NCERT Exercises (Questions-Solutions)

Exercise 13.1

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**1.** **List any four symmetrical objects from your home or school.**

Sol. There are many symmetrical objects which found in our school or home. Some of these are blackboard, table top, wall clock, bucket photo frame, etc.

2. **For the given figure, which one is the mirror line, l_1 or l_2 ?**

Sol. We know that, if we fold a picture in half, such that the left and right halves match exactly, then the picture is said to have line of symmetry or mirror line. Here, if we fold the picture about l_2, then the left and right halves match exactly. So, l_2 is the mirror line.
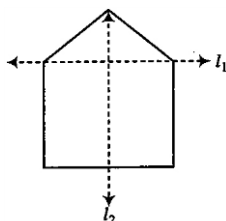

3. **Identify the shapes given below. Check whether, they are symmetric or not. Draw the line of symmetry as well.**
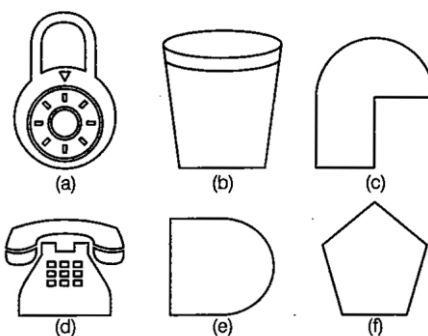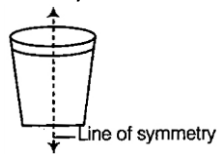

TIPS
We know that, if we place a mirror on the fold, then the image of one side of picture will fall exactly on the other side of the picture, then thefold, which is the mirror line, is a line of symmetry for the picture.

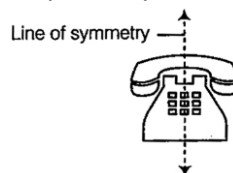**Sol.** (a) It is synimetrical figure and its line of Symmetry is shown below:
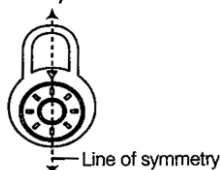
(b) It is a symmetrical figure and its line of symmetry is shown below:

(c) This is not a symmetrical figure because if we fold, then we cannot get the image of one side exactly fall on the other side.
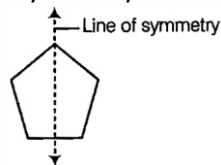

(d) The given figure is symmetric and its line of symmetry is shown below:

(e) The given figure is symmetric and its line of symmetry is shown below:

(f) The given figure is symmetric and its line of symmetry is shown below:

4. **Copy the following on a squared paper. A square paper is what you would have used in your arithmetic notebook in earlier classes. Then, complete them such that the dotted line is the line of symmetry.**
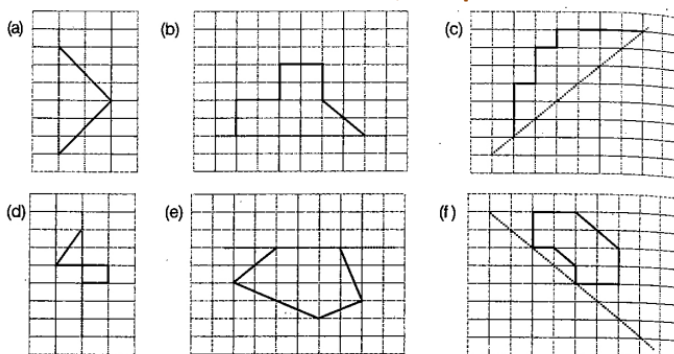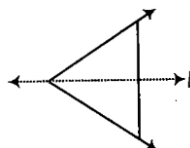

Sol. On completing the given figure considering the dotted lines as the line of symmetry, we get the following figures which are shown as below:
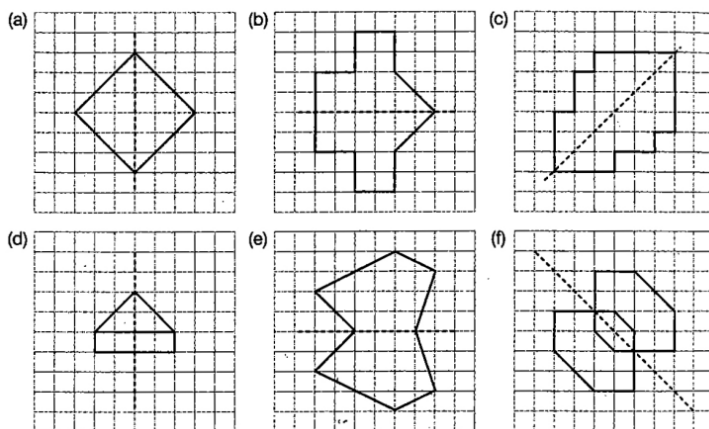
5. In the figure, l is the line of symmetry. Complete the diagram to make it symmetric.
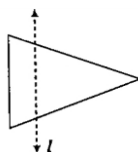

Sol. On completing the diagram, we get the following figure which is symmetrical about the line l, where l is the line of symmetry.
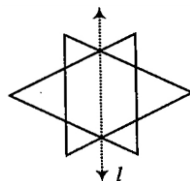

