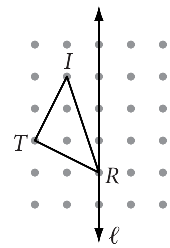
# Lesson 7.1 • Transformations and Symmetry

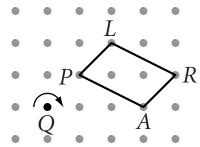
**Name** ______________________ **Period** __________ **Date** ____________

In Exercises 1–3, copy the figure onto graph or dot paper and perform the transformation.

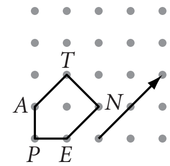
**1.** Reflect $\triangle TRI$ over line $\ell$.



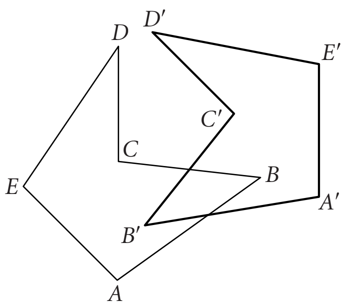

**2.** Rotate *PARL* 270° clockwise about *Q*.




**3.** Translate *PENTA* by the given vector.

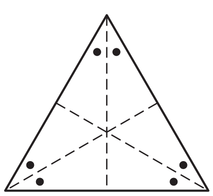



**4.** Copy *ABCDE* and its reflected image, $A'B'C'D'E'$. Use construction tools to locate the line of reflection, $\ell$. Explain your method.

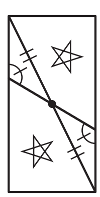



In Exercises 5–8, identify the type(s) of symmetry in each figure.

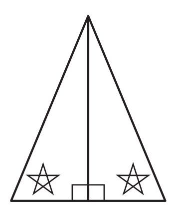
**5.** Equilateral triangle



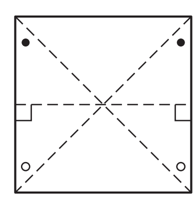
**6.** Rectangle



**7.** Isosceles triangle



**8.** Square



In Exercises 9–12, draw each polygon and identify the type(s) of symmetry in each. Draw all lines of reflection and mark centers of rotation.

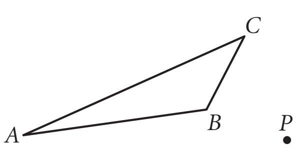
**9.** Rhombus

**10.** Parallelogram

**11.** Isosceles trapezoid

**12.** Square

**13.** Copy $\triangle ABC$ and the center of rotation, *P*. Using only a compass and straightedge, construct the image of $\triangle ABC$ after a rotation of 180° about *P*.

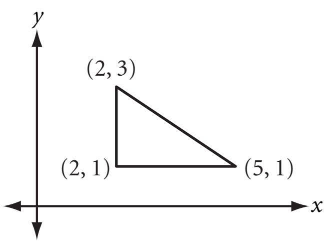


# Lesson 7.2 • Properties of Isometries

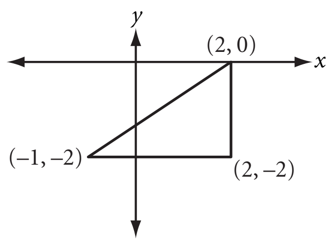
**Name** ______________________________ **Period** __________ **Date** ______________

In Exercises 1–3, copy the figure and draw the image according to the rule. Identify the type of transformation.

