3

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

**Solution:-**

Equilateral triangle and circle.

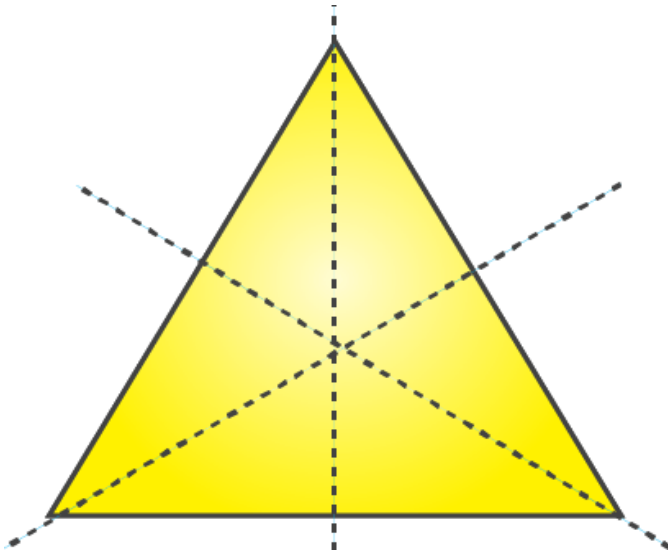
2. Draw, wherever possible, a rough sketch of

(i) a triangle with both line and rotational symmetries of order more than 1.

**Solution:-**

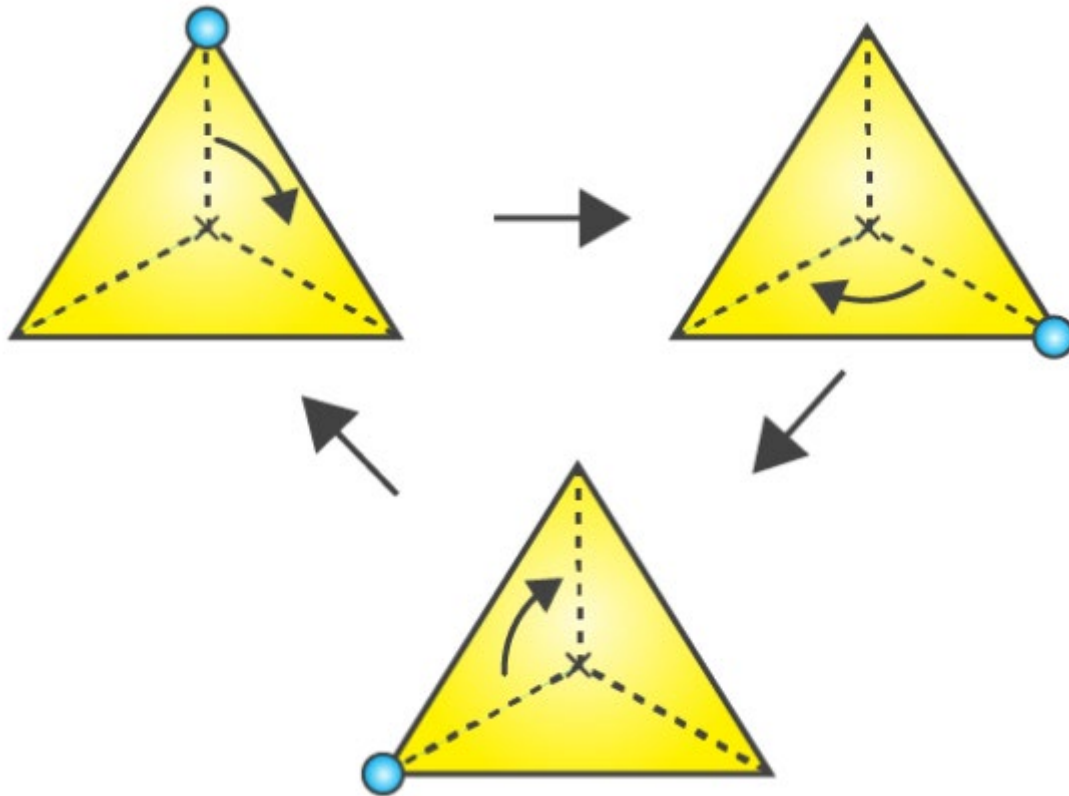
A triangle with both line and rotational symmetries of order more than 1 is an equilateral triangle.

