

# Symmetry

## Understanding the Lesson

- Symmetrical figures.
- Axis of symmetry.
- Figures with two lines of symmetry.
- Figures with multiple lines of symmetry.
- Reflection and symmetry.
- Application of reflectional symmetry.

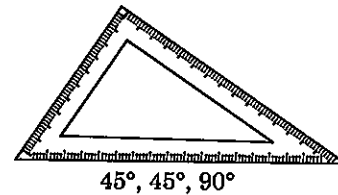
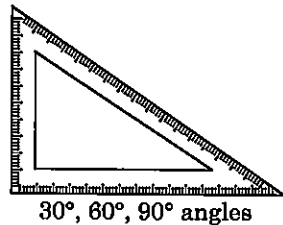
## Conceptual Facts

- The objects or shapes with evenly balanced proportions are called symmetrical objects or shapes.
- When a figure can be folded into two halves and both the halves overlap each other, the figure is said to be symmetrical.
- The line along which the figure is folded is called lines of symmetry.
- Line of symmetry can be horizontal, vertical or slant.

### TRY THESE (PAGE 262)

Q1. You have two set-squares in your 'mathematical instruments box'. Are they symmetrical?

Sol.



The set-square with angles 30°, 60° and 90° is not symmetrical.

The set-square with angles 45°, 45° and 90° is symmetrical.

## EXERCISE 13.1

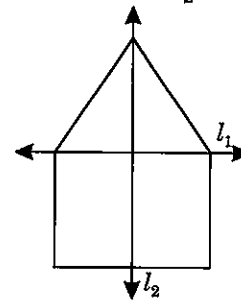
Q1. List any four symmetrical objects from your home or school.

Sol. The following objects can be symmetrical:

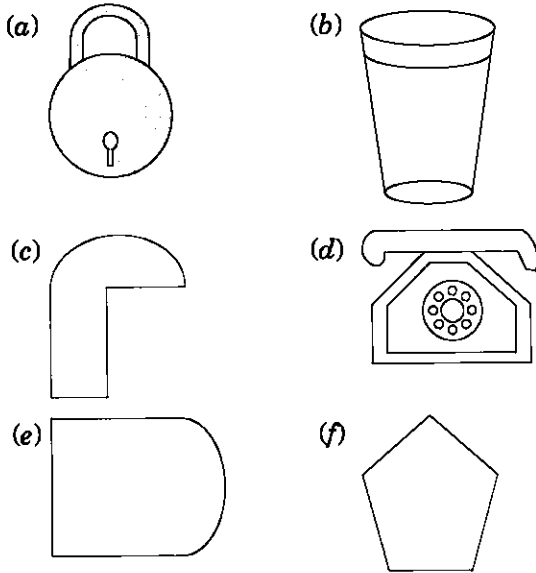
- |                        |                  |
|------------------------|------------------|
| (a) Notebook           | (b) Dining table |
| (c) A blackboard       | (d) Wall clock   |
| (e) A pair of scissors |                  |

Q2. For the given figure, which one is the mirror line,  $l_1$ , or  $l_2$ ?

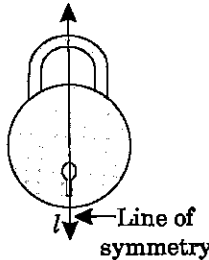
Sol. In the following figure,  $l_2$  is the mirror line.



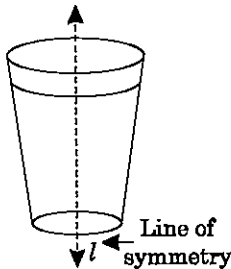
**Q3.** Identify the shapes given below. Check whether they are symmetrical or not. Draw the line of symmetry as well.



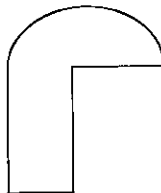
**Sol.** (a) The given symmetric figure is a lock in which vertical line  $l$  is the line of symmetry.



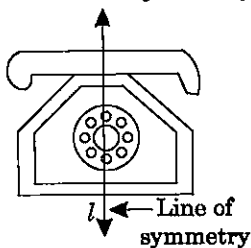
(b) The given figure is a symmetrical bucket in which vertical line  $l$  is the line of symmetry.



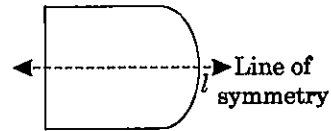
(c) The given figure is not symmetrical.



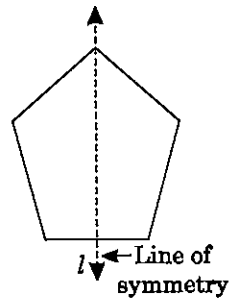
(d) The given figure is a symmetric telephone in which vertical line  $l$  is called the line of symmetry.