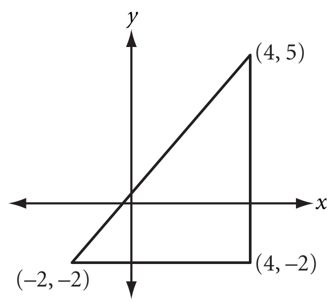
**1.** $(x, y) \rightarrow (-x, -y)$




**2.** $(x, y) \rightarrow (x - 4, y + 6)$

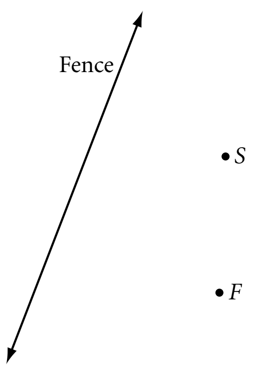



**3.** $(x, y) \rightarrow (4 - x, y)$

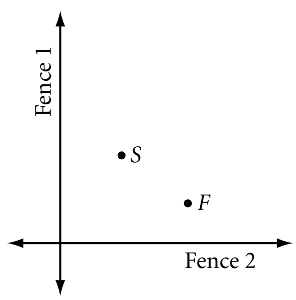



In Exercises 4 and 5, the Harbour High Geometry Class is holding a Fence Race. Contestants must touch each fence at some point as they run from *S* to *F*. Copy each diagram and use your geometry tools to draw the best possible race path.

**4.**

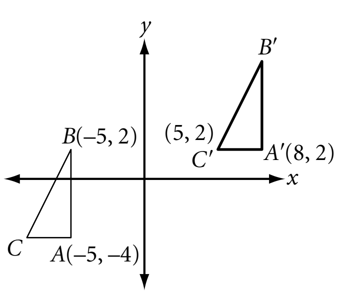



**5.**

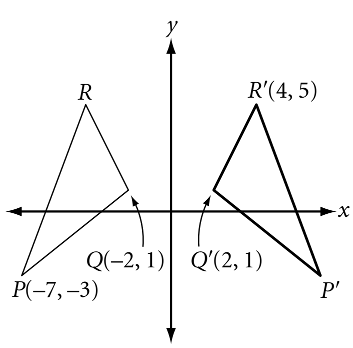



In Exercises 6–8, complete the ordered pair rule that transforms each triangle to its image. Identify the transformation. Find all missing coordinates.

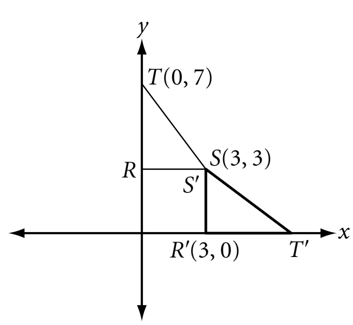
**6.** $(x, y) \rightarrow$ (______, ______)




**7.** $(x, y) \rightarrow$ (______, ______)




**8.** $(x, y) \rightarrow$ (______, ______)




**9.** Give the inverse mapping rule (the rule that maps the image back to the original) for each of the mappings in Exercises 1–3 and 6–8.

# Lesson 7.3 • Compositions of Transformations

**Name** ______________________________ **Period** __________ **Date** ______________

In Exercises 1–8, name the single transformation that can replace the composition of each set of multiple transformations.

**1.** Translation by $(+4, +1)$, followed by $(+2, -3)$, followed by $(-8, +7)$

**2.** Rotation 60° clockwise, followed by 80° counterclockwise, followed by 25° counterclockwise all about the same center of rotation

**3.** Reflection over vertical line $m$, followed by reflection over vertical line $n$, where $n$ is 8 units to the right of $m$

**4.** Reflection over vertical line $p$, followed by reflection over horizontal line $q$

**5.** Reflection over vertical line $n$, followed by reflection over vertical line $m$, where $n$ is 8 units to the right of $m$

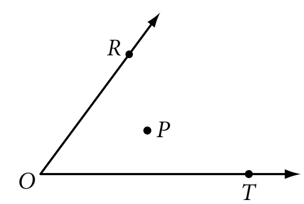
**6.** Reflection over horizontal line $q$, followed by reflection over vertical line $p$

**7.** Translation by $(+6, 0)$, followed by reflection over the $y$-axis

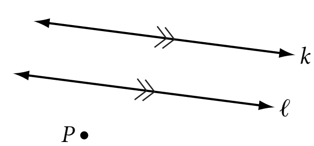
**8.** Reflection over the $y$-axis, followed by translation by $(+6, 0)$

In Exercises 9–12, copy the figure onto your paper and use your geometry tools to perform the given transformation.

