Geometry 9.5

Identify line and rotational symmetry in two dimensional figures

Identify plane and axis symmetry in three-dimensional figures

"symmetry" match

line symmetry (reflection symmetry)

line of symmetry

rotational symmetry

center of symmetry

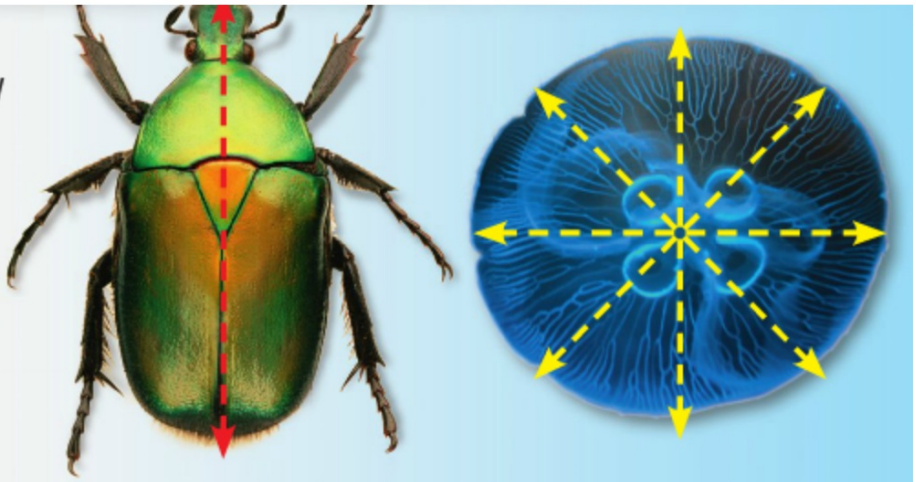
order of symmetry

magnitude of symmetry

plane symmetry

axis symmetry

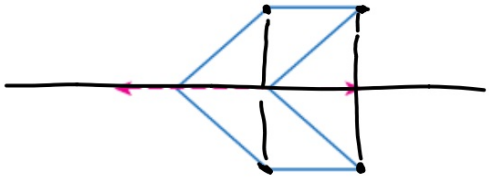
- In the animal kingdom, the symmetry of an animal's body is often an indication of the animal's complexity. Animals displaying line symmetry, such as insects, are usually more complex life forms than those displaying rotational symmetry, like a jellyfish.



**1 Symmetry in Two-Dimensional Figures** A figure has **symmetry** if there exists a rigid motion—reflection, translation, rotation, or glide reflection—that maps the figure onto itself. One type of symmetry is line symmetry.

**KeyConcept Line Symmetry**

A figure in the plane has **line symmetry** (or *reflection symmetry*) if the figure can be mapped onto itself by a reflection in a line, called a **line of symmetry** (or *axis of symmetry*).



(reflection)

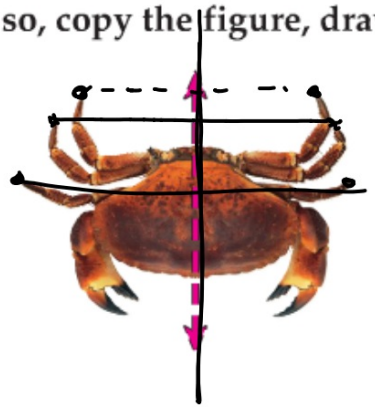
The Line of Symmetry is a perp bisector between A and A'

## Real-World Example 1 Identify Line Symmetry

PT

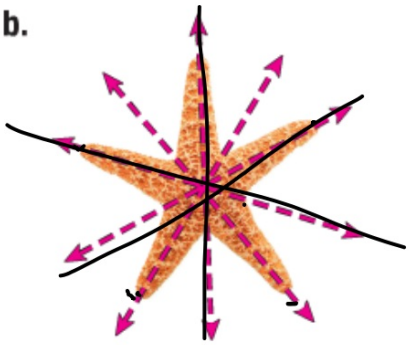
**BEACHES** State whether the object appears to have line symmetry. Write *yes* or *no*. If so, copy the figure, draw all lines of symmetry, and state their number.

a.