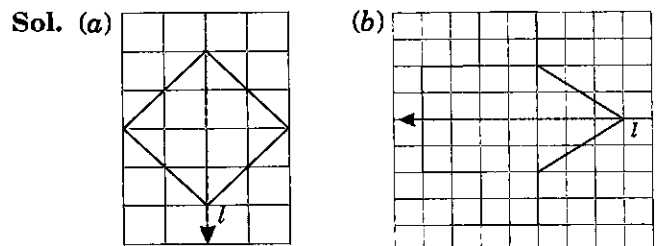
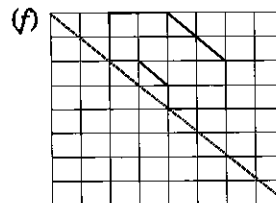
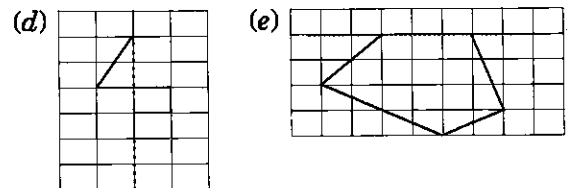
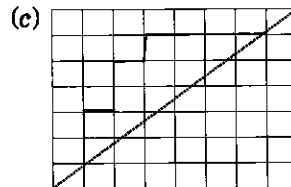
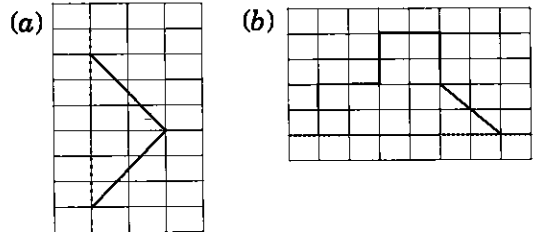
(e) The given figure is symmetrical. Horizontal line  $l$  is called the line of symmetry.

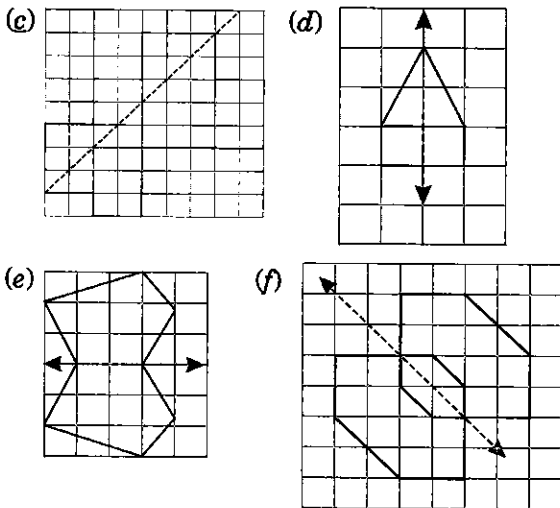


(f) The given figure is symmetrical. Vertical line  $l$  is called its line of symmetry.

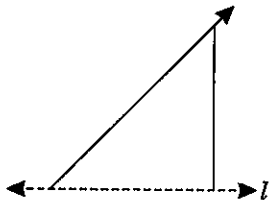


**Q4.** Copy the following on a squared paper. A square paper is what you would have used in your arithmetic notebook in earlier classes. Then complete them such that the dotted line is the line of symmetry.

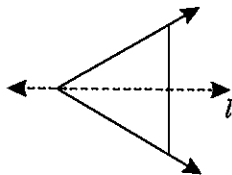




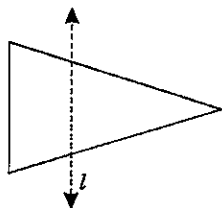
**Q5.** In the figure,  $l$  is the line of symmetry. Complete the diagram to make it symmetric.



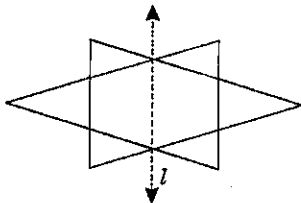
**Sol.** The completed figure is as follows:



**Q6.** 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.** The symmetric figure is given as follows.

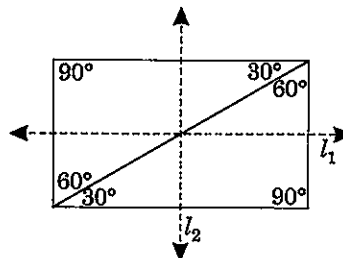


**TRY THESE (PAGE 264)**

**Q1.** Form as many shapes as you can by combining two or more set squares. Draw them on squared paper and note their lines of symmetry.

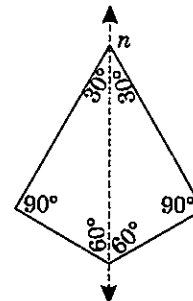
**Sol.** We have two types of set squares  $30^\circ, 60^\circ, 90^\circ$  and  $45^\circ, 45^\circ, 90^\circ$ .