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6. In the figure, l is the line of symmetry. Draw the image of the triangle and complete the diagram, so that it becomes symmetric.
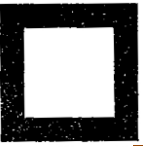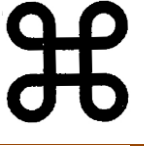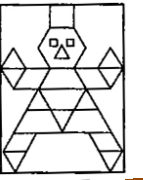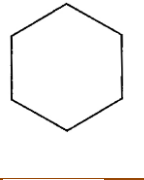
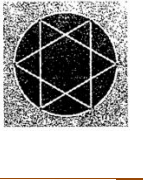

Sol. On drawing the image of the triangle and completing the diagram, we get the following figure which is symmetrical about the line of symmetry l.
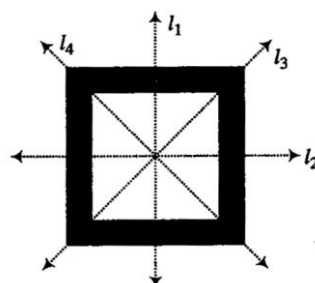
Exercise 13.2

1. **Find the number of lines of symmetry for each of the following shapes.**

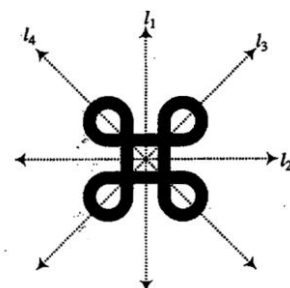|					
(a)		(b)		(c)	
(d)		(e)		(f)	
(g)		(h)		(i)	

TIPS

If we fold a picture about a line such that the one half fits exactly over the other half, then this line is called the line of symmetry.
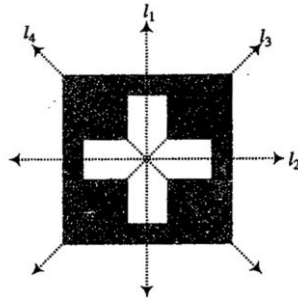
Sol. (a) Given figure is

Here, l_1, l_2, l_3 and l_4 are four lines of symmetry.
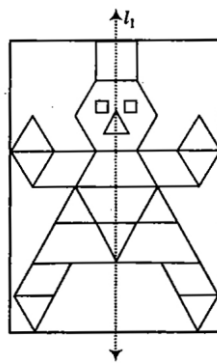
(b) Given figure is

Here, l_1, l_2, l_3 and l_4 are four lines of symmetry.
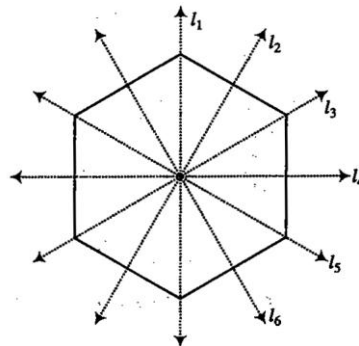
(c) Given figure is

Here, l_1, l_2, l_3 and l_4 are four lines of symmetry.
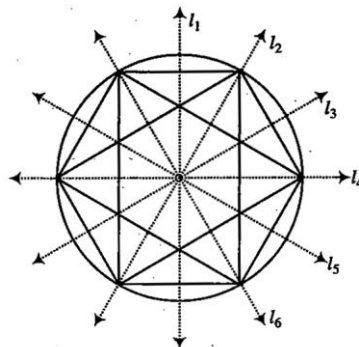
(d) Given figure is

Here, l_1 is the only line of symmetry.

(e) Given figure is

Here, l_1, l_2, l_3, l_4, l_5 and l_6 are six lines of symmetry.
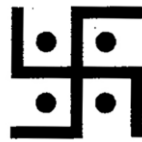
(f) Given figure is

Here, l_1, l_2, l_3, l_4, l_5 and l_6 are six lines of symmetry.
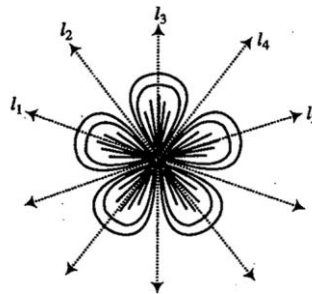
(g) Given figure is
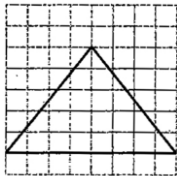
No line of symmetry is here.

(h) Given figure is

No line of symmetry is here.

(i) Given figure is

Here, l_1, l_2, l_3, l_4 and l_5 are five lines of symmetry.

2. **Copy the triangle in each of the following figures on squared paper. In each case, draw the line(s) of symmetry, if any and identify the type of triangle.**
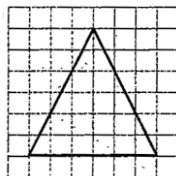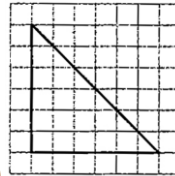
(a)   (b)   (c)   (d)

Sol. On copying the triangles on squared paper, we get the following figures:

(a) Here, the given triangle is an isosceles right angled triangle and one angle is 90° and its line of symmetry is l_1.

(b) Here, the given triangle is an isosceles triangle and its line of symmetry is l_1.

