

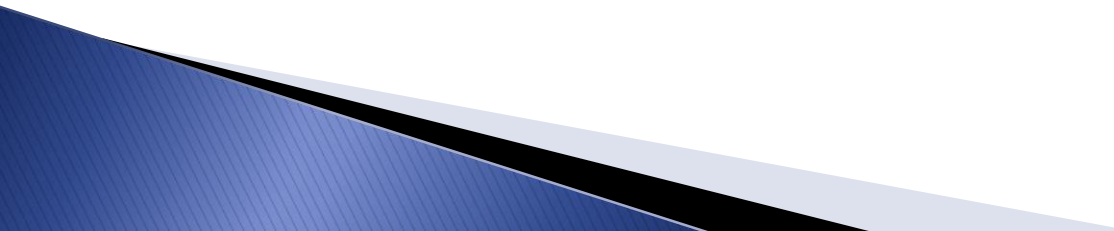
Lesson 67

Introduction to Transformations

Transformation – A change in position, size, or shape of a figure. Translations, reflections, and rotations are examples of a special class of transformation called isometries.

Preimage – The original figure in a transformation.

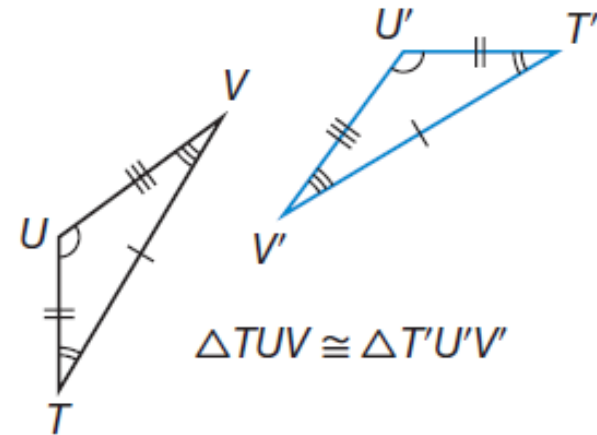
Image – The shape that results from the transformation.



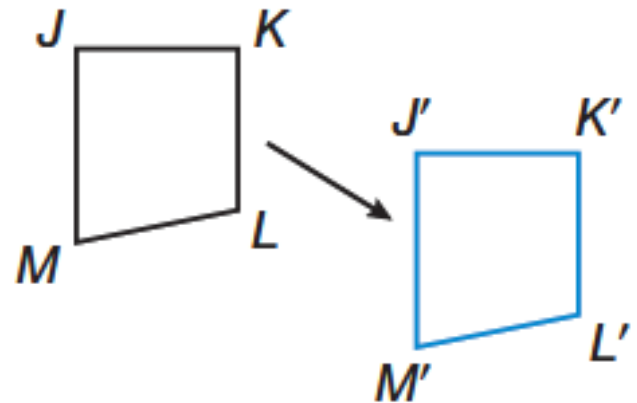
An isometry maps a figure to a congruent figure – An isometry is a transformation that does not change the size or shape of a figure. That is, the image of an isometry is congruent to its preimage. This diagram shows an isometry with preimage

The small ' marks next to T , U , and V are primes: a symbol used to label the image in a transformation.

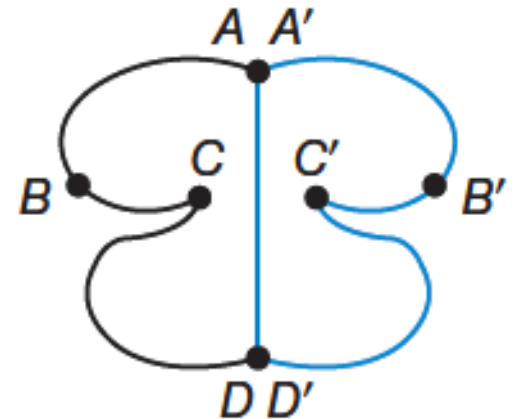
An isometry is also called a congruence transformation or rigid transformation.