(a) Combination of two set squares  $30^\circ, 60^\circ$ , and  $90^\circ$  each.



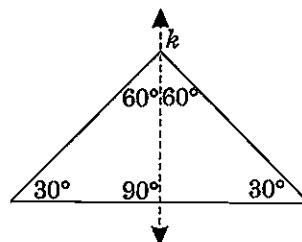
$l_1$  and  $l_2$  are two symmetric lines.

(b) Combination of two set squares  $30^\circ, 60^\circ$  and  $90^\circ$  each.



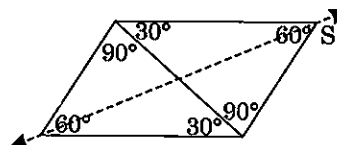
It has only one symmetric line 'n'

(c) Combining two set squares  $30^\circ, 60^\circ, 90^\circ$  each.



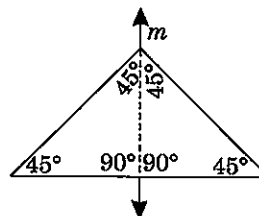
$k$  is the only line of symmetry.

(d) Combining two set squares  $30^\circ, 60^\circ$  and  $90^\circ$  each.



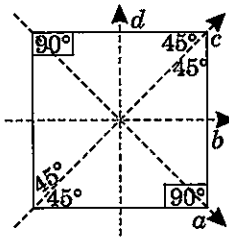
$s$  is the line of symmetry.

(e) Combining two set squares  $45^\circ, 45^\circ$  and  $90^\circ$  each.



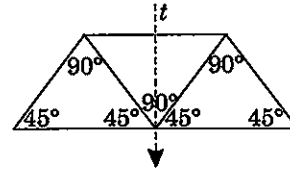
$m$  is the line of symmetry.

(f) Combining two set squares  $45^\circ, 45^\circ$  and  $90^\circ$ .



Here,  $a, b, c$  and  $d$  are four lines of symmetry.

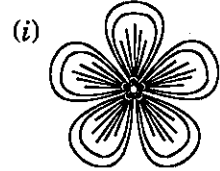
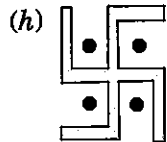
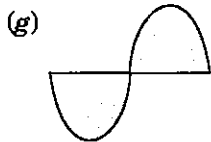
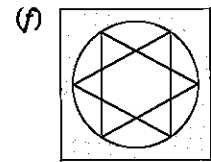
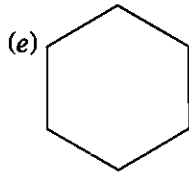
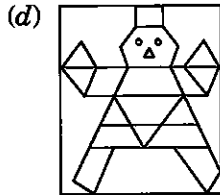
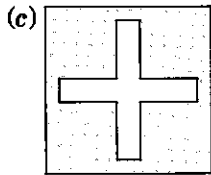
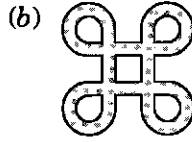
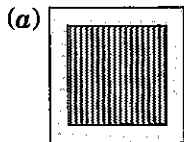
(g) Combining the three set squares of  $45^\circ, 45^\circ$  and  $90^\circ$  each.



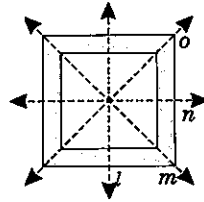
$t$  is the line of symmetry.

**EXERCISE 13.2**

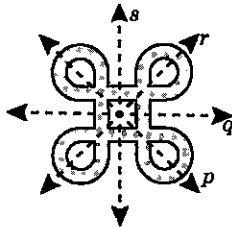
**Q1.** Find the number of lines of symmetry for each of the following shapes.



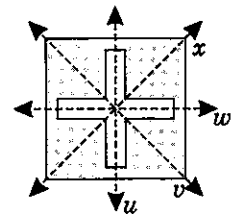
**Sol.** (a) Here, there are four symmetric lines  $l, m, n$  and  $o$ .



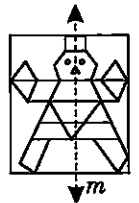
(b) In this figure, there are four symmetric lines  $p, q, r$  and  $s$ .



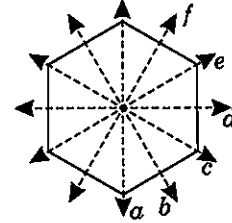
(c) In this shape,  $u, v, w$  and  $x$  are four lines of symmetry.



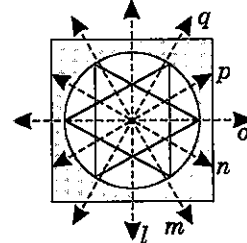
(d) In this shape only  $m$  is the line of symmetry.



