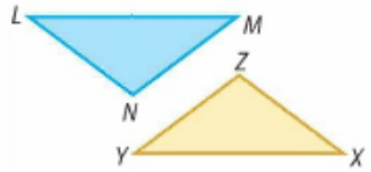
1.



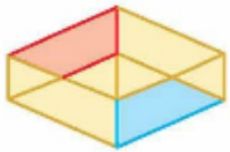
Show your work.

The two triangles are congruent because a rotation followed by a translation will map $\triangle LMN$ onto $\triangle XYZ$.

2.

The two figures are congruent because a clockwise rotation of 90° followed by a translation maps the red figure onto the green figure.

3. The Boyd Box Company uses the logo shown. What transformations could be used if the red trapezoid is the preimage and the blue trapezoid is the image? Are the two figures congruent? Explain. (Example 3)



Sample answer: a rotation followed by a translation; they are congruent because an image produced by a rotaion and a translation have the same size and shape.

4. **Building on the Essential Question** Why do translations, reflections, and rotations create congruent images?

Sample answer: Rotations, reflections, and translations do not change size or shape. Since congruent figures have the same size and shape, the three transformations create congruent images.

Rate Yourself!

How confident are you about the relationship between congruence and transformations? Check the box that applies.

Tutor

Independent Practice

Go online for Step-by-Step Solutions

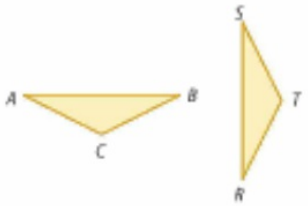
Determine if the two figures are congruent by using transformations. Explain your reasoning. (Examples 1 and 2)

1.

Show your work.

not congruent; No sequence of transformations maps *RSTU* onto *WXYZ* exactly.

2.

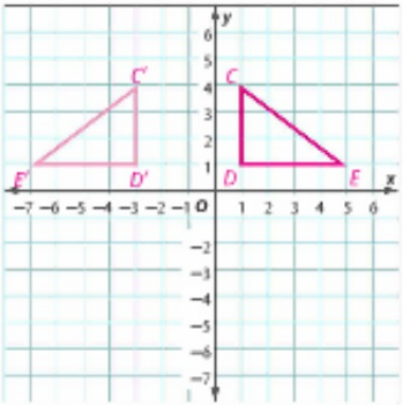


congruent; A counterclockwise rotation of 90° followed by a translation maps △*ABC* onto △*RST*.

3. Nilda purchased some custom printed stationery with her initials. What transformations could be used if the letter "Z" is the preimage and the letter "N" is the image in the design shown? Are the two figures congruent? Explain. (Example 3)

Sample answer: 90° clockwise rotation followed by a translation; they are congruent because an image produced by a rotation and a translation have the same size and shape.

4. CCSS **Multiple Representations** One way to identify congruent triangles is to prove their matching sides have the same measure. Triangle *CDE* has vertices at (1, 4), (1, 1), and (5, 1).



a. **Graphs** Graph △*CDE*.

b. **Numbers** Find the lengths of the sides of △*CDE*.

***DC* = 3 units, *DE* = 4 units, *CE* = 5 units**

c. **Geometry** Reflect △*CDE* over the *y*-axis, then translate it 2 units left. Label the vertices of the image *C'D'E'*. Write the coordinates of △*C'D'E'* below.

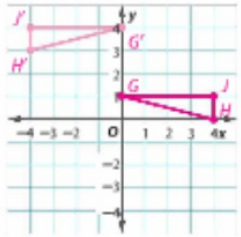
***C'*(−3, 4), *D'*(−3, 1), *E'*(−7, 1)**

d. **Numbers** Find the lengths of the sides of △*C'D'E'*.

***D'C'* = 3 units, *D'E'* = 4 units, *C'E'* = 5 units**

5. Graph $\triangle GHJ$ with vertices at $G(0, 1)$, $H(4, 0)$, and $J(4, 1)$. Then graph the image of the triangle after a translation of 3 units up followed by a reflection over the y-axis. Find the lengths of each side of the preimage and the image. Then determine if the two figures are congruent.

4 units, 1 unit, $\sqrt{17}$ units; 4 units, 1 unit, $\sqrt{17}$ units; yes



H.O.T. Problems Higher Order Thinking

6. **Model with Mathematics** Create a design in the space at the right, using a series of transformations that produce congruent figures. Exchange designs with a classmate and determine what transformations were used to create their design.

Show your work.

See students' work.

7. **Persevere with Problems** Triangle $A'B'C'$ has vertices $A'(-4, 5)$, $B'(-1, 4)$, and $C'(-2, 0)$. Triangle ABC was rotated 90° in a clockwise direction about the origin, translated 2 units up, and reflected over the y-axis. What were the coordinates of the vertices of triangle ABC?

$A(-3, 4)$, $B(-2, 1)$, $C(2, 2)$

8. **Persevere with Problems** Line segment XY has endpoints at $X(3, 1)$ and $Y(-2, 0)$. Its image after a series of transformations has endpoints at $X'(0, 1)$ and $Y'(5, 0)$. Find the series of transformations that maps $\overline{XY}$ onto $\overline{X'Y'}$. Then find the exact length of both segments.

Sample answer: a reflection over the y-axis followed by a translation of 3 units to the right; $\sqrt{26}$

9. **Justify Conclusions** A line segment has endpoints at (a, b) and (c, d). Determine whether the following statements are *true* or *false*. Justify your reasoning.

   a. The line segment with endpoints at $(a + x, b)$ and $(c + x, d)$ is congruent to the original segment. **true; Sample answer: The segment was translated x units to the right.**

   b. The line segment with endpoints at $\left(\frac{2}{3}a, \frac{2}{3}b\right)$ and $\left(\frac{2}{3}c, \frac{2}{3}d\right)$ is congruent to the original segment. **false; Sample answer: The segment was dilated by a scale factor of $\frac{2}{3}$.**