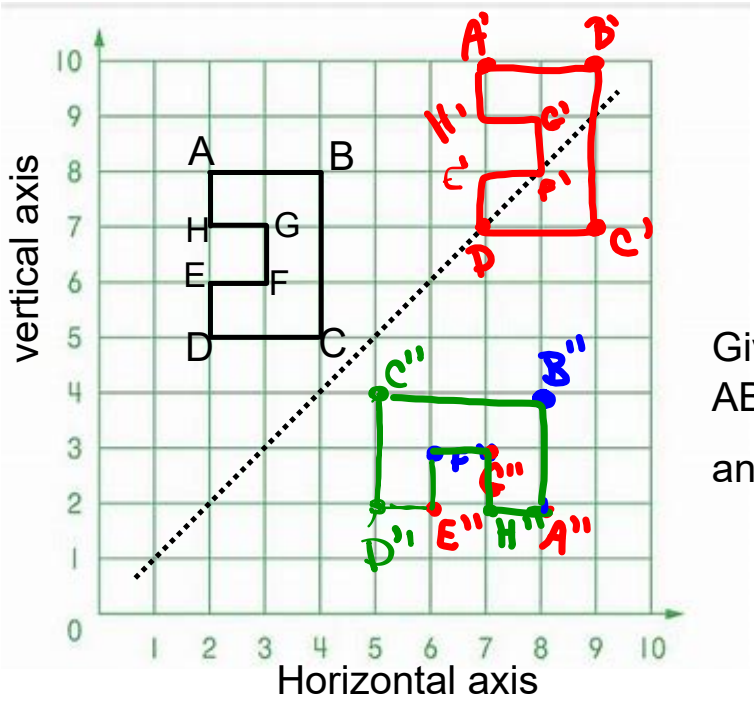
Lesson 3 Day 1

Successive Transformations

Warm Up Grade 6
Ch. 8 Transformations
Date:_____



Translate ABCDEFGH Up 2 , right 5

Give coordinates for ABCDEFGH

and its new image

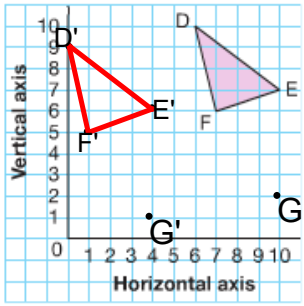
A'(7,10)
B'(9,10)
C'(9,7)
D'(7,7)
E'(7,8)
F'(8,8)
G'(8,9)
H'(7,9)

b) Reflect ABCDEFGH across the dotted line (Label new image)

Practice

Use tracing paper or a Mira when it helps.

1. Copy this triangle on a grid.
   a) Draw the image of △DEF after the translation 6 squares left and 1 square down.
   b) Write the coordinates of the vertices of the triangle and its image. How are the coordinates related?
   c) Another point on this grid is G(10, 2). Use your answer to part b to predict the coordinates of point G′ after the same translation.



b) D(6, 10) D'(0,9)
E(10, 7) E'(4, 6)
F(7, 6) F'(1, 5)

The coordinates are related by:
The x coordinate is 6 units less and the y coordinate is 1 unit less

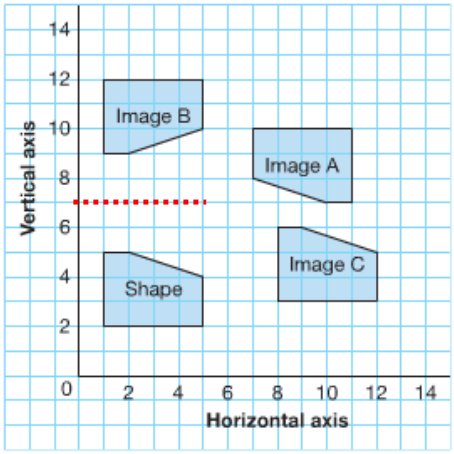
x-6
y-1

c) G(10, 2)

10-6 = 4 2-1 = 1

G'(4, 1)

3. This diagram shows a shape and its image after 3 different transformations.



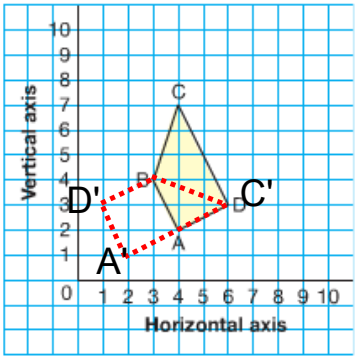
Identify each transformation.
Explain how you know.

a) the shape to Image A
b) the shape to Image B
c) the shape to Image C

the same. So, I knew my prediction was correct.