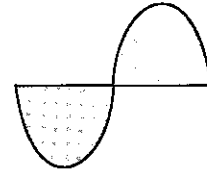
(e) Here,  $a, b, c, d, e$  and  $f$  are six lines of symmetry.



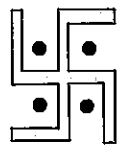
(f) In this figure  $l, m, n, o, p$  and  $q$  are six lines of symmetry.



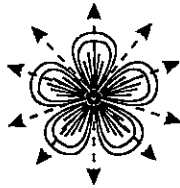
(g) This figure has no lines of symmetry.



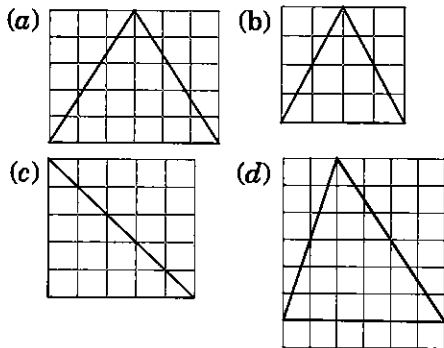
(h) This figure has no lines of symmetry.



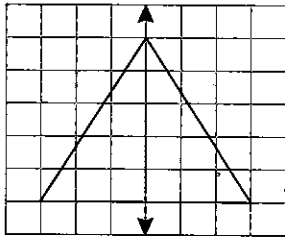
(i) This figure has five lines of symmetry.



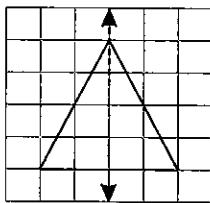
Q2. Copy the triangle in each of the figures on squared paper. In each case, draw the line(s) of symmetry, if any and identify the type of triangle. (Some of you may like to trace the figures and try paper-folding first!)



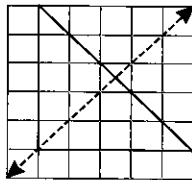
Sol. (a) It is an isosceles triangle having one symmetric line.



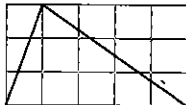
(b) This figure is an isosceles triangle having only one symmetric line.



(c) It is an isosceles right angled triangle which has only one symmetric line.



(d) It is a scalene triangle. It has no symmetric line.



Q3. Complete the following table.

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

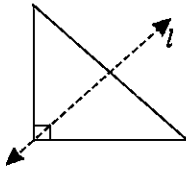
Sol. Completed table:

Shape	Rough figure	Number of lines of symmetry
(a) Equilateral triangle		3
(b) Square		4
(c) Rectangle		2
(d) Isosceles triangle		1
(e) Rhombus		2
(f) Circle		Infinite

- Q4. 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?

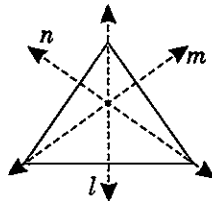
Sketch a rough figure in each case.

- Sol. (a) Yes, Isosceles right angled triangle has exactly one line of symmetry.

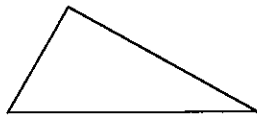


- (b) No, we cannot draw any triangle with two symmetric lines.

- (c) Yes, equilateral triangle has three lines of symmetry.



- (d) Yes, scalene triangle has no lines of symmetry.

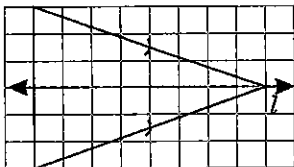


- Q5. On a squared paper, sketch the following:

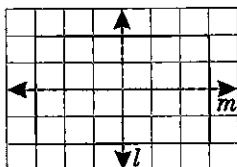
- (a) A triangle with a horizontal line of symmetry but no vertical line of symmetry.  
 (b) A quadrilateral with both horizontal and vertical lines of symmetry.  
 (c) A quadrilateral with a horizontal line of symmetry but no vertical line of symmetry.  
 (d) A hexagon with exactly two lines of symmetry.  
 (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)

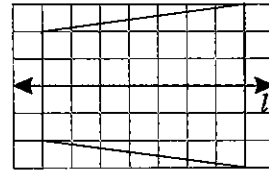
- Sol. (a) The figure shows an isosceles triangle with horizontal line of symmetry.



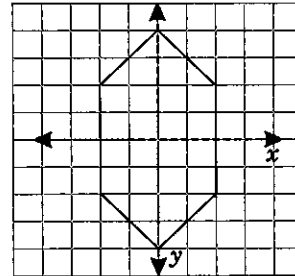
- (b) Rectangle (quadrilateral) shows both the horizontal and vertical lines of symmetry.



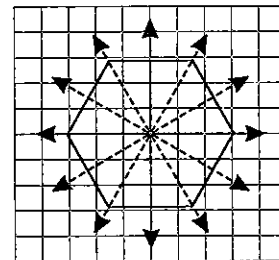
- (c) Trapezium (quadrilateral) shows the horizontal but no vertical line of symmetry.



