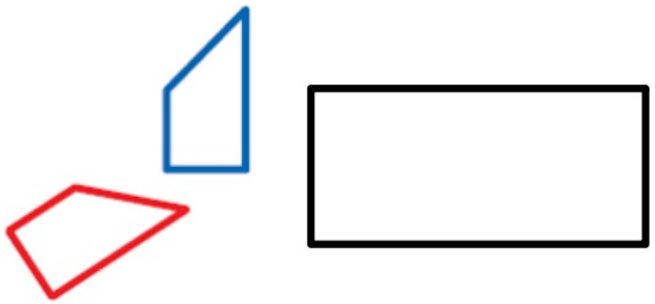
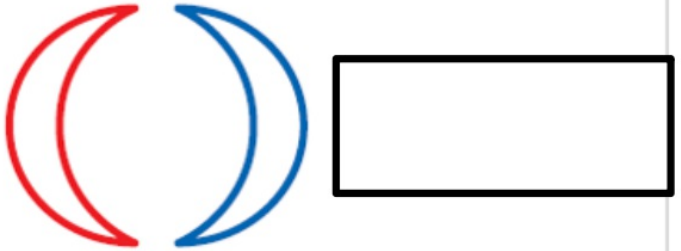
Warm Up

Identify each transformation.

1.



2.



Rotate Δ*ABC* with the given vertices by the given angle.

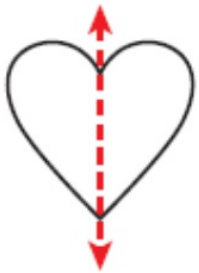
3. *A*(3, –4), *B*(5, 1), *C*(–4, 0); 180°

4. *A*(1, –5), *B*(7, –1), *C*(3, 6); 90°

A figure has **symmetry** if there is a transformation of the figure such that the image coincides with the preimage.

Line Symmetry

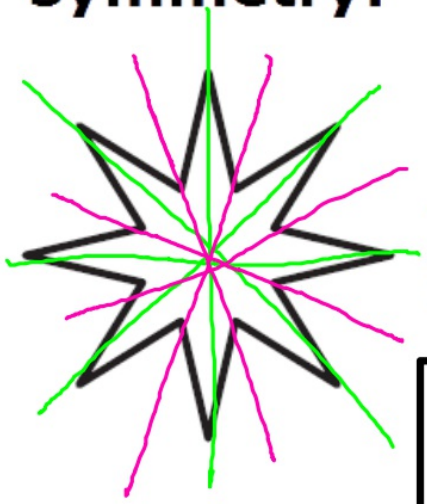
A figure has **line symmetry** (or reflection symmetry) if it can be reflected across a line so that the image coincides with the preimage. The **line of symmetry** (also called the axis of symmetry) divides the figure into two congruent halves.



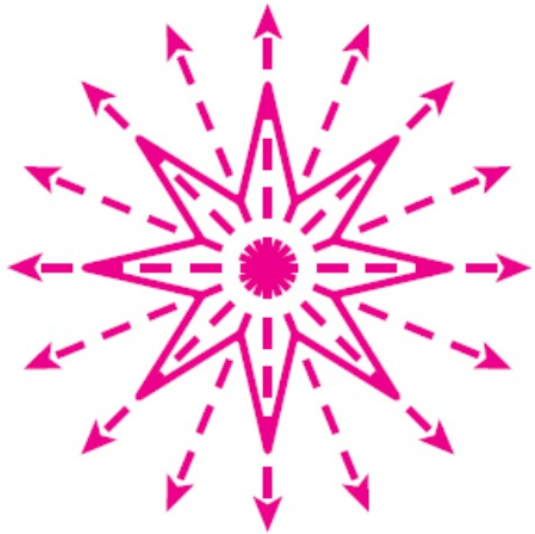
Tell whether the figure has line symmetry. If so, copy the shape and draw all lines of symmetry.

no line symmetry

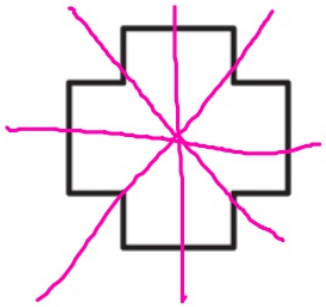
Tell whether the figure has line symmetry. If so, copy the shape and draw all lines of symmetry.