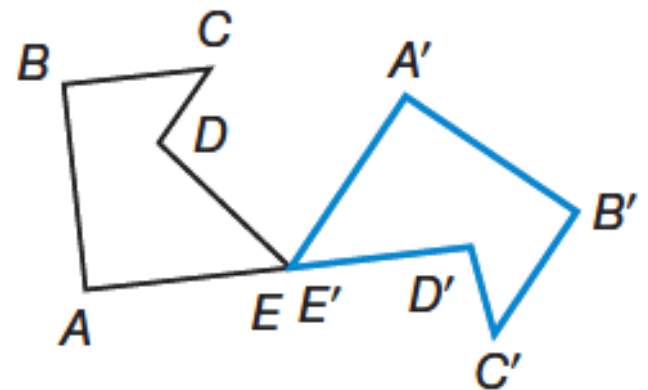
Translation (Slide) – A type of transformation that shifts or slides every point of a figure the same distance in the same direction as shown with parallelogram $JKLM$.



Reflection (Flip) – A transformation across a line (the line of reflection) such that the line is the perpendicular bisector of each segment joining each point and its image (If a point lies on the line of reflection, the point and its image will be the same.) In this diagram, the figure has been reflected across \overleftrightarrow{AD} . Each point of the preimage is the same distance from \overleftrightarrow{AD} as its matching point on the reflected image.



Rotation (Turn) - A transformation about a point (the point or center of rotation) such that each point and its image are the same distance from that point, and angles formed by a point, its image, and the point of rotation (as the vertex) are congruent. In this diagram, $ABCDE$ has been rotated clockwise about E . Notice that $EA = EA'$, $EB = EB'$, $EC = EC'$, and $ED = ED'$; notice also that $\angle AEA'$, $\angle BEB'$, $\angle CEC'$, and $\angle DED'$ are all congruent. Since E is the point of rotation, E and E' are the same point.

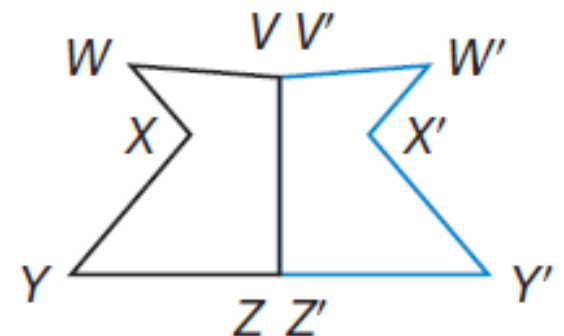


Example 1 Identifying Transformations

a. Identify the type of transformation illustrated below.

SOLUTION

The figure $VWXYZ$ is reflected across \overleftrightarrow{VZ} . Reflecting the figure flips the figure across the line of reflection. Notice that each distance from a point of the preimage to its image, other than V and Z , which are on the line of reflection, is bisected by \overleftrightarrow{VZ} .

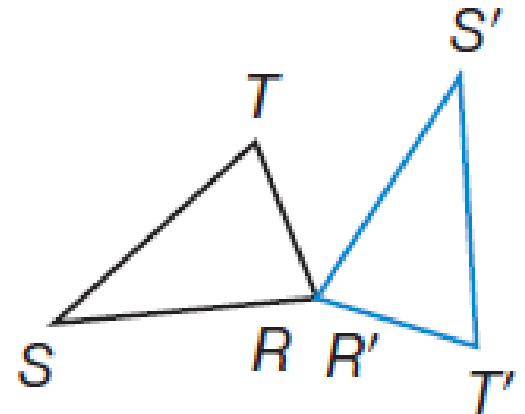


Example 1 Identifying Transformations

b. Identify the type of transformation illustrated below.

SOLUTION

Triangle RST is rotated about the fixed point R . Rotating the figure turns the figure around a fixed point. Notice that the triangle remains the same size and shape as before the rotation.

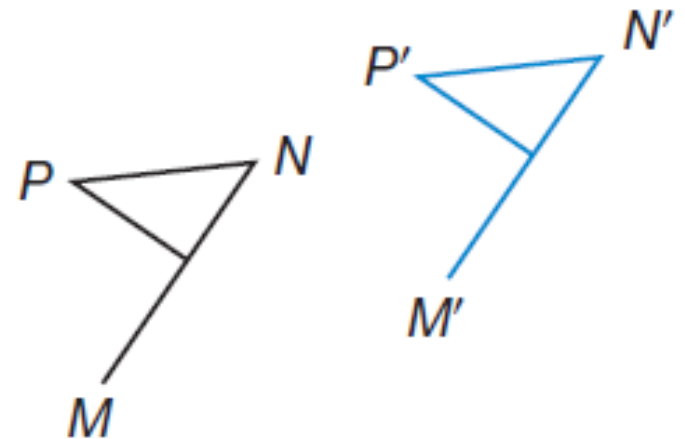


Example 1 Identifying Transformations

c. Identify the type of transformation illustrated below.