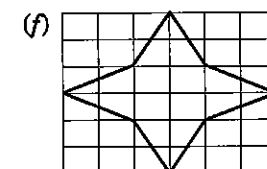
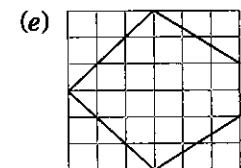
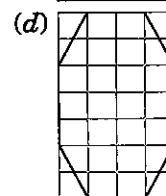
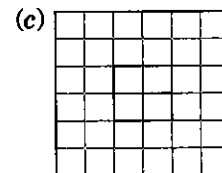
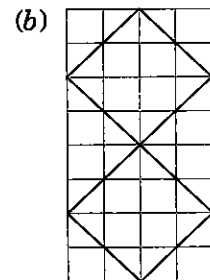
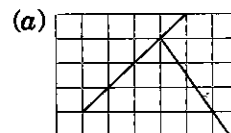
- (d) The hexagon drawn below shows only two lines of symmetry.



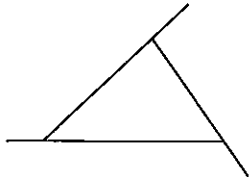
- (e) The regular hexagon shows the six lines of symmetry.



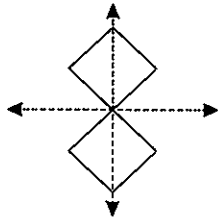
- Q6. Trace each figure and draw the lines of symmetry, if any.



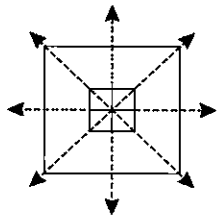
Sol. (a) The given figure has no line of symmetry as it is not symmetrical.



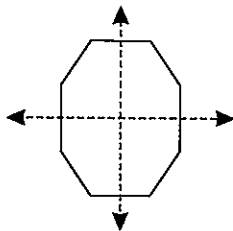
(b) The given figure has two lines of symmetry.



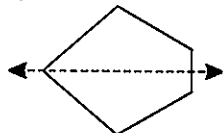
(c) The given figure has four lines of symmetry.



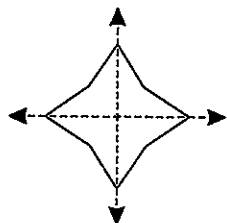
(d) The given figure has two lines of symmetry.



(e) This figure has only one horizontal line of symmetry.



(f) The given figure has two lines of symmetry.



Q7. 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 following letters have vertical lines of symmetry:

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

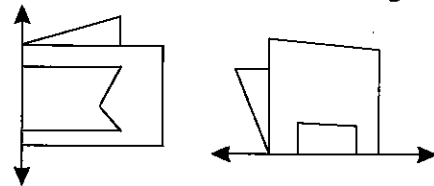
(b) The following letters have horizontal lines of symmetry:

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

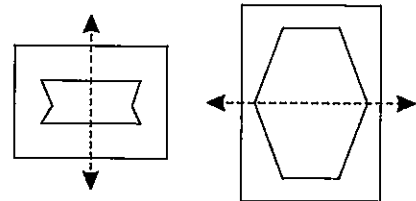
(c) The following letters have no lines of symmetry:

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

Q8. 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 given figures will be seen as follows when they are completed.



### TRY THESE (PAGE 270)

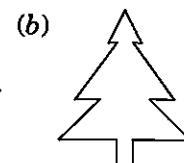
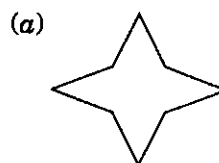
Q1. If you are 100 cm in front of a mirror, where does your image appear to be? If you move towards the mirror, how does your image move?

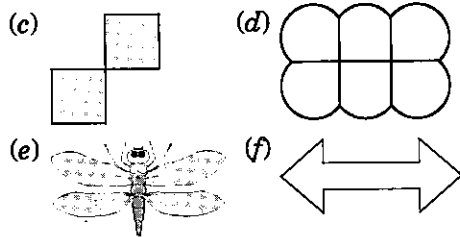
Sol. Your image will be seen 100 cm behind the mirror when the object is in front of it.

If you move towards the mirror, your image will also move closer to you.

### EXERCISE 13.3

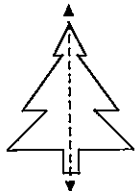
Q1. Find the number of lines of symmetry in each of the following shapes. How will you check your answer?



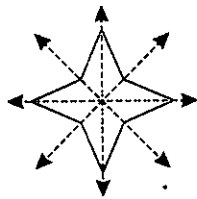
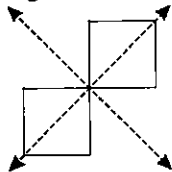


Sol. (a) The given figure has 4 lines of symmetry.

