

# SHARP

## Worksheet 20: Transformation Geometry

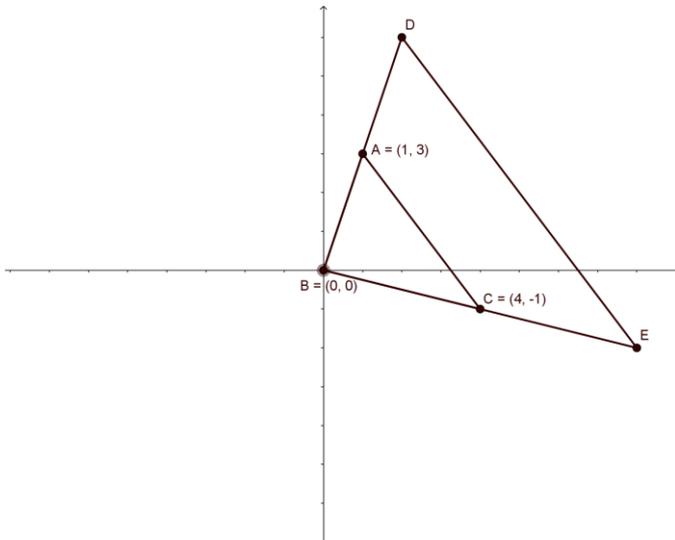
### Grade 9 Mathematics

1. Describe what happens for each of these transformations and give the rule:
  - a) reflection in the x-axis
  - b) reflection about the line  $y = x$
  - c) a point translated 3 units to the right and 4 units down
  - d) reflection about the y-axis
  - e) an enlargement by a factor of 2
  - f) a reduction by a factor of 3.
  
2. For the point  $Z (3; 5)$ , give the point
  - a) A, where Z is reflected about the y-axis
  - b) B, where Z is translated by the rule  $(x - 2; y + 2)$ .
  - c) C, where Z is enlarged by a factor of 3.
  - d) D, where Z is reflected about the line  $y = x$ .
  - e) E, where Z is translated 5 units to the left and 4 units up.
  - f) F, where Z is reflected about the x-axis.
  - g) G, where Z is reduced by a factor of 2.
  - h) H, where Z is reflected about the line  $x = y$ .
  
3. Given the following points and their images, give the rule for each transformation:

a) $A (3; 7) \rightarrow A' (-3, 7)$	b) $B (8; 5) \rightarrow B' (5; 8)$
c) $C (4; -6) \rightarrow C' (2; -3)$	d) $D (5; -8) \rightarrow D' (3; 3)$
e) $E (10; -9) \rightarrow E' (-10; -9)$	f) $F (8; 1) \rightarrow F' (16; 2)$
g) $G (-3; 7) \rightarrow G' (7; -3)$	h) $H (9; -6) \rightarrow H' (3; -2)$
i) $I (7; -6) \rightarrow I' (7; 6)$	j) $J (2; -3) \rightarrow J' (-3; 2)$
k) $K (-6; 6) \rightarrow K' (6; 6)$	l) $L (7; -5) \rightarrow L' (2; 2)$
m) $M (3; 3) \rightarrow M' (1; 1)$	n) $N (-10; 0) \rightarrow N' (0; -10)$
o) $O (-2; 2) \rightarrow O' (2; -2)$	p) $P (2; 1) \rightarrow P' (4; 2)$
q) $Q (-2; 10) \rightarrow Q' (10; -2)$	r) $R (-7; -9) \rightarrow R' (-5; -10)$
s) $S (-4; 5) \rightarrow S' (0; 0)$	t) $T (0; 1) \rightarrow T' (1; 0)$
u) $U (2; 7) \rightarrow U' (-2; 3)$	v) $V (-8; 0) \rightarrow V' (-4; 0)$

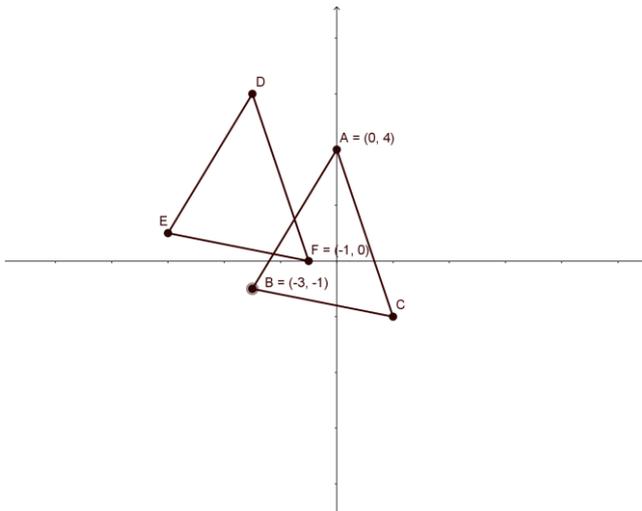


4. Given the following triangle,  $\triangle ABC$  with vertices A (1; 3), B (0; 0) and C (4; -1).



- a) If  $\triangle BDE$  is the enlargement of  $\triangle ABC$  by a factor of 2, give the coordinates of D and E.
- b) Why doesn't B's coordinates change?
- c) Redraw the cartesian plane with  $\triangle ABC$  and  $\triangle BDE$  and draw the following on it with the correct image coordinates:
  - i)  $\triangle ABC$  reflected about the x-axis
  - ii)  $\triangle BDE$  reflected about the y-axis
  - iii)  $\triangle ABC$  reflected about the line  $y = x$
  - iv)  $\triangle BDE$  translated 3 units down and 1 unit left.
- d) What is the ratio of the area of  $\triangle ABC$  to  $\triangle BDE$ ?
- e) Is  $\triangle ABC$  congruent or similar or neither with  $\triangle BDE$ ?

5. Given in the diagram below are two triangles, where  $\triangle ABC$ , with vertices A (0; 4) and B (-3; -1), has been translated 3 units to the left and 2 units up to  $\triangle DEF$ , with F (-1; 0).



- a) Write down an algebraic rule to describe this transformation.
- b) Find the coordinates for C, D and E.
- c) Are the triangles similar or congruent or neither?
- d) Reflect  $\triangle DEF$  about the line  $y = x$ .
  - i) Give the coordinates for the new points.
  - ii) What do we notice about the image of F?
- e) If  $\triangle DEF$  was reduced by a factor of 2, would F still have the same coordinate? Why or why not?