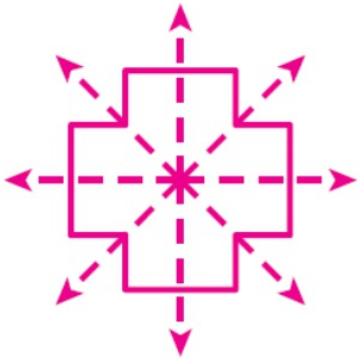
yes; eight lines of symmetry

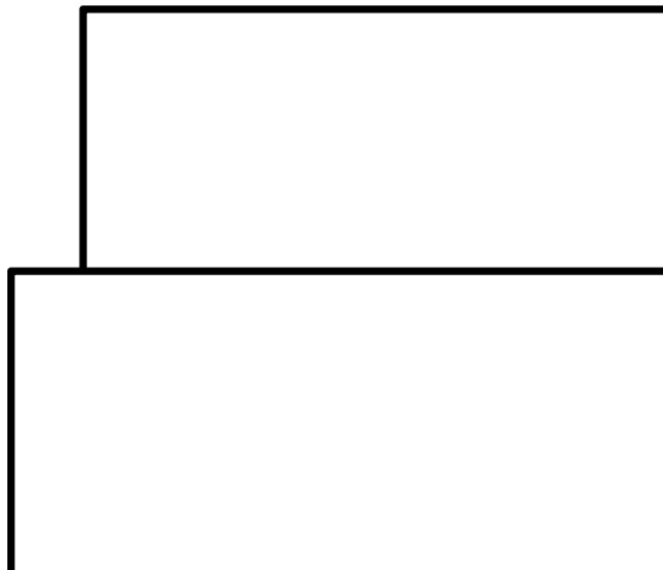


Tell whether the figure has line symmetry. If so, copy the shape and draw all lines of symmetry.



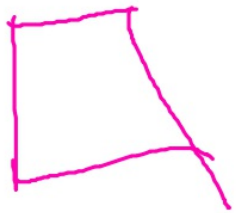
Yes; four lines of symmetry





Draw two figures that have lines of symmetry

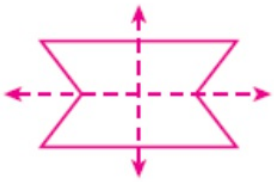
Draw two figures that do not have lines of symmetry



Tell whether each figure has line symmetry. If so, copy the shape and draw all lines of symmetry.

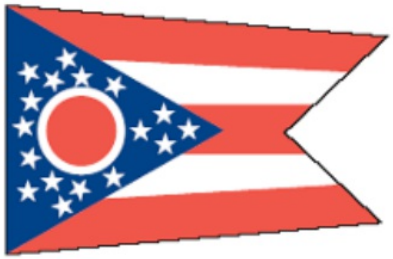
a. 