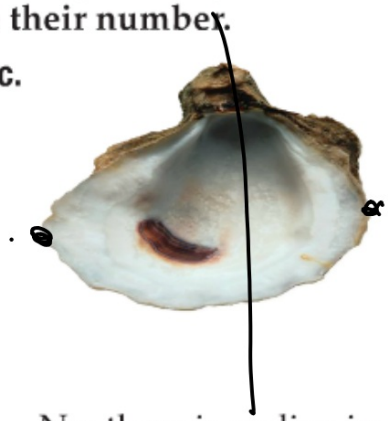
Yes; the crab has one line of symmetry.

b.



Yes; the starfish has five lines of symmetry.

c.

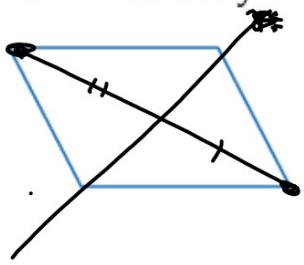


No; there is no line in which the oyster shell can be reflected so that it maps onto itself.

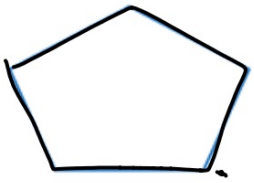
## GuidedPractice

**State whether the figure has line symmetry. Write *yes* or *no*. If so, copy the figure, draw all lines of symmetry, and state their number.**

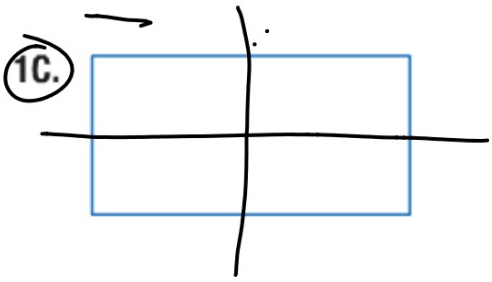
**1A.**



**1B.**



**1C.**

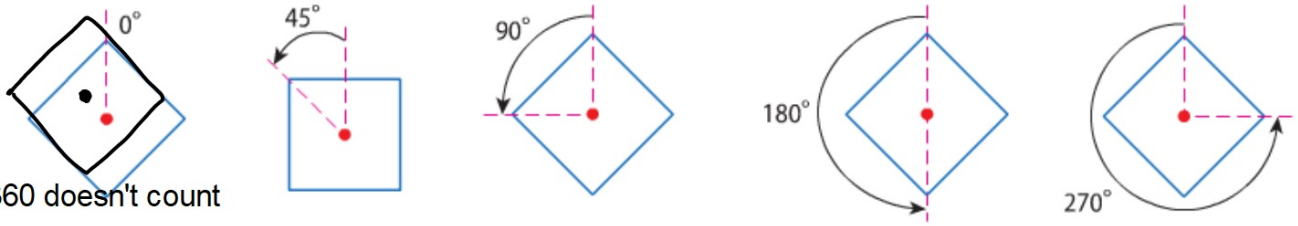


## KeyConcept Rotational Symmetry

A figure in the plane has **rotational symmetry** (~~or *radial symmetry*~~) if the figure can be mapped onto itself by a rotation between 0° and 360° about the center of the figure, called the **center of symmetry** (or *point of symmetry*).

$\frac{360}{4} = 90$

**Examples** The figure below has rotational symmetry because a rotation of 90°, 180°, or 270° maps the figure onto itself.