(c) Here, the given triangle is an isosceles right angled triangle and one angle is 90° and its line of symmetry is l_1.
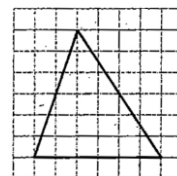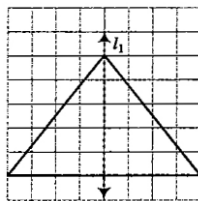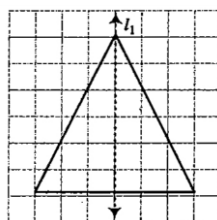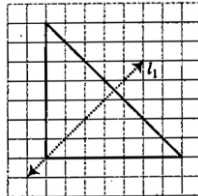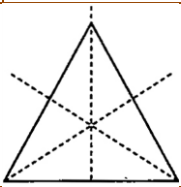

(d) Here, the given triangle is scalene triangle. So, this is not the symmetrical figure. Therefore, there is no line of symmetry.
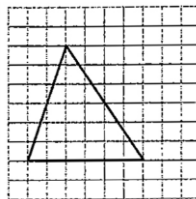
3. **Complete the following table.**

Shape	Rough figure	Number of lines of symmetry
Equilateral triangle		3
Square		
Rectangle		
Isosceles triangle		
Rhombus		
Circle		

Sol. First, we draw rough figure of each shape.
(i) A rough figure of an equilateral triangle is given below:
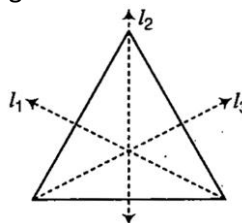
In equilateral triangle, l_1, l_2 and l_3 are three lines of symmetry.

(ii) A rough figure of a square is given below:
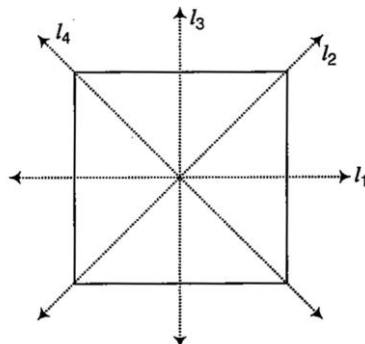
In square, l_1, l_2, l_3 and l_4 are four lines of symmetry.

(iii) A rough figure of a rectangle is given below:
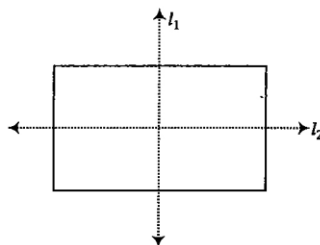
In rectangle, l_1 and l_2 are two lines of symmetry.

(iv) A rough figure of an isosceles triangle is given below:
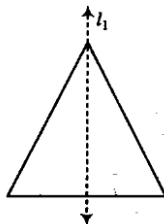
In isosceles triangle, l_1 is the only line of symmetry.

(v) A rough figure of a rhombus is given below

In rhombus, l_1 and l_2 are two lilies of symmetry.

(vi) A rough figure of a circle is given, below:

In circle, there are infinite lines of symmetry.

Now, the complete table is given below:

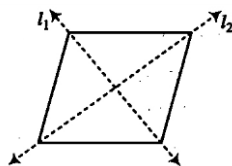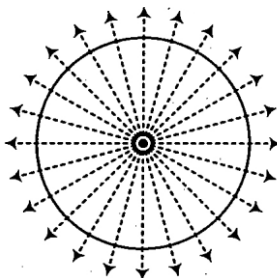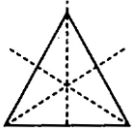| Shape	Rough figure	Number of lines of symmetry
Equilateral triangle		3
Square		4
Rectangle		2
Isosceles triangle		1
Rhombus		2
Circle		**Infinite**

4. **Can you draw a triangle which has**
(a) exactly one line of symmetry?
(b) exactly two lines of symmetry?
(c) exactly three lines of symmetry?
(d) no lines of symmetry?

Sol. (a) Yes, we can draw an isosceles triangle which has exactly oneline of symmetry, as shown below:

Isosceles triangle
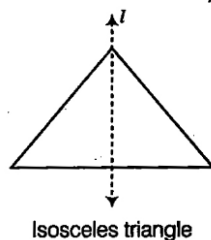
(b) No, we cannot draw a triangle which has exactly two lines of symmetry.

(c) Yes, we can draw an equilateral triangle, which has exact three lines of symmetry, as shown below:

Equilateral triangle
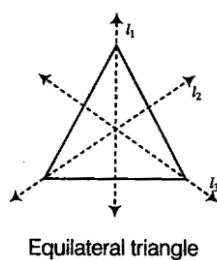
(d) Yes, we can draw a scalene triangle which has no lines of symmetry, as shown below:

Scalene triangle
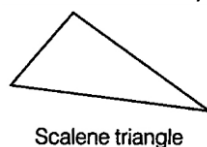
5. **On a squared paper, sketch the following.**
(a) A triangle with a horizontal line of symmetry but no vertical line of symmetry.
(b) A quadrilateral with both horizontal and vertical lines of symmetry.
(c) A quadrilateral with a horizontal line of symmetry but no vertical line of symmetry.
(d) A hexagon with exactly two lines of symmetry.

(e) A hexagon with six lines of symmetry.

(Hint: It will be helpful, if you first draw the lines of symmetry and then complete the figures.)