3. a) 180° rotation about (6, 6); the shape and its image face different ways. This suggests a rotation.
   b) A reflection in the horizontal line through the vertical axis at 7; the shape and its image face opposite ways. This suggests a reflection.
   c) A translation 7 squares right and 1 square up; the shape and its image face the same way. This suggests a translation.

4. Copy this quadrilateral on a coordinate grid.
Trace the quadrilateral on tracing paper.
Draw the image of the quadrilateral after each rotation below.
Write the coordinates of the vertices.
   a) 90° clockwise about vertex B
   b) 270° clockwise about vertex B
   c) 270° counterclockwise about vertex B



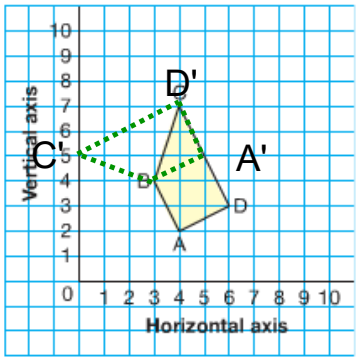
A'(1,3)

B(3,4)

C'(6, 3)

D'(2,1)

b)



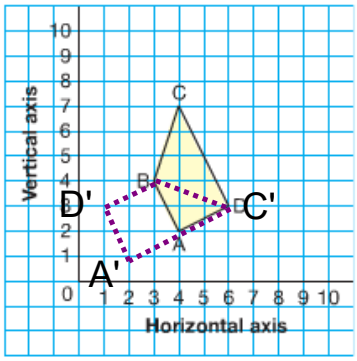
A'(5,5)

B(3,4)

C'(0,5)

D'(4,7)

c)



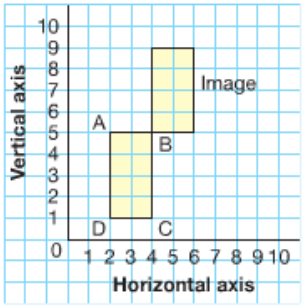
A'(1,3)

B(3,4)

C'(6, 3)

D'(2,1)

5. Copy the rectangle and its image on a coordinate grid.
   a) Describe as many different transformations as you can that move the rectangle to its image.
   b) For each transformation:
      - Label the vertices of the image.
      - Describe how the positions of the vertices of the rectangle have changed.



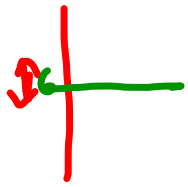
5. • 180° rotation about vertex B;
A′(6, 5), B(4, 5), C′(4, 9), D′(6, 9)
Vertex A moved 4 squares right to A′. Vertex B stayed where it was. Vertex C moved 8 squares up to C′. Vertex D moved 4 squares right and 8 squares up to D′.
• Translation 2 squares right and 4 squares up;
A′(4, 9), B′(6, 9), C′(6, 5), D′(4, 5)
Each vertex moved 2 squares right and 4 squares up.
• Reflection in the horizontal line through the vertical axis at 5, followed by a translation 2 squares right;
A′(4, 5), B′(6, 5), C′(6, 9), D′(4, 9)
Vertex A moved 2 squares right to A′. Vertex B moved 2 squares right to B′. Vertex C moved 2 squares right and 8 squares up to C′. Vertex D moved 2 squares right and 8 squares up to D′.
• Reflection in the vertical line through the horizontal axis at 4, followed by a reflection in the horizontal line through the vertical axis at 5;
A′(6, 5), B(4, 5), C′(4, 9), D′(6, 9)
Vertex A moved 4 squares right to A′. Vertex B stayed where it was. Vertex C moved 8 squares up to C′. Vertex D moved 4 squares right and 8 squares up to D′.
• Reflection in the vertical line through the horizontal axis at 4, followed by a translation 4 units up;
A′(6, 9), B′(4, 9), C′(4, 5), D′(6, 5)
Vertex A moved 4 squares right and 4 squares up to A′. Vertex B moved 4 squares up to B′. Vertex C moved 4 squares up to C′. Vertex D moved 4 squares right and 4 squares up to D′.

