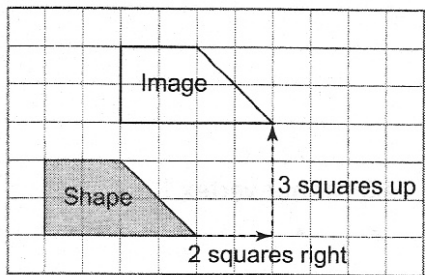# ▶ 7.7 Skill Builder

Translations

A **translation** moves a shape along a straight line.
A shape and its translation image face the same way.
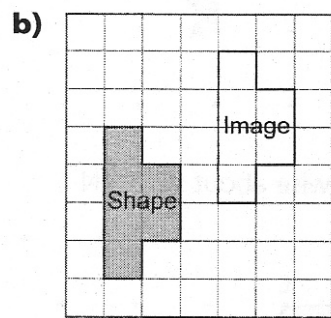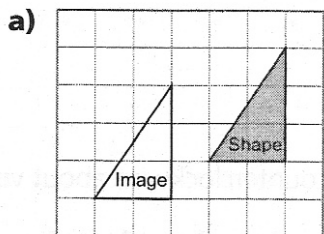
This shape was translated 2 squares right and 3 squares up.

We say how many squares left or right before we say how many up or down.
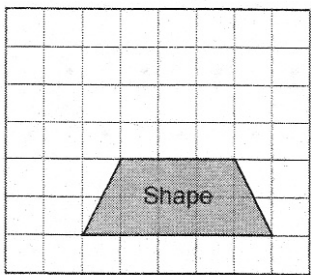
Check

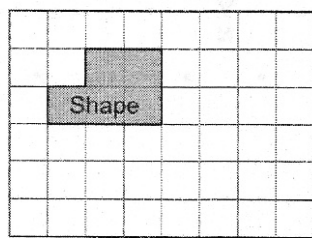**1.** Write the translation that moves each shape to its image.

a)

b)

_____

_____

2. Draw each translation image.

a) 1 square left and 3 squares up

b) 3 squares right and 2 squares down

# 7.7 Identifying Types of Symmetry on the Cartesian Plane

FOCUS Identify and classify line and rotational symmetry.

A diagram of a shape and its transformation image may have:

- line symmetry
- rotational symmetry
- both line symmetry and rotational symmetry
- no symmetry

Example 1 | Determining whether Shapes Are Related by Symmetry

Are rectangles ABCD and EFGH related by symmetry?
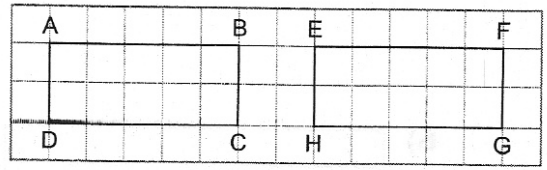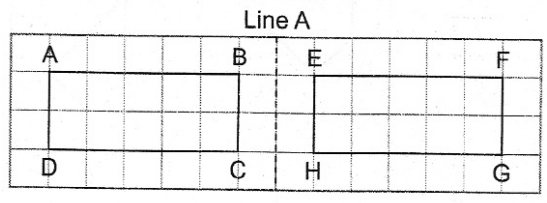
Solution

Check for line symmetry:
Rectangle ABCD is to the left of rectangle EFGH.
So, try a vertical line of reflection.
When I place a Mira on Line A,
the rectangle and its image match.
So, the rectangles are related by line symmetry.

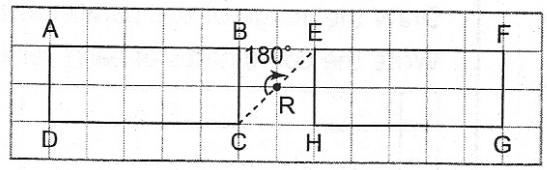*Matching points are the same distance from the line of reflection.*

Check for rotational symmetry:
The rectangles do not touch.
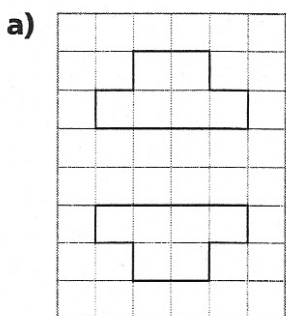So, try a point of rotation off the rectangles.
Try different points to see if the rectangles
ever match. When I rotate rectangle ABCD 180°
about point R, the rectangles match.
So, the rectangles are related by rotational symmetry.

Check

1. For each diagram, find out if the polygons are related by symmetry. ·

a)

Do the polygons face opposite ways? _____

One polygon is above the other,

so try a _____ line of reflection.

Use a Mira to find the line of reflection.

Are the polygons related by a reflection? _____

If they are, draw the line of reflection.

Do the polygons touch? _____

So, try a point of rotation _____ the polygons.

Try different points of rotation.