Sol. (a) An isosceles triangle has only one line of symmetry. On a squared paper, its figure with a horizontal line of symmetry is given below:
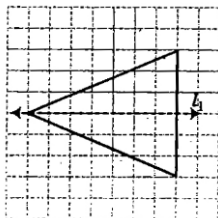
(b) A square is also a quadrilateral and a square has both horizontal and .vertical lines of symmetry. On a squared paper, its figure with both horizontal and vertical lines of symmetry, is given below:
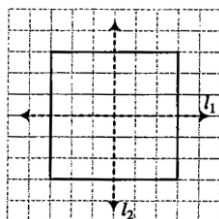
(c) A quadrilateral with a horizontal line of symmetry but no vertical line of symmetry on a squared paper, is shown below:
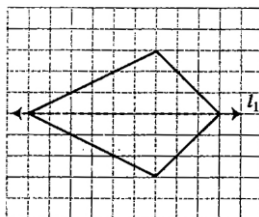
(d) A hexagon has two lines of symmetry on a squared paper, is shown below:
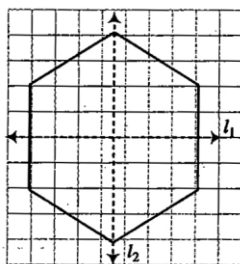
(e) A hexagon with six lines of symmetry on a squared paper, is shown below:
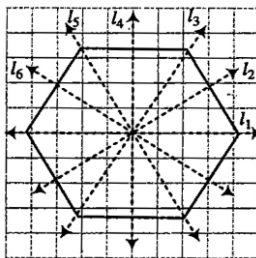
6. **Trace each figure and draw the lines of symmetry, if any**

(a)

(b)

(c)

(d)

(e)

(f)
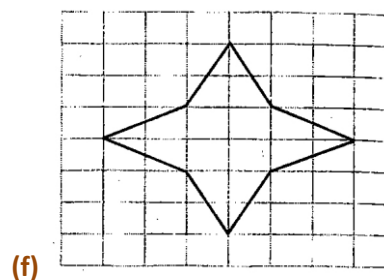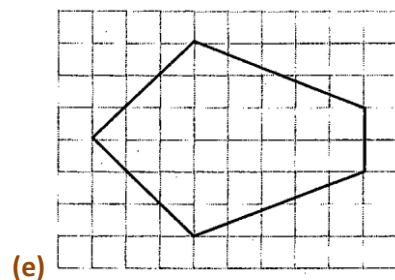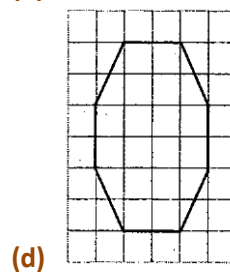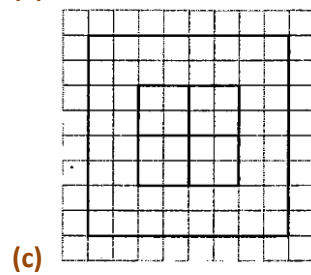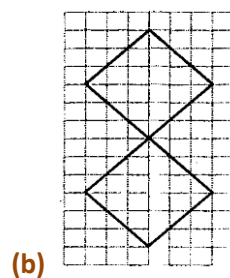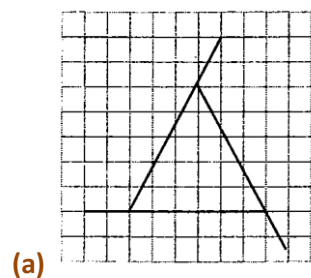
Sol.   On tracing given figures, we get the following figures.
(a) There is no line of symmetry.
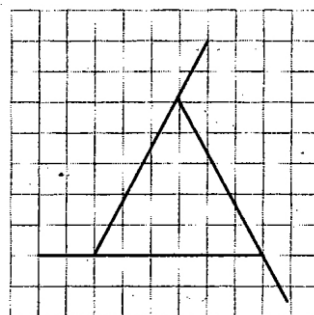
(b) There are two lines of symmetry.
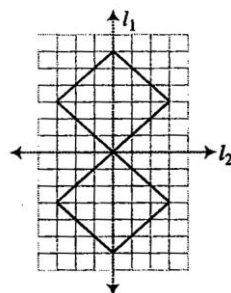
(c) There are four lines of symmetry.
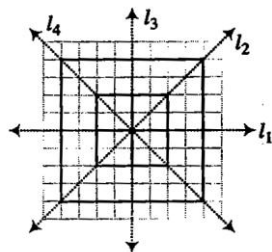
(d) There are two lines of symmetry.
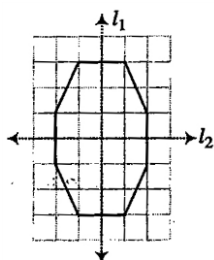
(e) There is one line of symmetry.
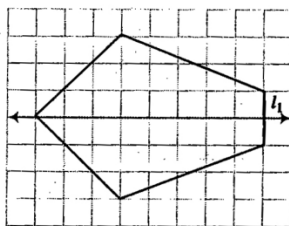
(f) There are four lines of symmetry.
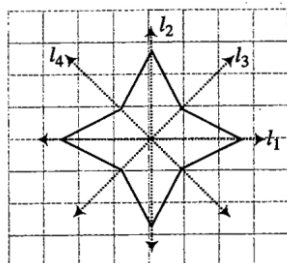
7. **Consider the letters of English alphabets A to Z. List among them the letters which have**
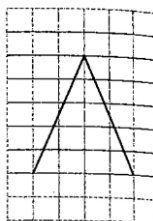
(a) vertical lines of symmetry (like A).
(b) horizontal lines of symmetry (like B).
(c) no lines of symmetry (like Q).