6. A quadrilateral has these vertices:
Q(5, 2), R(4, 5), S(9, 4), T(6, 3)
Draw the quadrilateral on a coordinate grid.
For each transformation below:
- Draw the image.
- Write the coordinates of the vertices of the image.
- Describe how the positions of the vertices of the quadrilateral have changed.

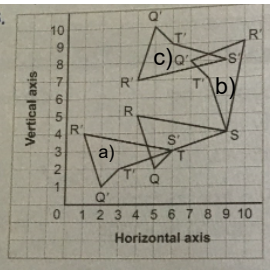
a) a translation of 3 squares left and 1 square down

b) a rotation of 90° clockwise about vertex S

c) a reflection in the horizontal line through the vertical axis at 6



6.



a) Q'(2, 1), R'(1, 4), S'(6, 3), T'(3, 2)
Each vertex moved 3 squares left and 1 square down to its translation image.

b) Q'(7, 8), R'(10, 9), S(9, 4), T'(8, 7)
Vertex Q moved 2 squares right and 6 squares up to Q'. Vertex R moved 6 squares right and 4 squares up to R'. Vertex S stayed where it was. Vertex T moved 2 squares right and 4 squares up to T'.

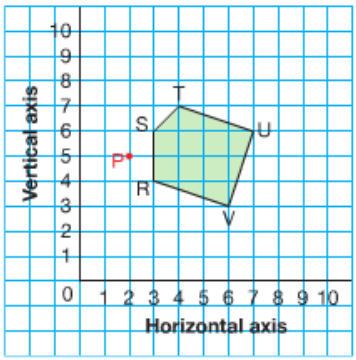
c) Q'(5, 10), R'(4, 7), S'(9, 8), T'(6, 9)
Vertex Q moved 8 squares up to Q'. Vertex R moved 2 squares up to R'. Vertex S moved 4 squares up to S'. Vertex T moved 6 squares up to T'.

7. Copy this pentagon on a coordinate grid.
Write the coordinates of each vertex.
For each transformation below:
- Draw the image.
- Write the coordinates of the vertices of the image.
- Describe how the positions of the vertices of the pentagon have changed.

a) a translation 2 units right and 3 units up

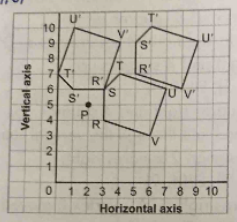
b) a reflection in the vertical line through the horizontal axis at 5

c) a rotation of 90° counterclockwise about P

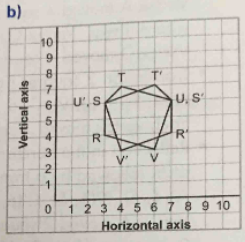


7. Coordinates of original pentagon:
R(3, 4), S(3, 6), T(4, 7), U(7, 6), V(6, 3)

a), c)



b)



a) R′(5, 7), S′(5, 9), T′(6, 10), U′(9, 9), V′(8, 6)
Each vertex moved 2 squares right and 3 squares up.

b) R′(7, 4), S′(7, 6), T′(6, 7), U′(3, 6), V′(4, 3)
Vertex R moved 4 squares right to R′. Vertex S moved 4 squares right to S′. Vertex T moved 2 squares right to T′. Vertex U moved 4 squares left to U′. Vertex V moved 2 squares left to V′.

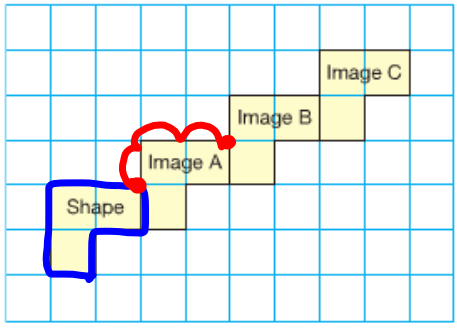
c) R′(3, 6), S′(1, 6), T′(0, 7), U′(1, 10), V′(4, 9)
Vertex R moved 2 squares up to R′. Vertex S moved 2 squares left to S′. Vertex T moved 4 squares left to T′. Vertex U moved 6 squares left and 4 squares up to U′. Vertex V moved 2 squares left and 6 squares up to V′.

REFLECT: I can give the coordinates of the vertices of the shape and its image to describe how the position of the shape changed after the transformation. I can also describe the location of a point of rotation or a line of reflection on the grid.

LESSON 3

Successive Transformations

Which type of transformation does this diagram show?
Describe a transformation that moves the shape directly to Image C.