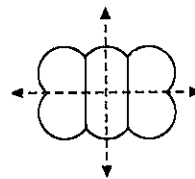
(b) The given figure has only one line of symmetry.



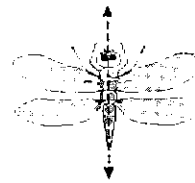
(c) The given figure has two lines of symmetry.



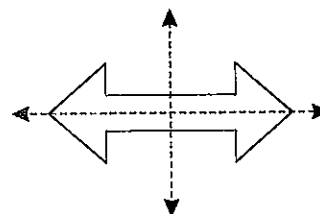
(d) The given figure has two lines of symmetry.



(e) This figure has only one line of symmetry.



(f) The given figure has two lines of symmetry.



## Learn More Q & A

### I. VERY SHORT ANSWER (VSA) QUESTIONS

Q1. Write four such English letters which have no line of symmetry.

Sol. The 4 English letters having no line of symmetry are : P, F, G and Z

Q2. Write 5 such English letters which have horizontal line of symmetry.

Sol. The required letters are:

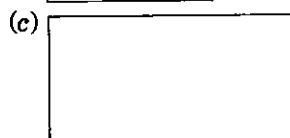
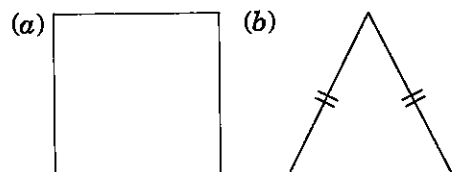
E, B, C, D, K

Q3. Write 4 English letters which have vertical lines of symmetry.

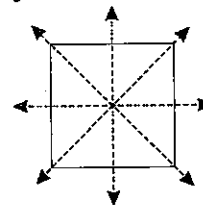
Sol. The required English letters are

A, H, I, M

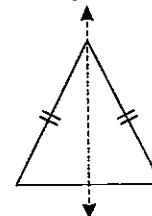
Q4. How many symmetrical lines do they have?



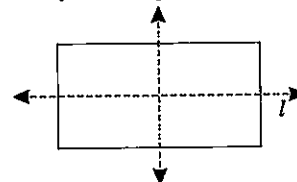
Sol. (a) The figure is a square. It has 4 lines of symmetry.



(b) It is an isosceles triangle. It has one vertical line of symmetry.

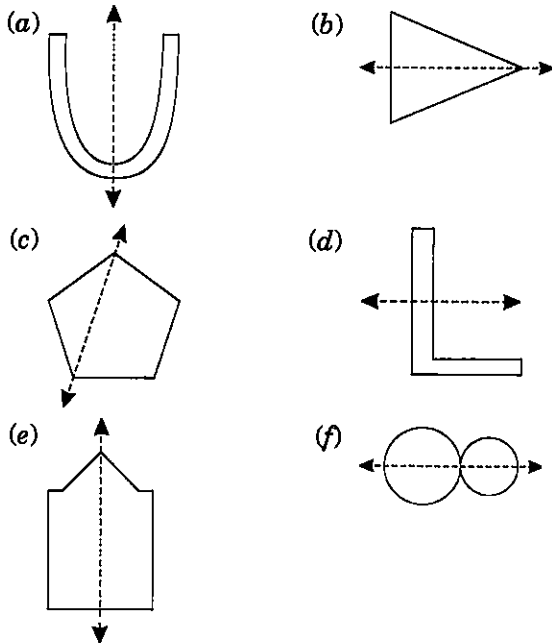


(c) The given figure is a rectangle which has two lines of symmetry.





Q5. Find in which of the following, the dotted line is a line of symmetry.

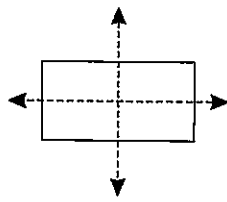


- Sol. (a) The dotted line is a line of symmetry.  
 (b) The dotted line is a line of symmetry.  
 (c) The dotted line is not a line of symmetry.  
 (d) The dotted line is not a line of symmetry.  
 (e) The dotted line is a line of symmetry.  
 (f) The dotted line is a line of symmetry.

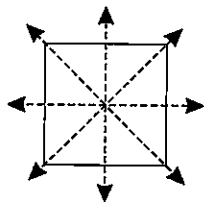
II. SHORT ANSWER (SA) QUESTIONS

Q6. How many lines of symmetry does (a) a rectangle (b) a square (c) a parallelogram have? What about right angled triangle?

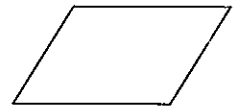
- Sol. (a) Rectangle has two lines of symmetry  
 (i) Horizontal  
 (ii) Vertical



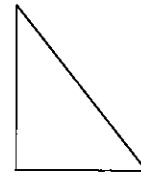
- (b) Square has four lines of symmetry.  
 (i) 1 horizontal  
 (ii) 1 vertical  
 (iii) 2 diagonally



(c) Parallelogram has no lines of symmetry.