Sol. (a) The letters of English alphabet which have vertical, lines of symmetry (like A), are

A, H, I, M, O, T, U, V, W, X, Y

(b) The letters of English alphabet which have horizontal lines of symmetry (like B), are

B, C, D, E, H, I, K, O, X

(c) The letters of English alphabet which have no lines of symmetry (like Q), are

F, G, J, L, N, P, Q, R, S, Z

8. **Given, here are figures of a few folded sheets and designs drawn about the fold. In each case, draw a rough diagram of the complete figure that would be seen, when the design is cut off.**
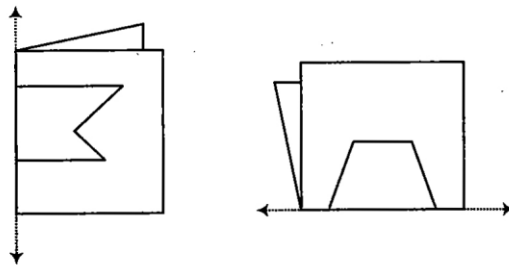
Sol. The rough diagram of the complete figure that would be seen when the design is cut off, are given below:
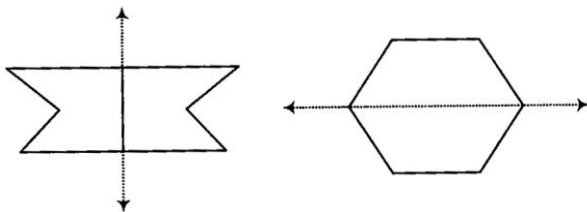
Exercise 13.3

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1. **Find the number of lines of symmetry in each of the following shapes. How will you check your answers?**

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

(e)   (f)
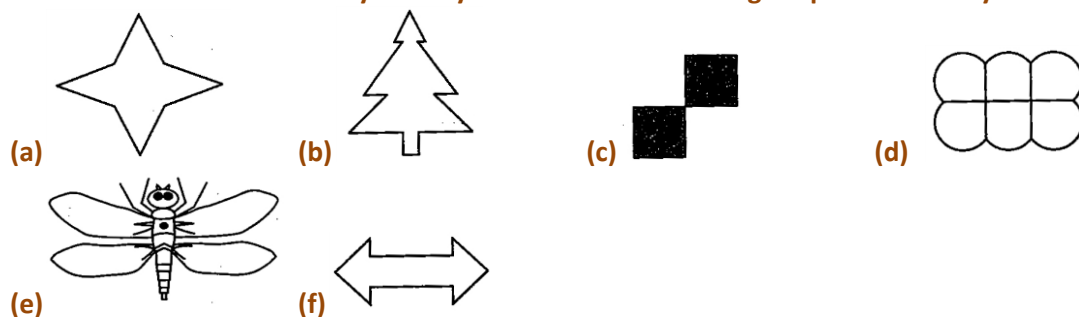
Sol. (a) The number of lines of symmetry for this figure are 4, which are shown below:
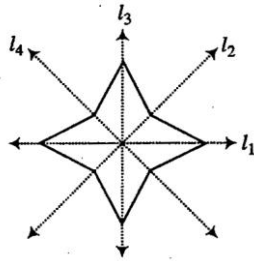
(b) The number of lines of symmetry for this figure is 1, which is shown below:
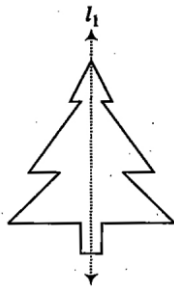
(c) The number of lines of symmetry for this figure are 2, which are shown below:
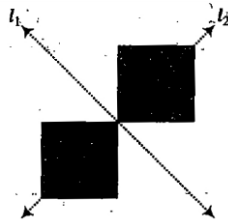
(d) The number of lines of symmetry for this figure are 2, which are shown below:
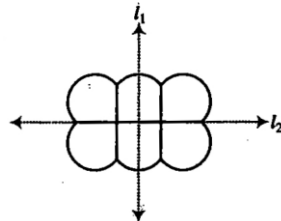
(e) The number of lines of symmetry for this figure is 1, which is shown below:
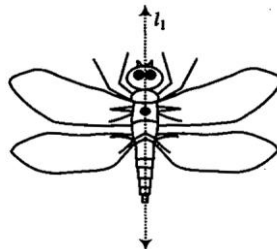
(f) The number of lines of symmetry for this figure are 2, which are shown below:
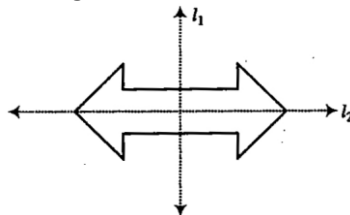
For checking, we fold the figure about line of symmetry. If one side of the picture fall exactly on the other side of the picture, then our line of symmetry is correct, otherwise line of symmetry is not correct.

2.   **Copy the following drawing on squared paper.**
   Complete each one of them such that the resulting figure has two dotted lines as two lines of symmetry.

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

(e)   (f)
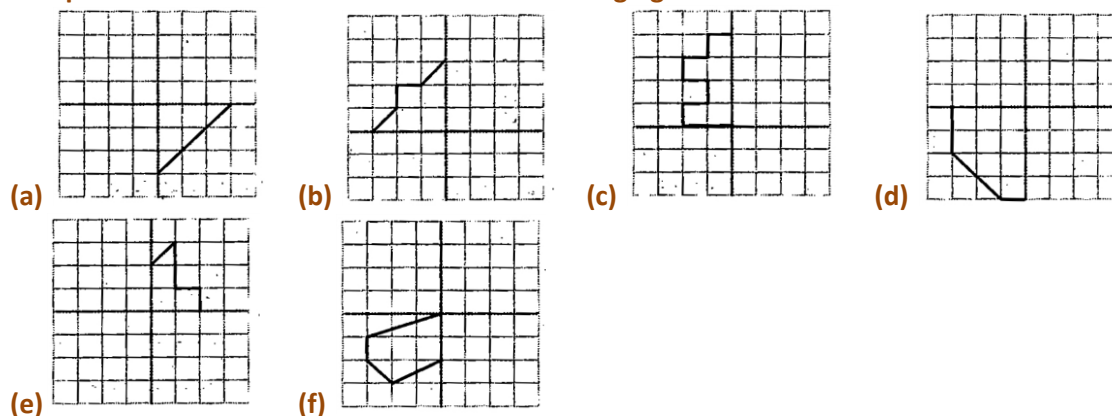
   How did you go about completing the picture?