yes; two lines of symmetry

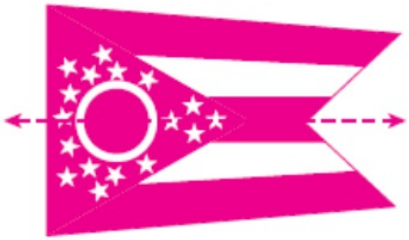


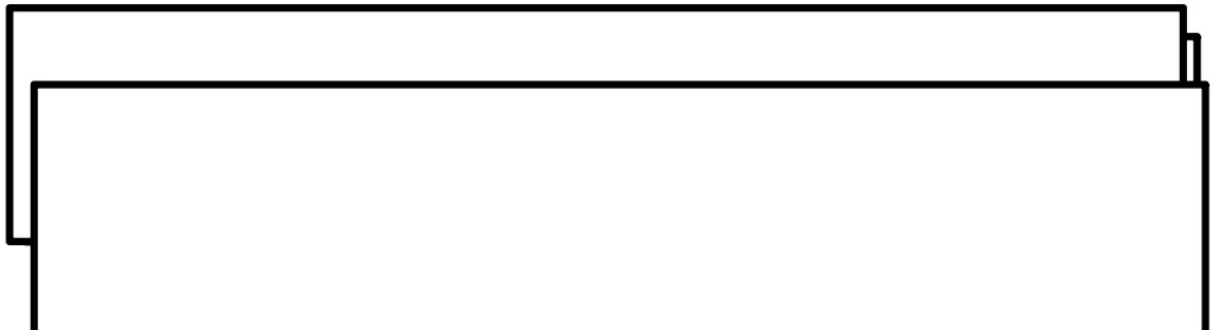
b. 

yes; one line of symmetry

c. 

yes; one line of symmetry

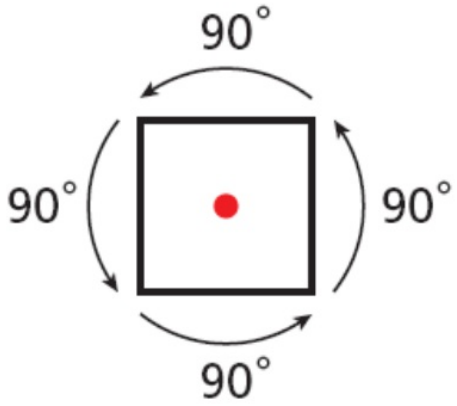


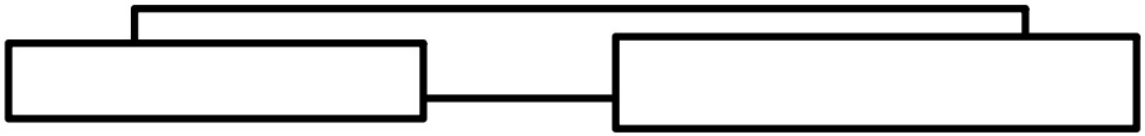


Rotational Symmetry

A figure has **rotational symmetry** (or *radial symmetry*) if it can be rotated about a point by an angle greater than 0° and less than 360° so that the image coincides with the preimage.

The *angle of rotational symmetry* is the smallest angle through which a figure can be rotated to coincide with itself. The number of times the figure coincides with itself as it rotates through 360° is called the *order* of the rotational symmetry.





Tell whether each figure has rotational symmetry. If so, give the angle of rotational symmetry and the order of the symmetry.

A. 

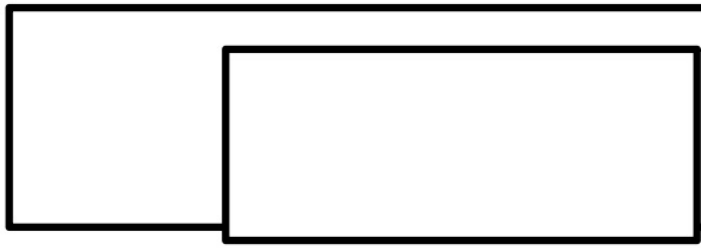
no rotational symmetry

B. 

yes; 180°; order: 2

C. 