Right angled triangle has no line of symmetry.



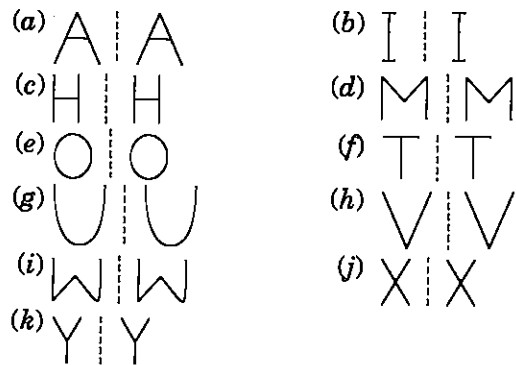
Q7. Fill in the blanks:

- (a) An angle is symmetrical about its \_\_\_\_\_.  
 (b) A circle has \_\_\_\_\_ lines of symmetry.  
 (c) A rectangle has \_\_\_\_\_ lines of symmetry.  
 (d) A square has \_\_\_\_\_ lines of symmetry.  
 (e) A letter D has \_\_\_\_\_ lines of symmetry.  
 (f) A letter N has \_\_\_\_\_ lines of symmetry.  
 (g) A kite is symmetrical about its longer \_\_\_\_\_.  
 (h) A scalene triangle has \_\_\_\_\_ lines of symmetry.  
 (i) A line of symmetry of an object is also called its \_\_\_\_\_ of symmetry.  
 (j) An equilateral triangle has \_\_\_\_\_ lines of symmetry.  
 (k) A regular pentagon has \_\_\_\_\_ lines of symmetry.  
 (l) A line of \_\_\_\_\_ divides a figure into two similar parts.

- Sol. (a) bisector (b) infinite (c) two  
 (d) four (e) one (f) no  
 (g) diagonal (h) no (i) axis  
 (j) three (k) five (l) symmetry

Q8. Show by figure the English alphabets which look the same in their reflected image.

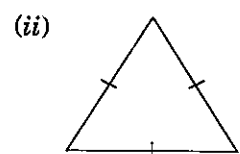
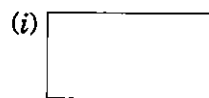
Sol. The following English alphabets look same after reflections:



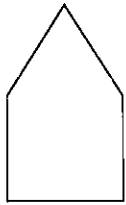
Test Yourself

I. VERY SHORT ANSWER (VSA) QUESTIONS

- List any three symmetric objects around yourself.
- Draw the lines of Symmetry in the following figures:



(iii)



3. How many lines of symmetry are in the following English alphabets?

(a) H (b) T (c) O (d) F (e) E

4. Write the English alphabets which have no lines of symmetry.

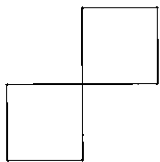
5. Which letter of English alphabet has more than two lines of symmetry?

6. Draw the following figures with their lines of symmetry:

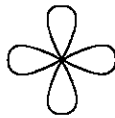
(a) Equilateral triangle  
(b) Isosceles right angled triangle  
(c) Rectangle

7. Find the number of lines of symmetry in the following figures.

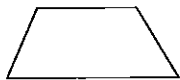
(a)



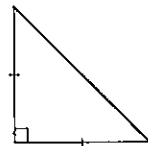
(b)



(c)



(d)



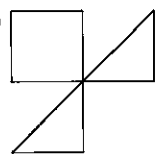
8. Write the English alphabets whose reflected image look like them.

9. Are the following items symmetrical about their axis?

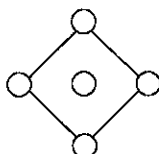
(a) Scissors  
(b) Rectangular photo frame  
(c) Hammer

10. Draw the lines of symmetry in the following figures:

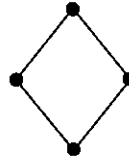
(a)



(b)



(c)



### SHORT ANSWER (SA) TYPE QUESTIONS

11. Match the following columns.

Column I	Column II
(a) Scalene triangle	(i) Two lines of symmetry
(b) Equilateral triangle	(ii) Four lines of symmetry
(c) Circle	(iii) One line of symmetry
(d) Rectangle	(iv) No line of symmetry
(e) Isosceles triangle	(v) One line of symmetry
(f) Square	(vi) Six lines of symmetry
(g) Regular hexagon	(vii) Three lines of symmetry
(h) Kite	(viii) Infinite number of lines of symmetry

12. List four names of the figure which have two lines of symmetry. Show the figures also.

13. List of all English alphabets which have no lines of symmetry.

14. List of all English alphabets which have only vertical lines of symmetry.

15. Fill in the blanks.

(i) A rectangle has \_\_\_\_ lines of symmetry.

