5.4 Enlargement and describing transformations

Name: _____ Class: _____ Date: _____ **Total: 15 marks**

KEY WORDS enlargement • centre of enlargement

Enlargement and describing transformations

Objective

Enlarge shapes with a centre and positive scale factor (fractions included), know enlargements preserve angles but not lengths, and give complete descriptions of any transformation (objectives Foundation 5.2 J–M).

1 Key knowledge and worked examples

Enlargement. Specified by a centre and a scale factor (positive; fractions shrink). About the origin, $(x, y) \to (kx, ky)$. Lengths scale by k but angles are preserved, so the image is SIMILAR, not congruent. Distances from the centre also scale by k – ray lines through the centre confirm the image.

Complete descriptions. "Rotation, 90° anticlockwise about (0, 1)"; "reflection in the line $y = x$"; "translation by $\binom{3}{-2}$"; "enlargement, scale factor 2, centre (1, 1)". Every parameter named, or the mark is lost.

2 Practice

2.1 Enlarge $(3, 2)$ by scale factor 2 about the origin. [1]

2.2 Enlarge $(3, 2)$ by scale factor $\frac{1}{2}$ about the origin. [1]

2.3 A square of side 4 cm is enlarged by scale factor 3. Find the image's side and area. [2]

2.4 Under an enlargement, angles are preserved but lengths are not. What is the relationship between object and image? [1]

3 Exam-style questions

3.1 *(Original.)* Triangle T has vertices $(1, 1)$, $(3, 1)$, $(1, 2)$. It is enlarged by scale factor 3, centre $(0, 0)$. (a) Write down the image's vertices. (b) Find the ratio of the image's area to T's area. [4]

3.2 *(Original.)* Shape S is drawn on a grid; its image S' has every length three times as long, with corresponding rays from a fixed point $C(1, 2)$ passing through corresponding vertices. Describe the transformation fully. [2]

3.3 *(Original.)* A rectangle 4 cm by 3 cm is enlarged with scale factor $\frac{1}{4}$, centre C. (a) Find the image's dimensions. (b) State two things the enlargement preserves. (c) A student says "the image is congruent to the original because angles match". Correct the error. [4]

Solutions

2.1 $(6, 4)$.

2.2 $(1.5, 1)$.

2.3 Side 12 cm; area $9 \times 16 = 144$ cm^2.

2.4 Similar (same shape, different size).

3.1 (a) $(3, 3)$, $(9, 3)$, $(3, 6)$. (b) Areas scale by $k^2 = 9$, so $9 : 1$.

3.2 Enlargement, scale factor 3, centre $(1, 2)$.

3.3 (a) 1 cm by 0.75 cm. (b) Angles are preserved, and so is the shape (sides stay parallel; the image is similar). (c) Congruent needs BOTH matching angles and matching lengths; an enlargement changes lengths, so the image is similar, not congruent.

Local review guidance: scale factor applied to coordinates or lengths from the stated centre; area ratio stated as k^2; descriptions carry centre AND factor. This is authored classroom guidance.