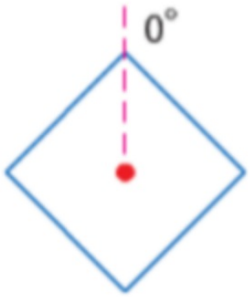



360 doesn't count

order= # of times in 360 4

magnitude =angle of rotation (in degrees) to each new position (lines up everything again)

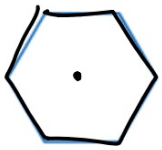
$\frac{360}{4}$ 90°



360 degrees does not count

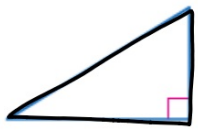
## Example 2 Identify Rotational Symmetry

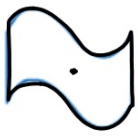
State whether the figure has rotational symmetry. Write *yes* or *no*. If so, copy the figure, locate the center of symmetry, and state the order and magnitude of symmetry.

a. 

$\frac{360}{6}$

yes
$o = 6$
$m = 60°$

b. 

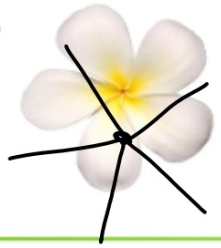
c. 

yes
$o = 2$
$m = 180°$

## GuidedPractice

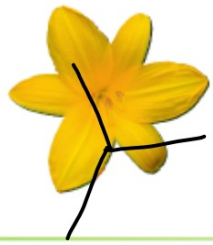
**FLOWERS** State whether the flower appears to have rotational symmetry. Write *yes* or *no*. If so, copy the flower, locate the center of symmetry, and state the order and magnitude of symmetry.

**2A.**



yes
$o = 5$
$m = 72°$

**2B.**



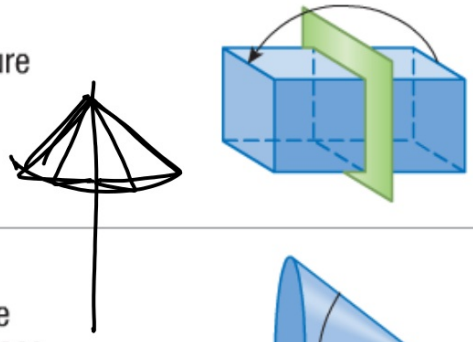
yes
$o = 3$
$m = 120°$

**2C.**

## KeyConcept Three-Dimensional Symmetries

### Plane Symmetry

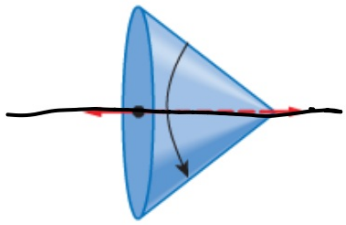
A three-dimensional figure has **plane symmetry** if the figure can be mapped onto itself by a reflection in a plane.



Can you slice it?

### Axis Symmetry

A three-dimensional figure has **axis symmetry** if the figure can be mapped onto itself by a rotation between 0° and 360° in a line.



Can you spin it?

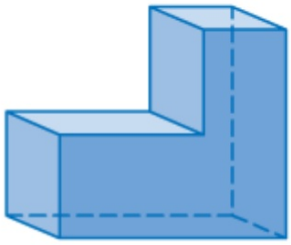
tape onto pencil

p 665

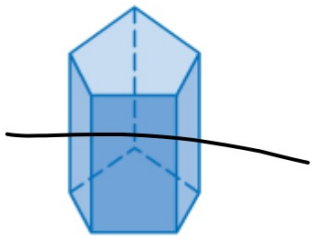
## Example 3 Three-Dimensional Symmetry

State whether the figure has *plane* symmetry, *axis* symmetry, *both*, or *neither*.

**a.** L-shaped prism



**b.** regular pentagonal prism



$\frac{360}{5} = 72$

## GuidedPractice

**SPORTS** **State whether each piece of sports equipment appears to have *plane* symmetry, *axis* symmetry, *both*, or *neither* (ignoring the equipment's stitching or markings).**

**3A.**

**3B.**

**3C.**

3D. 

WB 9.5
Sk + pr.