(ii) A square has \_\_\_\_ lines of symmetry.

(iii) A circle has \_\_\_\_ lines of symmetry.

(iv) Scalene triangle has \_\_\_\_ lines of symmetry.

(v) An angle is symmetric about its \_\_\_\_.

(vi) The letter D has \_\_\_\_ line of symmetry.

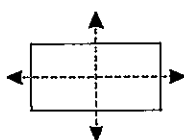
### ANSWERS

1. (a) Scissor

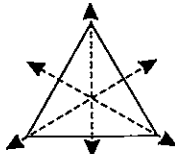
(b) Blackboard

(c) Study table

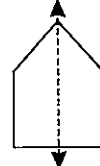
2. (i)



(ii)

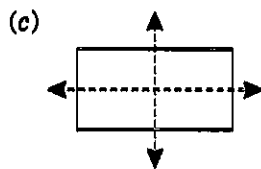
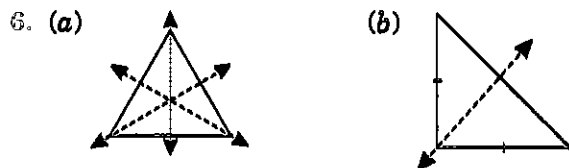


(iii)



3. (a) 2 (b) 1 (c) many (d) no (e) 1

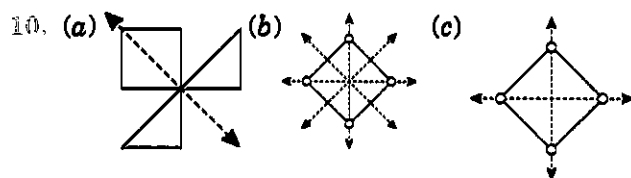
4. J, N, P, S, L 5. 0



7. (a) 2 (b) 4 (c) 1 (d) 1

8. A, H, M, V, O, T, W

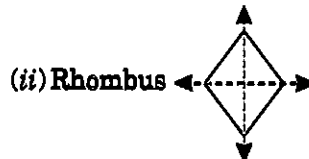
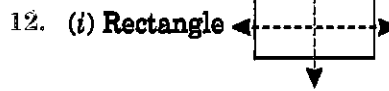
9. (a) yes (b) yes (c) no



11. (a) ↔ (iv), (b) ↔ (vii), (c) ↔ (viii),

(d) ↔ (i), (e) ↔ (v), (f) ↔ (ii),

(g) ↔ (vi), (h) ↔ (iii)



13. J, L, P, S, Q

14. A, V, M, U, Y

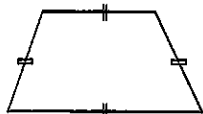
15. (i) two (ii) four (iii) infinite

(iv) no (v) bisector (vi) one

### Internal Assessment

1. How many lines of symmetry does the figure have?

- (a) 1  
(b) 2  
(c) 3  
(d) no line of symmetry



2. How many lines of symmetry does letter A have?

- (a) 2 (b) 0 (c) 1 (d) 3

3. Which of the following letters has vertical line of symmetry?

- (a) S (b) Y (c) D (d) E

4. Which of the following letters has horizontal line of symmetry?

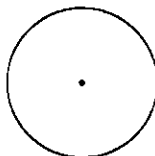
- (a) N (b) K (c) M (d) W

5. Which of the following letters has no line of symmetry?

- (a) J (b) X (c) V (d) A

6. How many lines of symmetry does the figure have?

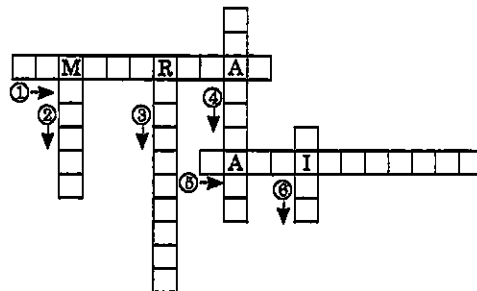
- (a) Countless (b) 0  
(c) 1 (d) 3



7. How many lines of symmetry does a regular hexagon have?

- (a) 1 (b) 6 (c) 4 (d) 3

8. Complete the following crossword puzzle.



Directions:

- An triangle is \_\_\_\_\_ about its bisector.
- The object and its image are symmetrical about a \_\_\_\_\_.
- The symmetry about a mirror is called \_\_\_\_\_.
- The image in a plane mirror is \_\_\_\_\_.
- In \_\_\_\_\_ usually two mirrors to form a V-shape are used.
- Isosceles triangle has only one \_\_\_\_\_ of symmetry.

### ANSWERS

1. (a) 2. (c) 3. (b) 4. (b)  
5. (a) 6. (a) 7. (b)  
1. SYMMETRICAL 2. MIRROR  
3. REFLECTION 4. IMAGINARY  
5. KALEIDOSCOPE 6. LINE