SHARP

Worksheet 20 Memorandum: Transformation Geometry

Grade 9 Mathematics

1. a) reflection in the x-axis – the point has a mirror image when the paper is folded on the x-axis. Rule: (x; y) → (x; -y)
   b) reflection about the line y = x – the x and the y-value swop around. Rule: (x; y) → (y; x)
   c) a point translated 3 units to the right and 4 units down – the point moves 3 units to the right and it moves 4 units down. Rule: (x; y) → (x + 3; y – 4)
   d) reflection about the y-axis – the point has a mirror image when the paper is folded on the y-axis. Rule: (x; y) → (-x; y)
   e) an enlargement by a factor of 2 – the point's coordinate is multiplied by 2, it becomes 2 times bigger. Rule: (x; y) → (2x; 2y)
   f) a reduction by a factor of 3 – the point's coordinates are divided by three, it becomes 3 times smaller. Rule: (x; y) → $\left(\frac{x}{3};\frac{y}{3}\right)$

2. a) Z (3; 5) → A (-3; 5)
   b) Z (3; 5) → B (1; 7)
   c) Z (3; 5) → C (9; 15)
   d) Z (3; 5) → D (5; 3)
   e) Z (3; 5) → E (-2; 9)
   f) Z (3; 5) → F (3; -5)
   g) Z (3; 5) → G $\left(\frac{3}{2};\frac{5}{2}\right)$
   h) Z (3; 5) → H (5; 3) (this is the same as question d on purpose).

3. a) reflected about the y-axis — Rule: (x; y) → (-x; y)
   b) reflected about the line y = x — Rule: (x; y) → (y; x)
   c) reduced by a factor of 2 — Rule: (x; y) → $\left(\frac{x}{2};\frac{y}{2}\right)$
   d) translated 2 units left and 11 units up — Rule: (x; y) → (x – 2; y + 11)
   e) reflected about the y-axis — Rule: (x; y) → (-x; y)
   f) enlarged by a factor of 2 — Rule: (x; y) → (2x; 2y)
   g) reflected about the line y = x — Rule: (x; y) → (y; x)
   h) reduced by a factor of 3 — Rule: (x; y) → $\left(\frac{x}{3};\frac{y}{3}\right)$
   i) reflected about the x-axis — Rule: (x; y) → (x; -y)
   j) reflected about the line y = x — Rule: (x; y) → (y; x)

k) reflected about the y-axis Rule: (x; y) → (-x; y)

l) translated 5 units left and 7 units up Rule: (x; y) → (x – 5; y + 7)

m) reduced by a factor of 3 Rule: (x; y) → $\left(\frac{x}{3};\frac{y}{3}\right)$

n) reflected about the line y = x Rule: (x; y) → (y; x)

o) reflected about the line y = x Rule: (x; y) → (y; x)

p) enlarged by a factor of 2 Rule: (x; y) → (2x; 2y)

q) reflected about the line y = x Rule: (x; y) → (y; x)

r) translated 2 units right and 1 unit down Rule: (x; y) → (x + 2; y – 1)

s) translated 4 units right and 5 units down Rule: (x; y) → (x + 4; y – 5)

t) reflected about the line y = x Rule: (x; y) → (y; x)

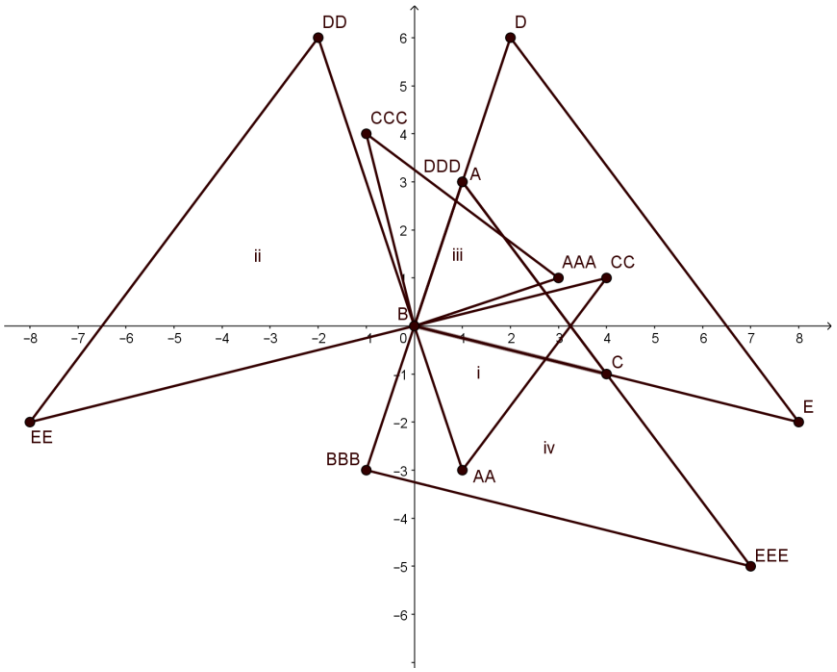
u) translated 4 units left and 4 units down Rule: (x; y) → (x – 4; y – 4)

v) reduced by a factor of 2 Rule: (x; y) → $\left(\frac{x}{2};\frac{y}{2}\right)$

4. a) D (2; 6) and E (8; -2)

b) zero multiplied by anything is still zero.

c)



d) area of ΔABC : area of ΔBDE is 1: 4

e) ΔABC is similar to ΔBDE – they have the same shape, but they differ in size.

5. a) (x; y) → (x – 3; y + 2)

b) C (2; -2), D (-3; 6) and E (-6; 1)

c) the triangles are congruent – they are the same shape and size.

d) i) D' (6; -3), E' (1; -6) and F' (0; -1)

ii) the point is now on the y-axis.

e) No, because -1 divided by 2 is $-\frac{1}{2}$, even though the zero stays the same.