Sol.   The complete figures with two dotted lines as two lines of symmetry are given below:

(a)   (b)

(c)   (d)

(e)   (f)
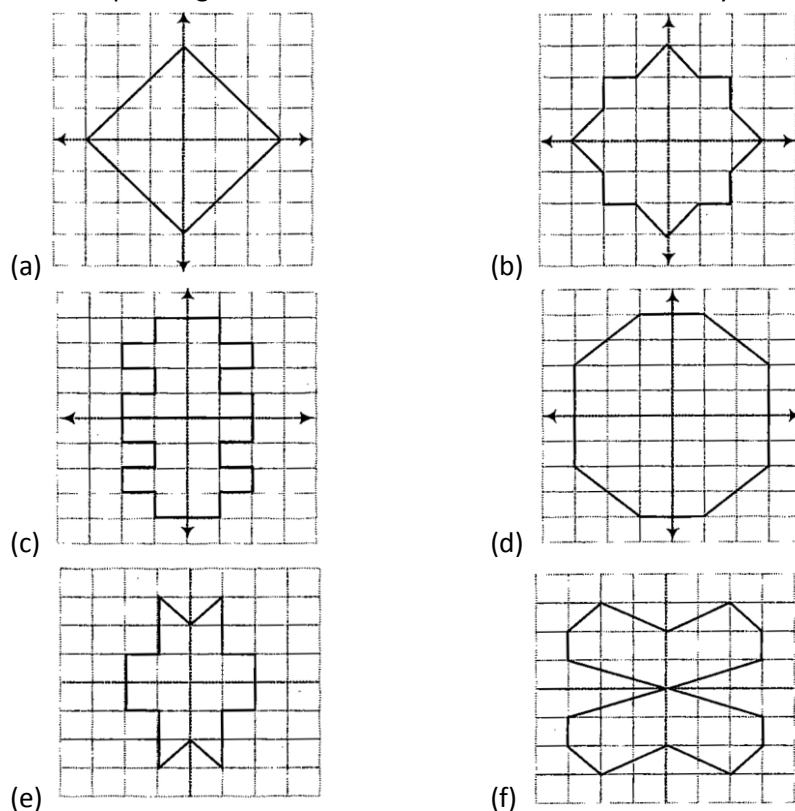
By using the given line of symmetry, we go about completing the picture.

3. In each figure alongside, a letter of the alphabet is shown along with a vertical line. Take the mirror image of the letter in the given line. Find which letters look the same after reflection (i.e. which letters look the same in the image) and which do not? Can you guess, why?
[Try of OEMNPHLTSVX]
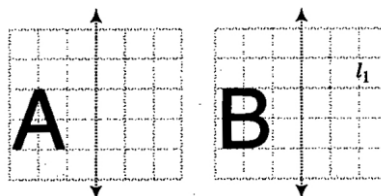
Sol. Taking the mirror image of the letters A and B in the given line.
These will look as shown below:

It is clear that, A look the same after reflection and B do not look the game because A has reflection symmetry but B do not have.
Now, the mirror image of other letters are shown below:
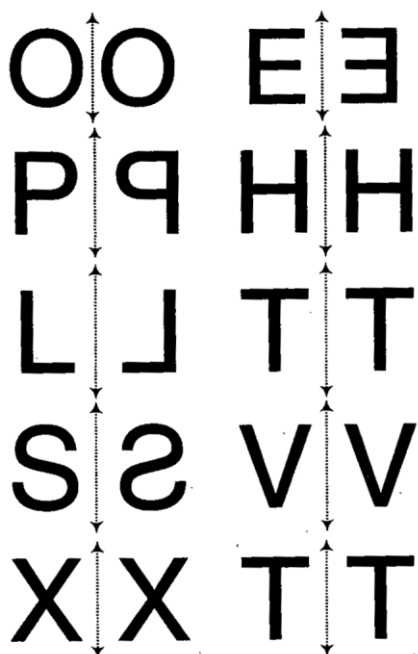
From above, we can say that A, O, M, H, T, V and X look the same after reflection because these letters are symmetrical.
Also, we see that B, E, N, P, L and S do not look the same after reflection because these letters are not symmetrical.

Directions In Questions 1 to 5, out of the four options, only one options is correct. Give the correct answer.

1. In the following figures, the figure that is symmetric with respect to any line, is
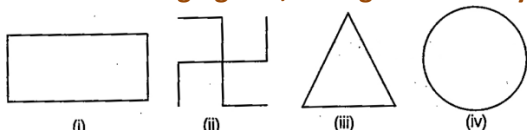
(a) (i)
(b) (ii)
(c) (iii)
(d) (iv)

Sol. In the figure (ii), there is no line segment.
So, the figure is not symmetric.
Hence, option (b) is correct

2. The number of lines of symmetry in a scalene triangle
(a) 0
(b)1
(c)2
(d)3

Sol. Triangle shown in figure is a scalene triangle and in this triangle, there is no line segment to divide into equal parts.
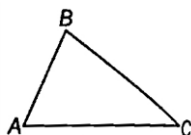
Hence, option (a) is correct

3. The number of lines of symmetry in a circle is
(a) 0
(b) 2
(c) 4
(d) more than 4

Sol. In the figure, we can draw many diameter to cut in symmetrical parts of a circle.
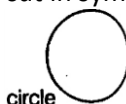
Hence, option (d) is correct circle.