**Line symmetry**





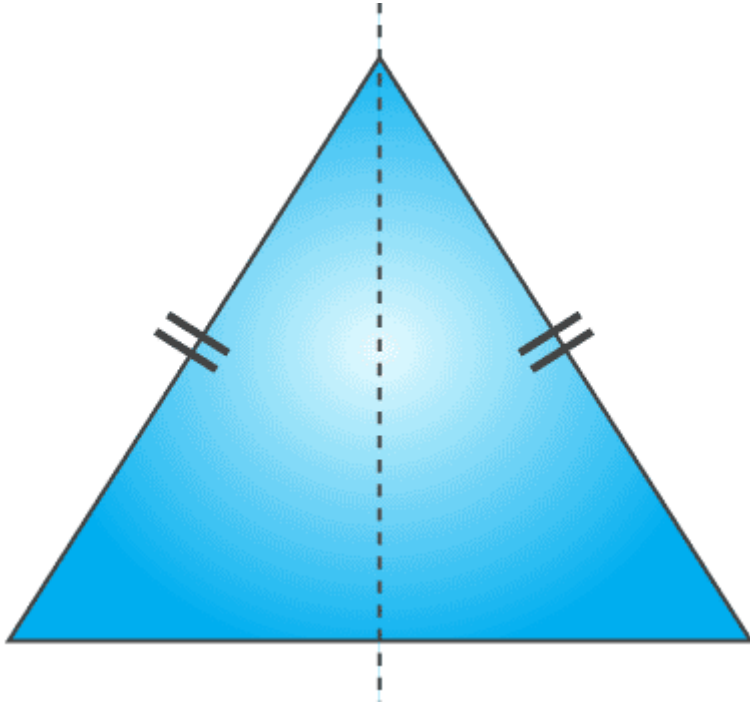
**Rotational symmetry**



(ii) a triangle with only line symmetry and no rotational symmetry of order more than 1.

**Solution:-**

A triangle with only line symmetry and no rotational symmetry of order more than 1 is isosceles triangle.



(iii) a quadrilateral with a rotational symmetry of order more than 1 but not a line symmetry.

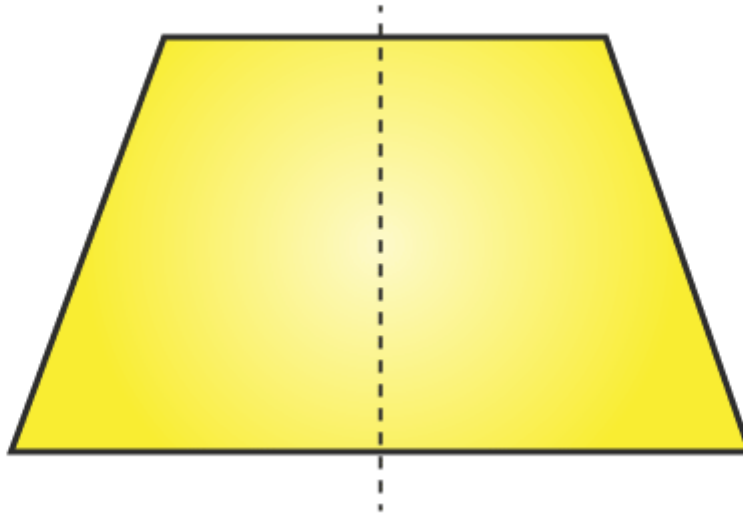
**Solution:-**

A quadrilateral with a rotational symmetry of order more than 1 but not a line symmetry is not possible to draw. This is because a quadrilateral with a line symmetry may have rotational symmetry of order one but not more than one.

(iv) a quadrilateral with line symmetry but not a rotational symmetry of order more than 1.

**Solution:-**

A quadrilateral with line symmetry but not a rotational symmetry of order more than 1 is a rhombus.



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 have 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:-