Translate the Shape Repeated

41 R2

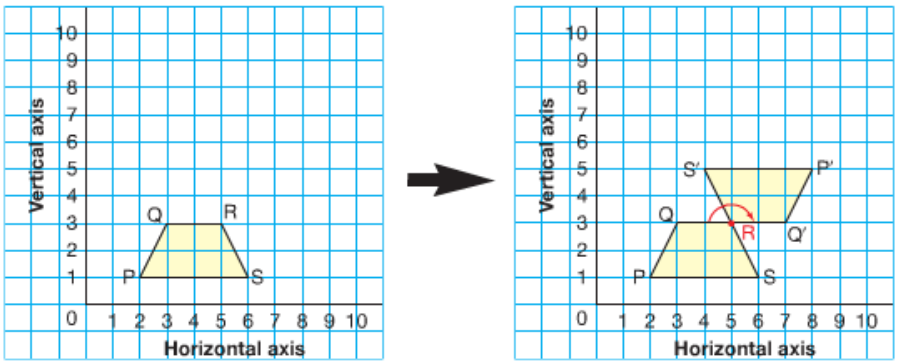
Connect

The same transformation can be applied to a shape more than once.

➤ When a shape is translated two or more times, we say the shape undergoes **successive translations**. The same translation may be repeated, as shown at the top of page 303, or the translations may be different.

The same is true for rotations and reflections.

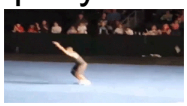
➤ Trapezoid PQRS undergoes **successive rotations**:
- It is rotated 180° about vertex R.
- Then, its image is rotated 90° clockwise about its top right vertex.



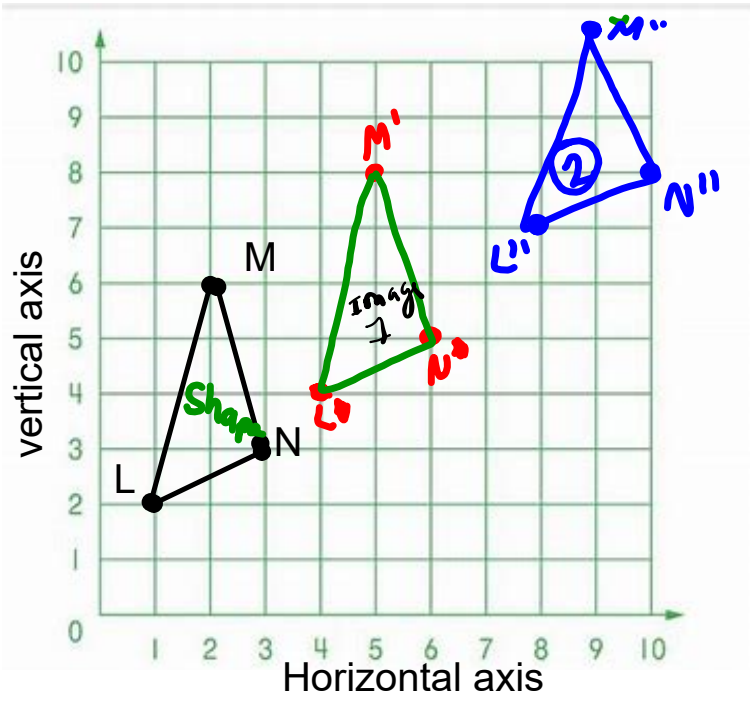
To find the image after the first rotation:

- Trace Trapezoid PQRS on tracing paper.
- Rotate the tracing 180° about R.
- Mark the positions of the vertices of the image.
- Draw the rotation image.
- Label the vertices P'Q'RS'.

Successive Transformations means you must complete 2 or more of the same transformation on the shape. For example you can translate twice but the directions can differ.