4. Which of the following letters have both horizontal andvertical lines of symmetry?
(a) X
(b) E
(c) M
(d) K

Sol. In the figure X, we can draw both horizontal and vertical lines for symmetry.
Hence, option (a) is correct.

5. Which of the following letters has only one line of symmetry?
(a) H
(b) X

(c) Z   **(d) T**

Sol. By checking one by one all figures, we observe that in figure T, wecan draw only one line segment for symmetry.

Hence, option (d) is correct.

6. **Write the number of lines of symmetry in each letter of the word 'SYMMETRY'.**

Sol. For defining the lines of symmetry in the word 'SYMMETRY', checkone by one line at segment.

(a) $S \rightarrow$ In the letter S, there is no line segment for dividing equalparts, hence lines of symmetry in S is zero.

(b) $Y \rightarrow$ In the letter Y, there is one line segment for dividing equalparts, hence lines of symmetry of Y letter is one.

(c) $M \rightarrow$ In the letter M, there is one line segment for dividingequal parts, hence lines of symmetry of M letter is one.
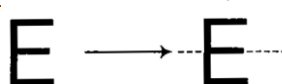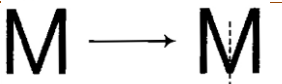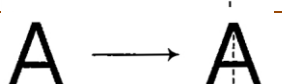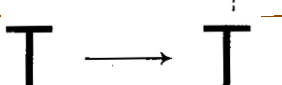
(d) $E \rightarrow$ In the letter E, there is one line segment for dividing equalparts, hence lines of symmetry of E letter is one.
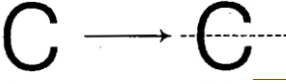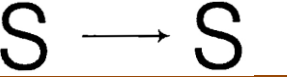
(e) $T \rightarrow$ In the letter T, there is one line segment for dividing equalparts, hence lines of symmetry of T letter is one.
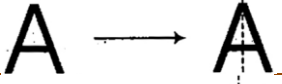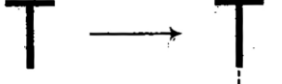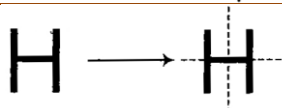
(f) $R \rightarrow$ In the letter R, there is no line of segment for dividing equal parts, hence lines of symmetry of R letter is zero.

7. **Write the letters of the word 'MATHEMATICS' which have no line of symmetry.**

Sol. For finding the no line of symmetry in the word 'MATHEMATICS',check all the letters one by one.

Then,

(a)	M ⟶ M	= One line segment
(b)	A ⟶ A	= One line segment
(c)	T ⟶ T	= One line segment
(d)	H ⟶ H	= One line segment
(e)	E ⟶ E	= One line segment
(f)	M ⟶ M	= One line segment
(g)	A ⟶ A	= One line segment
(h)	T ⟶ T	= One line segment
(i)	I ⟶ I	= Two line segment

(j)	C $\longrightarrow$ C	= One line segment
(k)	S $\longrightarrow$ S	= No line segment

Hence, in the word 'MATHEMATICS', S letter has no line of symmetry

8. **The number of lines of symmetry in figure is _____.**
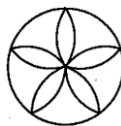
Sol. In the given figure of circle, we can draw 5 lines of segment to bisect the figure in equal line ofparts.
Hence, the line of symmetry of given circle is 5.
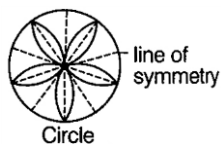
9. **Is there any line of symmetry in the figure? If yes, draw all the lines of symmetry.**
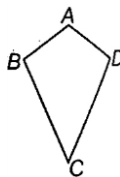
Sol. Yes, in the given figure, we can draw only one line of symmetry as shown in figure that divides the figure into two equal parts.
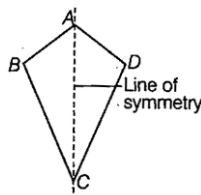
10. **In figure, PQRS is a rectangle.**
State the lines of symmetry of the rectangle.
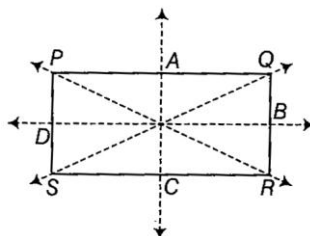
Sol. In the given figure, AC and BD are bisectors of rectangle which divides the rectangle in two equal parts.
Hence, the line of symmetry of given   rectangular figure is two.

11. A circle has only 16 lines of symmetry, is true or false.

Sol.

It is false, because the line of symmetry of circle is infinite.

12. The number of lines of symmetry in a ruler is
(a) 0   (b) 1
(c) 2   (d) 4

Sol. In the figure of ruler, we can draw both horizontal and vertical lines to bisect into equal parts.
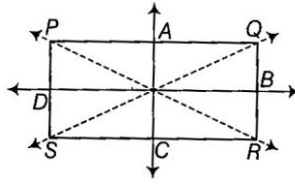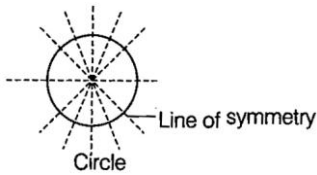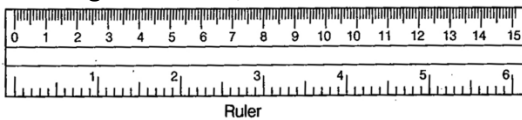

Hence, the line of symmetry of ruler is 2.

