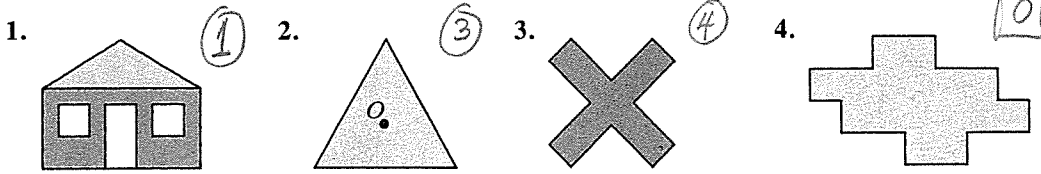


SYMMETRY

KEY

Classroom Exercises

Tell how many symmetry lines each figure has. In Exercise 2, O is the center of the equilateral triangle.

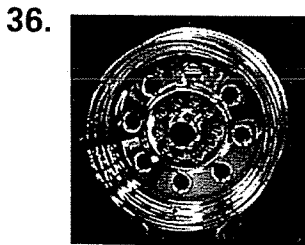


5. Which figures above have point symmetry? *3 and 4*
 6. Describe all of the rotational symmetries of the figure in Exercise 2. *$120^\circ, 240^\circ, 360^\circ$*
 7. Describe all of the rotational symmetries of the figure in Exercise 3. *$90^\circ, 180^\circ, 270^\circ, 360^\circ$*

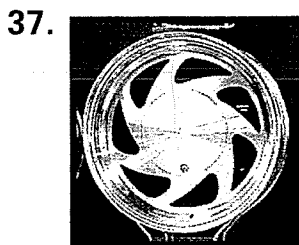
Draw each figure on the chalkboard and describe all of its symmetries.

8. isosceles triangle *line symmetry about \perp bisector*
 9. parallelogram *point sym about the intersection of diagonals*
 10. rectangle *pt. sym about intersection of diag.; line sym.*
 11. rhombus *point sym about intersed of diag. line sym.*

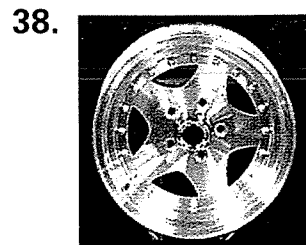
 **WHEEL HUBS** Describe the rotational symmetry of the wheel hub.



$45^\circ, 90^\circ, 135^\circ, 180^\circ, 225^\circ, 270^\circ, 315^\circ$



$51\frac{2}{7}^\circ, 102\frac{4}{7}^\circ$



$72^\circ, 144^\circ, 216^\circ, 288^\circ$

Written Exercises

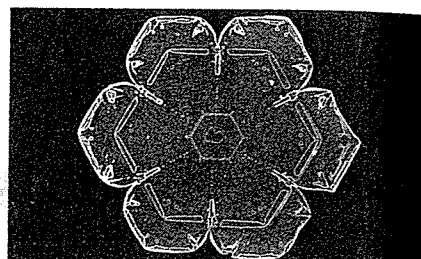
Consider the object shown in each photograph as a plane figure.

- a. State how many symmetry lines each figure has.
 b. State whether or not the figure has a symmetry point.
 c. List all the rotational symmetries of each figure between 0° and 360° .

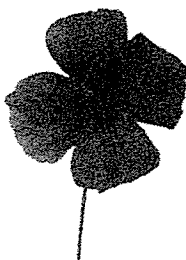
1. a) 5
 b) NO
 c) $72^\circ, 144^\circ, 216^\circ, 288^\circ$



2. a) 6
 b) Yes
 c) $60^\circ, 120^\circ, 180^\circ, 240^\circ, 300^\circ$

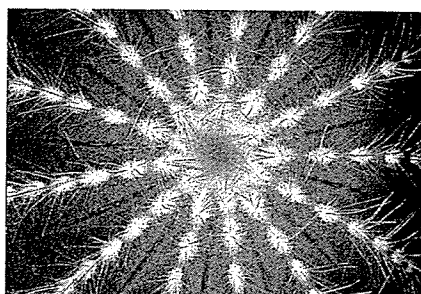


* Ignore the stem.



3. a) 4
 b) Yes
 c) $90^\circ, 180^\circ, 270^\circ$

4. a) 13
 b) NO
 c) $27\frac{9}{13}^\circ, 55\frac{5}{13}^\circ$, and multiples of $27\frac{9}{13}^\circ$



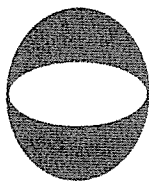
5. Which capital letters of the alphabet have just one line of symmetry? (One answer is 'D'.) *ABCDEKMTUVWY*

6. Which capital letters of the alphabet have two lines of symmetry? *H I O X*

7. Which capital letters of the alphabet have a point of symmetry? *H I N O S X Z*

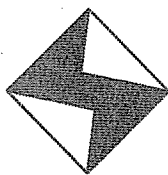
Determine whether the figure has rotational symmetry. If so, describe rotations that map the figure onto itself.

10.



Yes, 180°

11.



Yes, 180°

12.



NO if 360° is excluded

This pattern of five squares is centered at O . Find the 90° counterclockwise rotation image about O of each of the following.

15. point A *G*

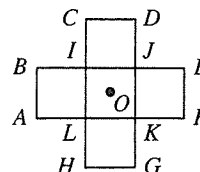
16. square $ABIL$ *GHLK*

17. rectangle $ABEF$

18. rectangle $CDKL$ *ABJK*

19. square $IJKL$

20. \overline{AE}



GHC

LJK

GC

21. (-1, 2)

Find the 90° counterclockwise rotation image about $(0, 0)$ of each point.

22. (3, 4)

21. $A(2, 1)$ 22. $B(4, -3)$ 23. $C(-1, 2)$

23. (-2, -1)

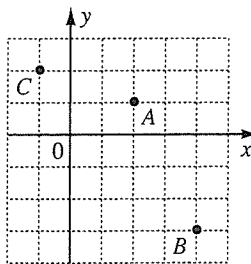
Find the 90° clockwise rotation image about $(0, 0)$ of each point.

24. (1, -2)

24. $A(2, 1)$ 25. $B(4, -3)$ 26. $C(-1, 2)$

25. (-3, -4)

26. (2, 1)



Trace the figure and determine whether each statement is true or false. Explain your reasoning.

27. If P' is the half-turn image of point P , then P is the half-turn image of P' .

True

28. The figure has 45° rotational symmetry.

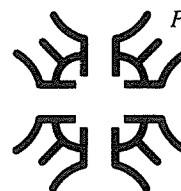
False

29. The figure has 90° rotational symmetry.

True

30. The figure has 270° rotational symmetry.

True



Trace the figure and use the tracing to answer each question.

31. Does the figure have 90° rotational symmetry?

Yes

32. Does the figure have 45° rotational symmetry?

NO

33. Does the figure have 270° rotational symmetry?

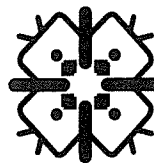
Yes

34. Does the figure have 60° rotational symmetry?

NO

35. Does the figure have reflectional symmetry?

Yes



Trace the figure and use the tracing to answer each question.

36. Does the figure have 180° rotational symmetry?

Yes

37. Does the figure have 135° rotational symmetry?

NO

38. Does the figure have 90° rotational symmetry?

Yes

39. Does the figure have reflectional symmetry?

NO