Do the polygons ever match? _____

Are the polygons related by a rotation? _____

If they are, label the point of rotation.

b)
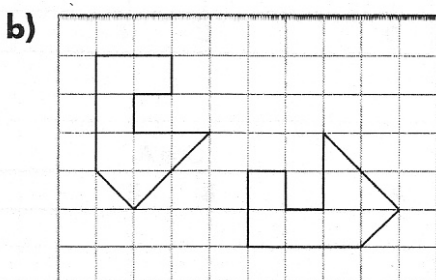
Do the polygons face different ways? _____

Do the polygons face opposite ways? _____

So, are the polygons related by a reflection? _____

Do the polygons touch? _____

So, try a point of rotation _____ the polygons.

Try different points of rotation.

Do the polygons ever match? _____

Are the polygons related by a rotation? _____

| Example 2 | Identifying Symmetry in a Shape and Its Transformation Image |

Draw the image of this parallelogram after a translation of 2 squares down and 1 square right. Write the coordinates of each vertex and its image. Describe any symmetry that results.
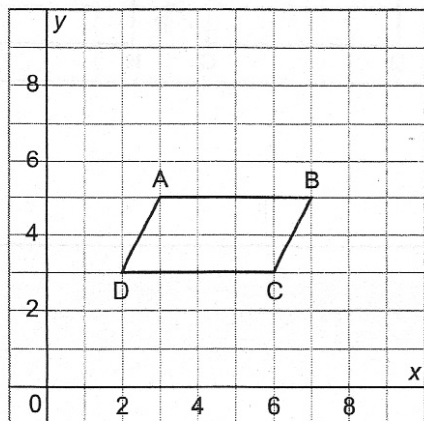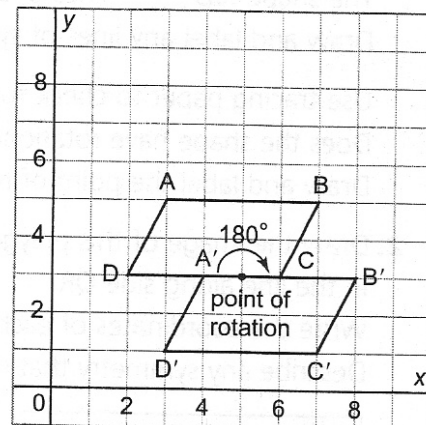
Solution

Translate parallelogram ABCD 2 squares down
and 1 square right.
Draw and label the translation image.
Write the coordinates of each vertex and its image.

Point	Image
A(3, 5)	A′(4, 3)
B(7, 5)	B′(8, 3)
C(6, 3)	C′(7, 1)
D(2, 3)	D′(3, 1)

Use a Mira to check for line symmetry.
There is no line on which I can place a Mira
so one parallelogram matches the other.
So, the shape does not have line symmetry.

Use tracing paper to check for rotational symmetry.
The shape and its tracing match after a rotation
of 180° about (5, 3).
So, the shape has rotational symmetry.

Check

1. Draw the image of this polygon after
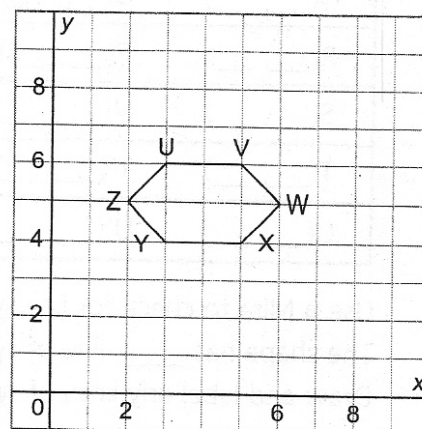a translation of 2 squares down.
Write the coordinates of each vertex and its image.
Describe any symmetry that results.

Translate the polygon 2 squares down.
Draw and label the translation image.

Point	Image
U(3, 6)	Y(3, 4)
V(5, 6)	X(5, 4)
W(__, __)	W′(__, __)
X(__, __)	X′(__, __)
Y(__, __)	Y′(__, __)
Z(__, __)	Z′(__, __)

Use a Mira to check for line symmetry.

The shape has _____ lines of symmetry:

Draw and label any lines of symmetry you found.

Use tracing paper to check for rotational symmetry.

Does the shape have rotational symmetry? _____

Draw and label the point of rotation.

2. Draw the image of this polygon after a reflection in the line along side QR.

Write the coordinates of each vertex and its image.

Describe any symmetry that results.

Reflect the polygon.

Draw and label the reflection image.

Point	Image
P(___, ___)	P'(___, ___)
Q(___, ___)	Q(___, ___)
R(___, ___)	R(___, ___)
S(___, ___)	S'(___, ___)
T(___, ___)	T'(___, ___)
U(___, ___)	U'(___, ___)

Use a Mira to check for line symmetry.