13. Open your geometry box. There are some drawing tools. Observe them and complete the following table:

Name of the tool	Number of lines of symmetry
(i) Ruler	_____
(ii) Divider	_____
(iii) Compasses	_____
(iv) Protractor	_____
(v) Triangular piece with two equal sides	_____
(vi) Triangular piece with unequal sides	_____

Sol. By observing the geometry tools, we find some important results.
(i) In the ruler, we can draw both horizontal and vertical lines.
Hence, in the ruler, number of lines of symmetry is 2.
(ii) In the divider, we can draw only one line of segment for dividing. So, in the divider, number of lines of symmetry is 1.
(iii) In the compass, we cannot draw any line of segment for dividing in each part. So, in the divider, number of lines of symmetry is 0.
(iv) In the protector, we can draw only one line of segment for dividing in each part. So, in the protractor, number of lines of symmetry is 1.
(v) In the triangular piece with two equal sides, we can draw only one line of segment because there are two equal sides of triangle. Hence, the line of symmetry is 1.

(vi) In the triangular piece with unequal sides, we can't draw any line of segment because there is no equal sides of triangular.
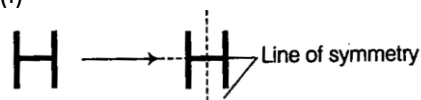
Hence, the line of symmetry is 0.

Name of the tool	Number of lines of symmetry
(i) Ruler	2
(ii) Divider	1
(iii) Compasses	0
(iv) Protractor	1
(v) Triangular piece with two equal sides	1
(vi) Triangular piece with unequal sides	0

14. **Write all the capital letters of the English alphabet swhich have more than one lines of symmetry.**
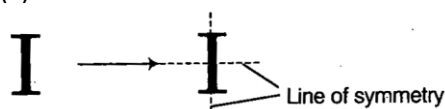
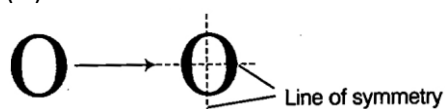**Sol.** For solution of this question, observe all English alphabets A to Z.

(i)

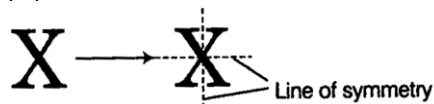In the letter H, we can draw two lines of segment. Hence, the lines of symmetry is 2.

(ii)

In the letter I, we can draw two lines of segment. Hence, the lines of symmetry is 2.

(iii)

In the letter O, we can draw two lines of segment. Hence, the lines of symmetry is 2.

(iv)

In the letter X, we can draw two lines of segment. Hence, the lines of symmetry is 2.

15. **Match the following.**

Shapes	Number of lines of symmetry
(i) Isosceles triangle	(a) 6
(ii) square	(b) 5
(iii) Kite	(c) 4
(iv) Equilateral triangle	(d) 3
(v) Rectangle	(e) 2

(vi) Regular hexagon	(f) 1
(vii) Scalene triangle	(g) 0

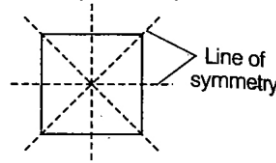**Sol.**   **(i) Isosceles triangle**
In an isosceles triangle, there are two equal sides of the triangle, then in an isosceles triangle, only one line of segment which divides into equal parts.
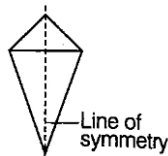Hence, the line of symmetry is 1 and option is (f).
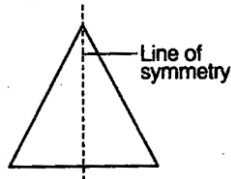
(ii) Square
In the square, there are four equal sides then in the square, we can draw four lines of segment, which divides square in equal parts. Hence, the line of symmetry is 4 and option is (c).


(iii) Kite
In the kite, there is only one line of segment which bisect the kite into equal parts. Hence, the lines of symmetry in kite is 1 and option is (f).

(iv) Equilateral triangle
In an equilateral triangle, there are three equal sides and medians of equilateral   triangle bisect   the triangle in three equal parts. Hence, the lines of symmetry in equilateral triangle is 3 and option is (d).
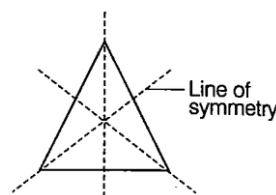

(v) Rectangle
In the rectangle, there are two equal sides, then there are two lines of segment which divides into equal parts. Hence, in the rectangle, the lines of symmetry in the rectangle is2 and option is (e).

(vi) Regular hexagon
In the regular hexagon, there are six equal sides, then the lines of segment in hexagon is six, which bisect theregular hexagon in equal parts. Hence, the lines of symmetry in regular hexagon is 6 and option is (a).
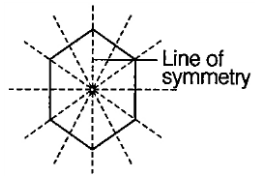
(vii) Scalene triangle

In the scalene triangle, there is no equal sides. Hence, we can't draw any line of segment. Hence, there is no line of symmetry and option is (g).