SOLUTION

The figure is translated up and to the right. In a translation the entire figure moves a specific distance in a specific direction.



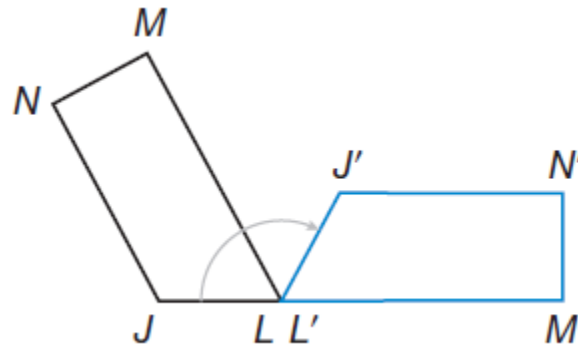
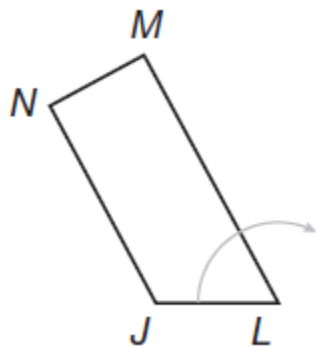
Example 2 Performing Transformations

Perform the indicated transformations.

a. Rotate the figure about point L .

SOLUTION

To rotate the figure about point L , keep L fixed and turn each point on a circular path around L as indicated.



Example 2 Performing Transformations

Perform the indicated transformations.

b. Translate the figure as indicated.

SOLUTION

To translate the figure, move each point of the preimage the distance and direction as indicated.



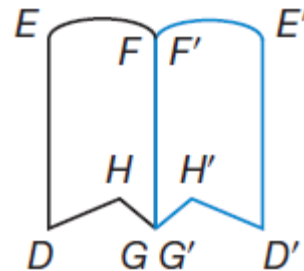
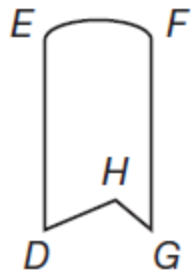
Example 2 Performing Transformations

Perform the indicated transformations.

c. Reflect the figure across \overleftrightarrow{FG} .

SOLUTION

To reflect the figure across \overleftrightarrow{FG} move each point across the line of reflection so that the point and its image are equidistant from the line of reflection.



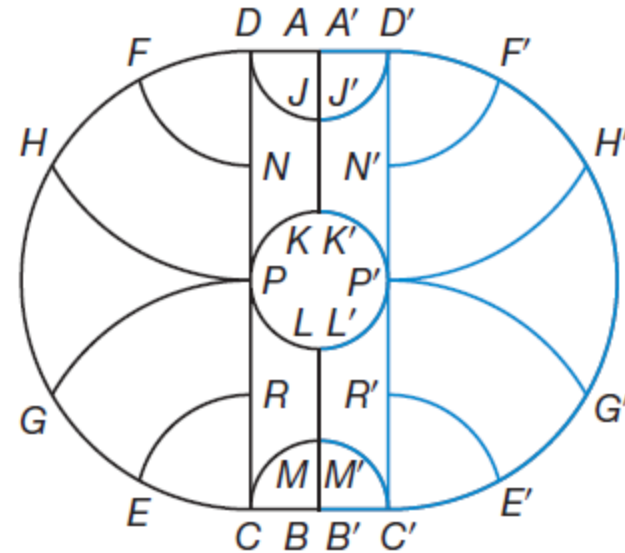
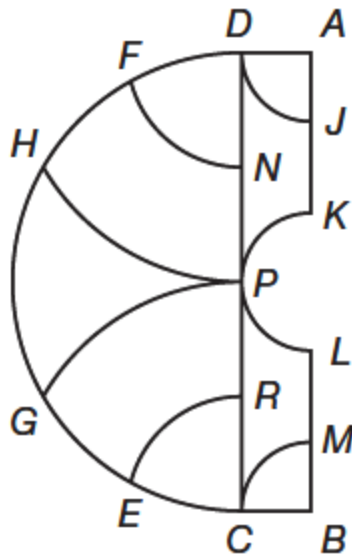
Example 3 Application: Stained Glass Design

Example 3 Application: Stained Glass Design

Often stained glass designers use vertical or horizontal symmetry to reduce the time it takes to design a project.