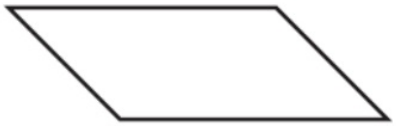
yes; 90°; order: 4



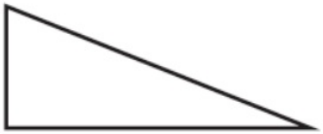
Tell whether each figure has rotational symmetry. If so, give the angle of rotational symmetry and the order of the symmetry.

a. 

yes; 120°; order: 3

b. 

yes; 180°; order: 2

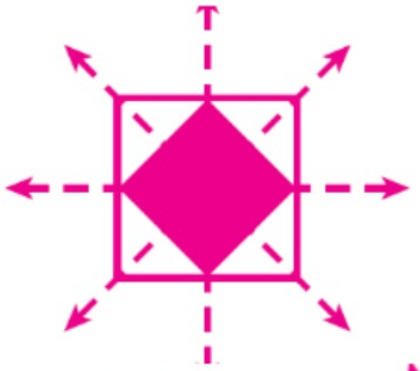
c. 

no rotational symmetry

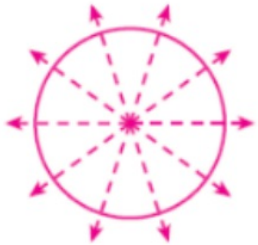
Describe the symmetry of each icon. Copy each shape and draw any lines of symmetry. If there is rotational symmetry, give the angle and order.

No line symmetry; rotational symmetry; angle of rotational symmetry: 180°; order: 2

Line symmetry and rotational symmetry; angle of rotational symmetry: 90°; order: 4

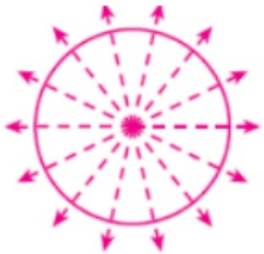


a.



line symmetry and rotational symmetry; 72°; order: 5

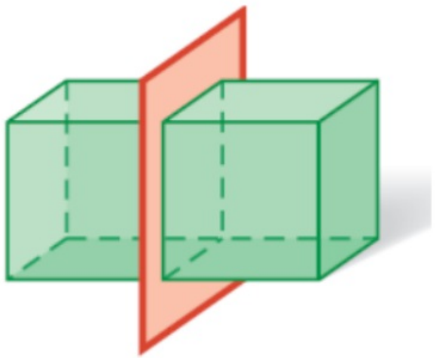
b.



line symmetry and rotational symmetry; 51.4°; order: 7

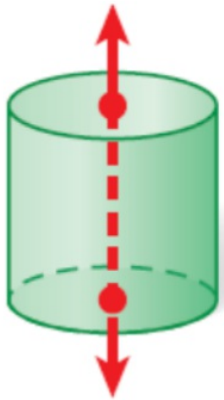
If a letter has line symmetry, draw the line,
If a letter has rotational symmetry, draw a dot
at the center of rotation

A three-dimensional figure has *plane symmetry* if a plane can divide the figure into two congruent reflected halves.



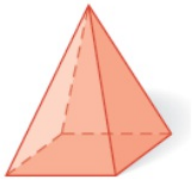
Plane symmetry

A three-dimensional figure has *symmetry about an axis* if there is a line about which the figure can be rotated (by an angle greater than 0° and less than 360°) so that the image coincides with the preimage.



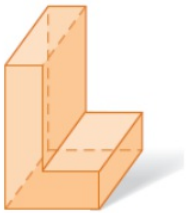
Symmetry about an axis

Tell whether the figure has plane symmetry, symmetry about an axis, or neither.

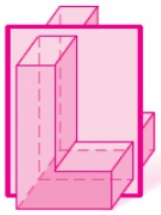


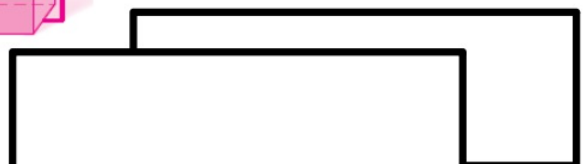
plane symmetry and
symmetry about an axis

Tell whether the figure has plane symmetry, symmetry about an axis, or neither.