The shape has _____ line of symmetry:

Draw and label any lines of symmetry you found.
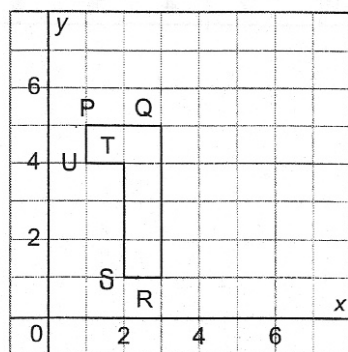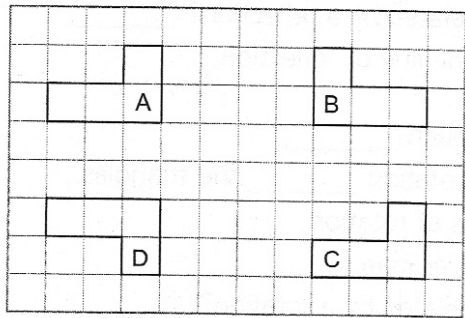
Use tracing paper to check for rotational symmetry.

Is there a point about which you can turn the tracing so it matches the shape? _____

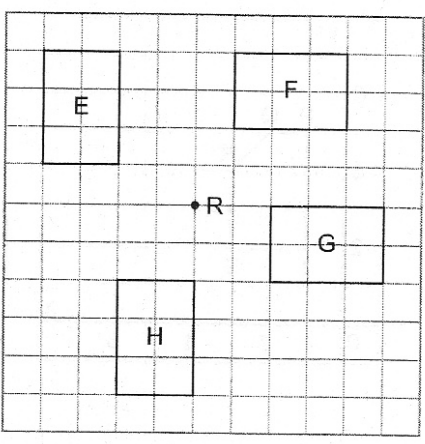Does the shape have rotational symmetry? _____

Practice

1. Which of these polygons are related by line symmetry?

Which pairs of polygons face opposite ways?

_____

Draw in the line of reflection for each
pair of polygons.
Which polygons are related by line symmetry?

_____

2. Which of these polygons are related by rotational symmetry about point R?

Trace rectangle E.
Rotate the tracing about point R.
Which rectangle does it match? _____

Trace rectangle G.
Rotate the tracing about point R.
Which rectangle does it match? _____

Which rectangles are related by rotational symmetry?

_____

3. For each diagram, find out if the triangles are related by symmetry.
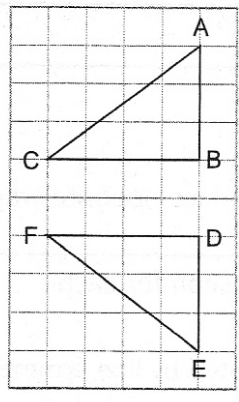Use tracing paper and a Mira to help.

a)
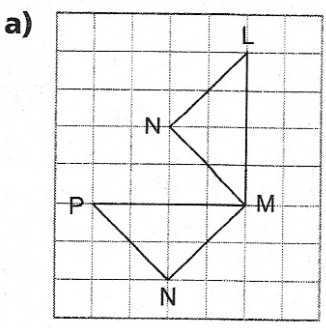
Do the triangles face opposite ways? _____
So, are the triangles related by a reflection? _____

Do the triangles touch? _____
So, try a point of rotation _____ the triangles.
Which vertex is common to both triangles?

_____

Try different rotations about this vertex.
When do the triangles match? _____

_____

Are the triangles related by a rotation? _____
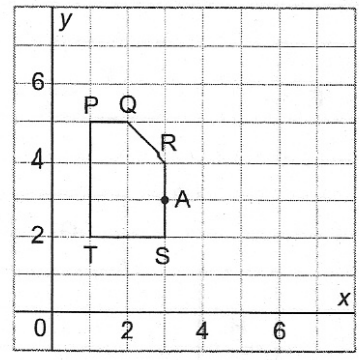If they are, label the point of rotation.

b)

Do the triangles face opposite ways? _____
One triangle is above the other,
so try a _____ line of reflection.
Use a Mira to find the line of reflection.
Are the triangles related by a reflection? _____
If they are, draw the line of reflection.

Do the triangles touch? _____
So, try a point of rotation _____ the triangles.
Try different points of rotation.
Do the triangles ever match? _____
Are the triangles related by a rotation? _____
If they are, label the point of rotation.

4. Draw the image of this polygon after
a rotation of 180° about point A.
Write the coordinates of each vertex and its image.
Describe any symmetry that results.

Rotate the polygon.
Draw and label the rotation image.

Point	Image
P(__ , __)	P'(__ , __)
Q(__ , __)	Q'(__ , __)
R(__ , __)	S(__ , __)
S(__ , __)	R(__ , __)
T(__ , __)	T'(__ , __)

Use a Mira to check for line symmetry.

_____

_____

_____

Use tracing paper to check for rotational symmetry.
Does the shape have rotational symmetry? _____
If it does, label the point of rotation.