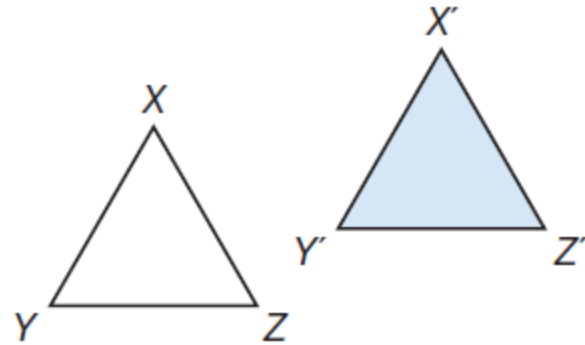
Reflect this template across the vertical line \overleftrightarrow{AB} to complete the design.

SOLUTION

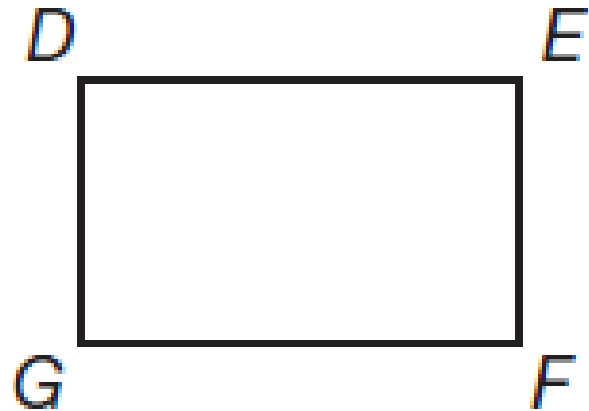


You Try!!!!

a. Identify the type of transformation which takes $\triangle XYZ$ to $\triangle X'Y'Z'$.

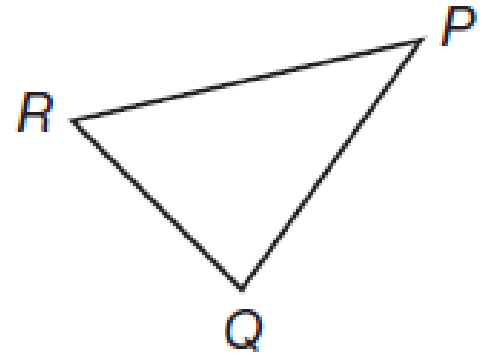


b. Reflect rectangle $DEFG$ across \overleftrightarrow{GF} . Label the image.



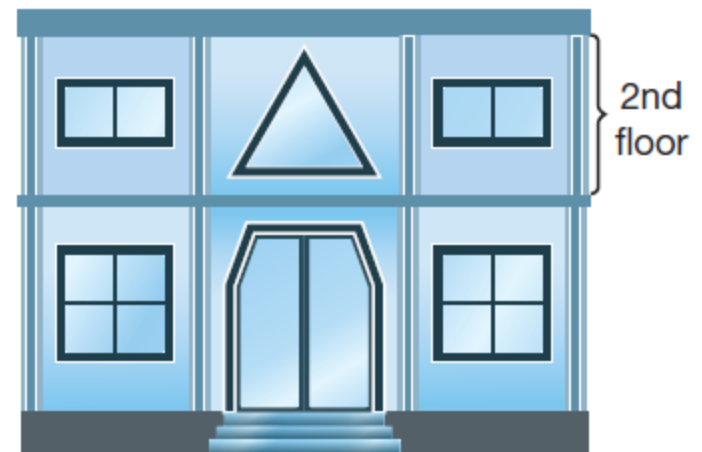
You Try!!!!

c. Rotate $\triangle PQR$ clockwise about point Q , so that Q' and P' are collinear with \overline{QR} .



You Try!!!!

d. This simplified blueprint shows the first two floors of the front of a new civic hall. The third floor will be a translation of the second floor so it is directly above the 2nd floor. Complete the plan by performing the translation.



Assignment

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Lesson Practice (Ask Mr. Heintz)

Page 449

Practice 1–30 (Do the starred ones first)