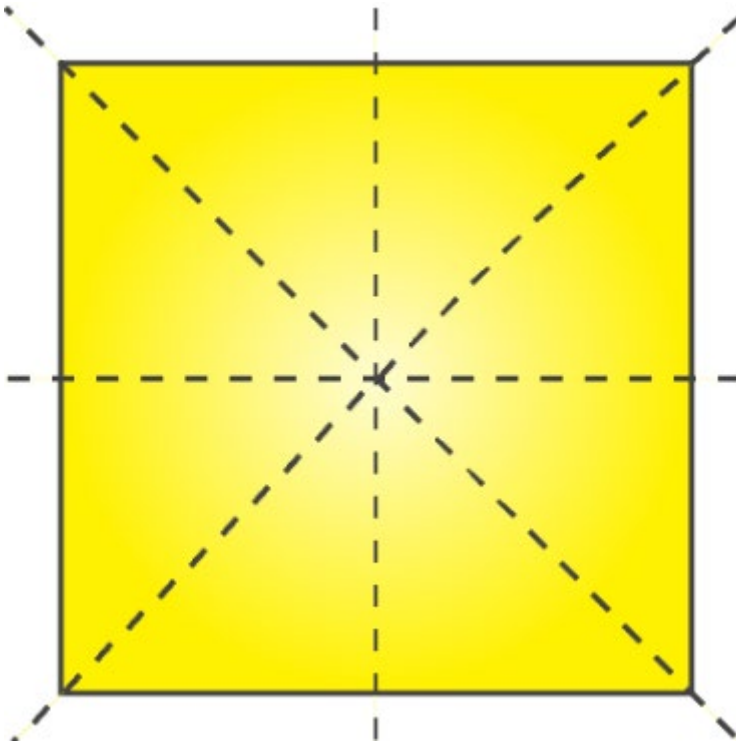
Shape	Centre of Rotation	Order of Rotation	Angle of Rotation
Square	Intersecting point of diagonals	4	90°
Rectangle	Intersecting point of diagonals	2	180°
Rhombus	Intersecting point of diagonals	2	180°
Equilateral Triangle	Intersecting point of medians	3	120°
Regular Hexagon	Intersecting point of diagonals	6	60°
Circle	Centre	Infinite	Every angle
Semi-circle	Mid-point of diameter	1	360°

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

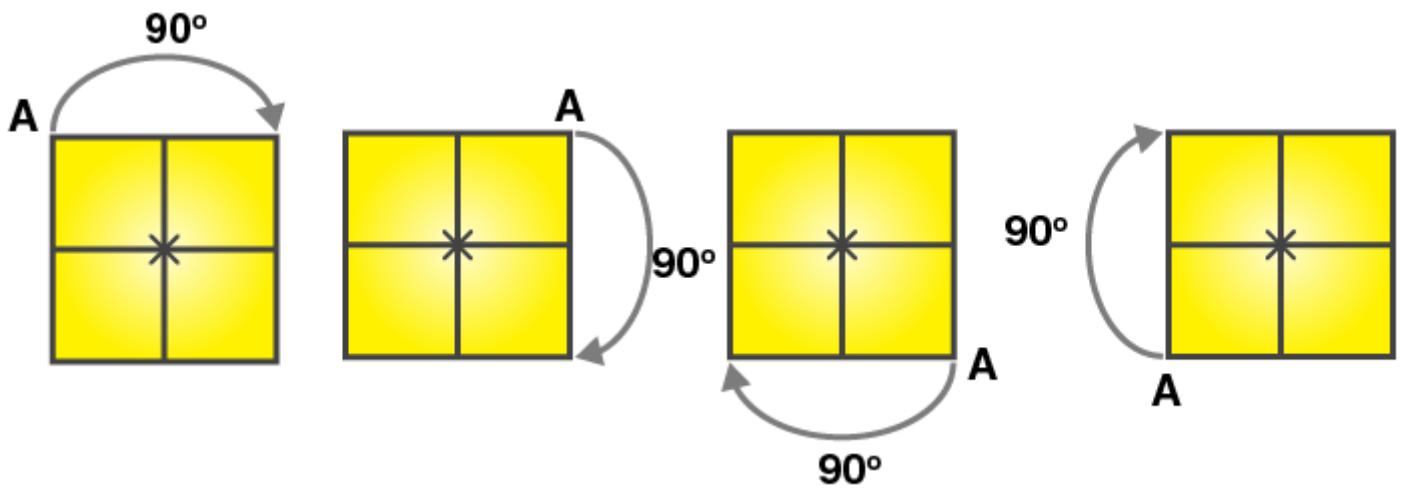
Solution:-

The quadrilateral which have both line and rotational symmetry of order more than 1 is a square.

Line symmetry:



Rotational symmetry:



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:-

The other angles are,  $120^\circ$ ,  $180^\circ$ ,  $240^\circ$ ,  $300^\circ$ ,  $360^\circ$

So, the figure is said to have rotational symmetry about same angle as the first one. Hence, the figure will look exactly the same when rotated by  $60^\circ$  from the last position.

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

**(i)  $45^\circ$ ?**

**Solution:-**

Yes. We can have a rotational symmetry of order more than 1 whose angle of rotation is  $45^\circ$ .

**(ii)  $17^\circ$ ?**

**Solution:-**

No. We cannot have a rotational symmetry of order more than 1 whose angle of rotation is  $17^\circ$ .