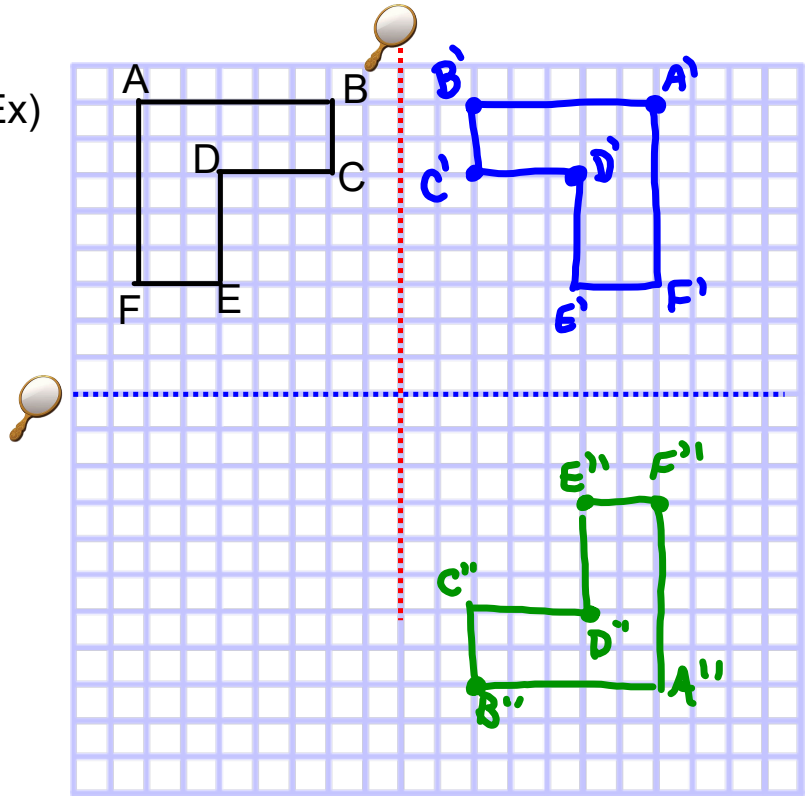


Ex) Translate the shape Up 2, Right 3 Redraw as image 1. Then translate image 1 up 3, Right 4 and label image 2



You can have successive reflections (reflect an object more than once. The line of reflection can differ)

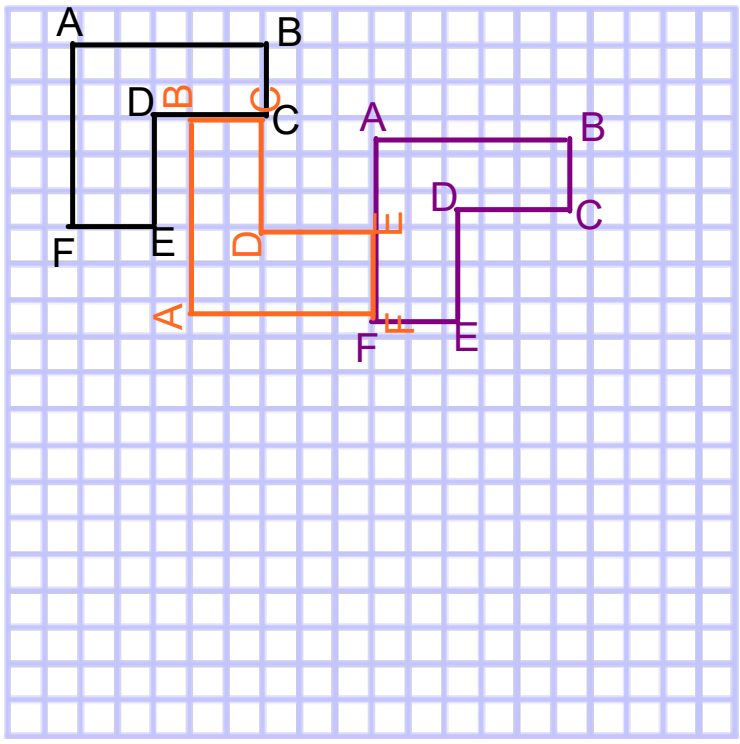
Ex)



Reflect ABCDEF across the vertical line of reflection (red line) Then reflect that new image across the horizontal line of reflection (Blue line)

You can have successive rotations (rotate an object more than once. The point of rotation can differ)

Ex)