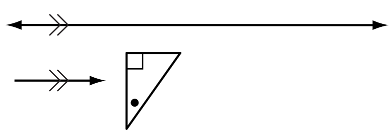
**9.** Locate $P'$, the reflected image over $\overrightarrow{OR}$, and $P''$, the reflected image of $P'$ over $\overrightarrow{OT}$. Find $m\angle ROT$ and give a single transformation that maps $P$ to $P''$.



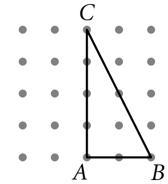

**10.** Locate $P'$, the reflected image over $k$, and $P''$, the reflected image of $P'$ over $\ell$. Find the distance between $\ell$ and $k$ and give a single transformation that maps $P$ to $P''$.




**11.** Draw five glide-reflected images of the triangle.

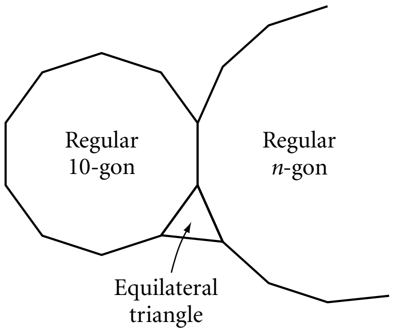


**12.** Using patty paper and dot paper, make three rotation-glide images of $\triangle ABC$. Find the first image by rotating the triangle 90° counterclockwise about point $A$ and then translating by the rule $(x, y) \rightarrow (x + 4, y + 4)$. The second image is the image of the first image and so on.

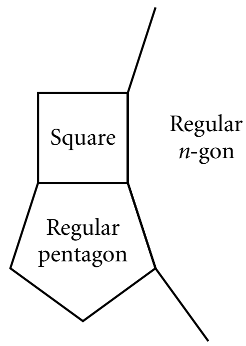


**Name** ______________________________ **Period** __________ **Date** ______________

**1.** Find $n$.




**2.** Find $n$.



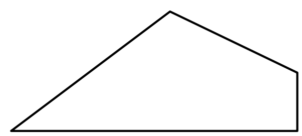

**3.** What is a regular tessellation? Sketch an example to illustrate your explanation.

**4.** What is a 1-uniform tiling? Sketch an example of a 1-uniform tiling that is not a regular tessellation.

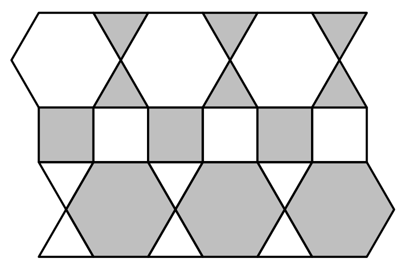
**5.** Use your geometry tools to draw the $4.8^2$ tessellation.

**6.** Carefully draw the tessellation $3^6/3^2.4.3.4$ with your geometry tools. Draw the dual of the tessellation and identify the polygons in the dual. Calculate the measure of each angle in the dual.

**7.** Trace the quadrilateral at right (or draw a similar one). Make the outline dark. Set another piece of paper on top of the quadrilateral and, by tracing, create a tessellation. (Hint: Trace vertices and use a straightedge to connect them.)



**8.** Give the numerical name for the tessellation at right.



**9.** Use your geometry tools to draw a parallelogram. Draw squares on each side. Create a tessellation by duplicating your parallelogram and squares.

**10.** On dot paper, draw a small concave quadrilateral (vertices on dots). Allow no more than three dots inside the figure. Tessellate the entire paper with your quadrilateral. Color and shade your tessellation.

**11.** In *non-edge-to-edge tilings,* the vertices of the polygons do not have to coincide, as in these wooden deck patterns. Use graph paper to create your own non-edge-to-edge tiling.