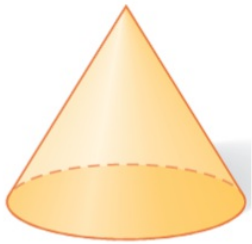
plane symmetry





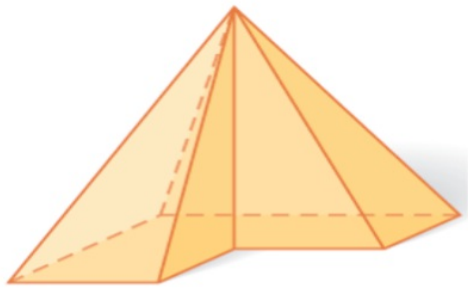
Tell whether each figure has plane symmetry, symmetry about an axis, or no symmetry.

a. cone



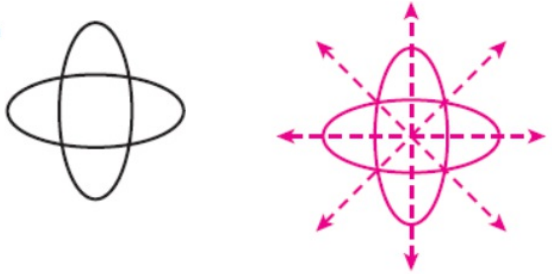
plane symmetry
and symmetry
about an axis

b. pyramid



neither

Describe the symmetry of each figure. Draw any lines of symmetry. Give the angle and the order of any rotational symmetry.

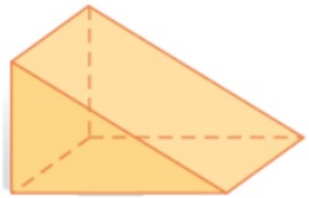
1. 

Line symmetry and rotational symmetry; 90°; order: 4

2. 

No symmetry

Tell whether each figure has plane symmetry, symmetry about an axis, or neither.

3. 

plane symmetry

4. 

symmetry about an axis

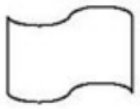
1. Describe the *line of symmetry* of an isosceles triangle.

2. The capital letter T has ___?___ . (*line symmetry* or *rotational symmetry*)

Tell whether each figure has line symmetry. If so, copy the shape and draw all lines of symmetry.

3. 

4. 

5. 

Tell whether each figure has rotational symmetry. If so, give the angle of rotational symmetry and the order of the symmetry.

6. 

7. 

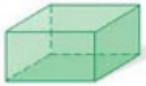
8. 

9. **Architecture** The Pentagon in Alexandria, Virginia, is the world's largest office building. Copy the shape of the building and draw all lines of symmetry. Give the angle and order of rotational symmetry.

Tell whether each figure has plane symmetry, symmetry about an axis, or neither.

10. prism 

11. cylinder 

12. rectangular prism 

PRACTICE AND PROBLEM SOLVING

Tell whether each figure has line symmetry. If so, copy the shape and draw all lines of symmetry.

13. 

14. 

15. 

Tell whether each figure has rotational symmetry. If so, give the angle of rotational symmetry and the order of the symmetry.

16. 

17. 

18. 

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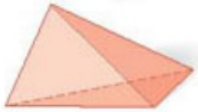
Tell whether each figure has plane symmetry, symmetry about an axis, or neither.

20. sphere 

21. triangular pyramid 

22. torus 

Draw a triangle with the following number of lines of symmetry. Then classify the triangle.

23. exactly one line of symmetry

24. three lines of symmetry

25. no lines of symmetry

Tell whether the figure with the given vertices has line symmetry and/or rotational symmetry. Give the angle and order if there is rotational symmetry. Draw the figure and any lines of symmetry.

29. $A(-2, 2), B(2, 2), C(1, -2), D(-1, -2)$

30. $R(-3, 3), S(3, 3), T(3, -3), U(-3, -3)$