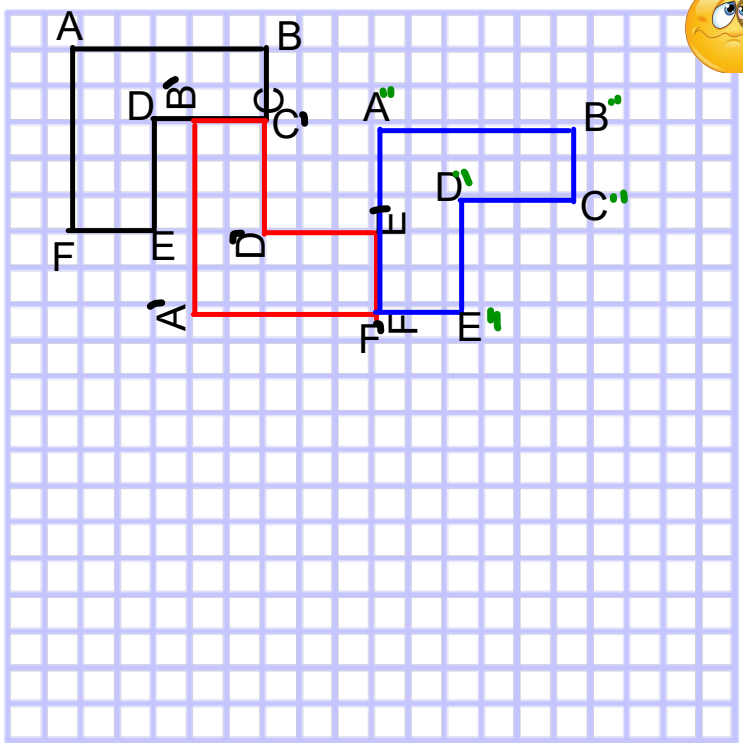


Rotate ABCDEF at vertex C a 3/4 rotation. Then rotate that new about F', 1/4 turn clockwise (90

Solution

You can have successive rotations (rotate an object more than once. The point of rotation can differ)

Ex)



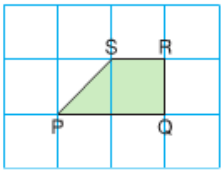
Rotate ABCD at vertex C a 3/4 rotation. Then rotate that new about F', 1/4 turn clockwise (90

page 306-307

#1 & #2

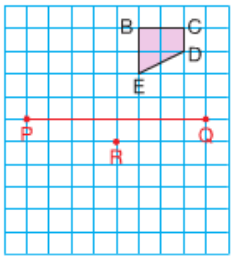
Practice

You will need grid paper, tracing paper, and a Mira.

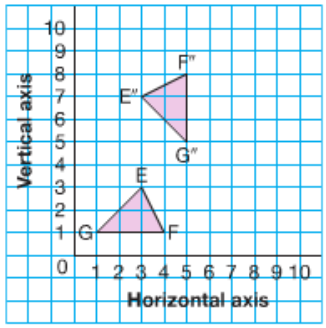


1. Copy this quadrilateral on grid paper. Make:
   a) 3 successive translations of 1 square right and 2 squares up
   b) 3 successive reflections in the line through SR
   c) 3 successive rotations of 180° about vertex R

2. Copy this diagram on grid paper.
   Draw and label both images each time.
   a) Translate the quadrilateral 3 squares left and 2 squares down. Then translate the image 1 square right and 3 squares down.
   b) Reflect the quadrilateral in a line through BE. Then reflect the image in the line PQ.
   c) Rotate the quadrilateral 90° counterclockwise about vertex E. Then rotate the image 180° about point R.

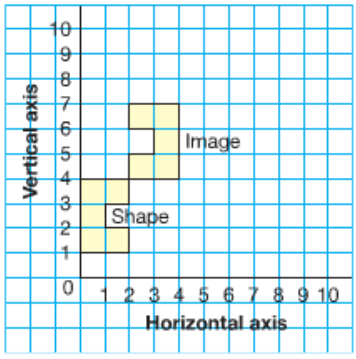


3. Describe two successive transformations that move △EFG to its image, △E″F″G″.
   Show your work.



4. Draw a triangle on grid paper.
   a) Choose two successive translations, reflections, or rotations.
   Apply the first transformation to the triangle.
   Then apply the second transformation to the image.
   b) Label the vertices of each image.
   c) What can you say about the triangle and the images?
   How could you check this?
   d) Describe a single transformation that would move
   the triangle directly to its final image.

5. a) Describe two successive transformations that move the octagon to its image.



   b) Can you find two other successive transformations?
   Explain.

6. The coordinates of a shape are:

A(3, 2)	B(3, 6)	C(5, 6)
D(6, 4)	E(5, 3)	F(5, 2)

- The shape is translated 3 squares right and 1 square up.
- Then, the image is translated 2 squares left and 2 squares up.
- Then, the image is translated 1 square left and 3 squares down.

What are the coordinates of the final image?
How have the positions of the vertices of the shape changed?
Explain.