Similarity by Transformations

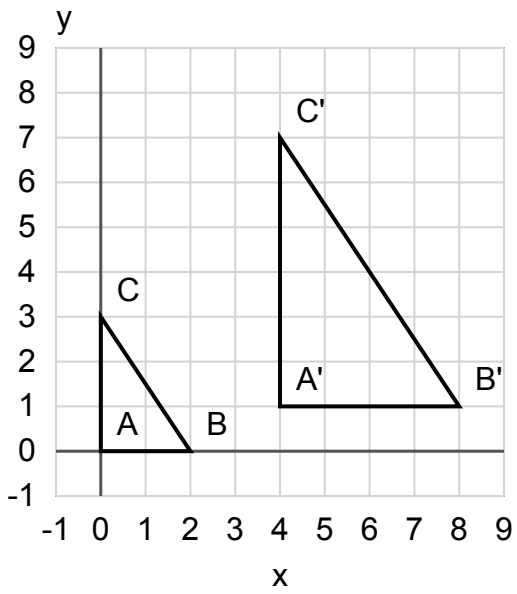
Use dilations and translations to decide whether triangles are similar.

Name: _____ Date: _____

Part 1 - Build a similarity transformation

Similarity test: Figures are similar when a sequence of rigid motions and a dilation maps one figure to the other. The dilation must use one scale factor for every corresponding side. A translation has rule (x, y) -> (x + a, y + b).

1. Triangle ABC and triangle A'B'C' are shown. Match A to A', B to B', and C to C'. First dilate ABC about the origin. Then translate the image. Complete the table and state whether the triangles are similar.



Vertex	After dilation	After translation
A(0, 0)		
B(2, 0)		
C(0, 3)		

Scale factor: _____ Translation rule: _____

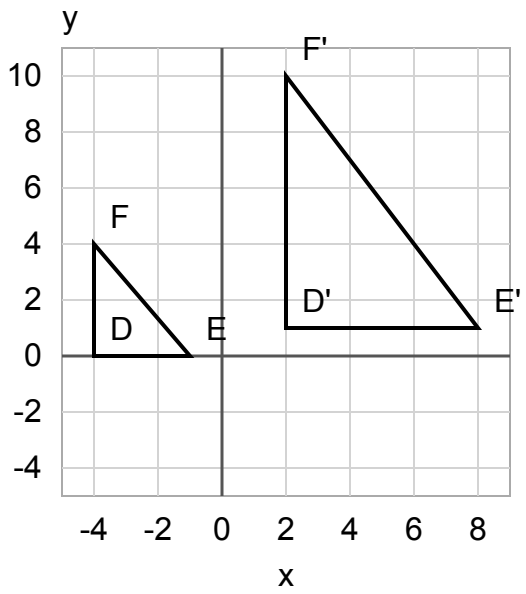
Similarity by Transformations

Use dilations and translations to decide whether triangles are similar.

Name: _____ Date: _____

Part 2 - Test a counterexample

2. Triangle DEF and triangle D'E'F' look related, but appearance is not enough. Use D -> D' and E -> E' to test this possible sequence: dilate triangle DEF about the origin by scale factor 2, then translate by <10, 1>.



Complete the checks. Then decide whether the triangles are similar.

Check	Your work
Image of F after the proposed sequence	
Compare that image with F'	
DE and D'E' ratio; DF and D'F' ratio	

Conclusion: Are the triangles similar? Explain using the transformation result and the side ratios.

Similarity by Transformations

Use dilations and translations to decide whether triangles are similar.

Answer key and teaching notes

Materials and setup: Print and supply all student pages, keeping teacher-key pages separate. Supplied: both coordinate diagrams and response tables. Additionally needed: pencils, rulers, and optional tracing paper or transparent grid paper. Have students work independently first, then compare transformation rules with a partner.

Teacher script: “A dilation changes distances from its center by one multiplier. A translation changes location but not lengths or angles. Do not decide from a picture alone: identify corresponding vertices, test a transformation, and check that one scale factor works for every pair of corresponding sides.”

Observe: While students work, look for (1) consistent vertex correspondence, (2) one stated scale factor, (3) a correct translation vector, and (4) a conclusion based on transformation and ratios rather than visual resemblance. Ask: “What happens to F under your rule?” Do not supply the conclusion.

1. Answer: Use scale factor 2 about the origin, then translation <4, 1>. A(0,0) -> (0,0) -> A'(4,1); B(2,0) -> (4,0) -> B'(8,1); C(0,3) -> (0,6) -> C'(4,7). Therefore ABC is similar to A'B'C'. Corresponding side lengths have common factor 2: AB = 2 and A'B' = 4; AC = 3 and A'C' = 6; BC = sqrt(13) and B'C' = 2sqrt(13). A dilation preserves corresponding angle measures, and the common factor makes corresponding sides proportional.

2. Answer: F(-4,4) dilates to (-8,8), then translates to (2,9). This is not F'(2,10). Also DE = 3 and D'E' = 6, so the ratio is 2. DF = 4 and D'F' = 9, so the ratio is 9/4. Because 2 is not equal to 9/4, no common scale factor works; the triangles are not similar. A correct explanation must name both the failed image of F and the unequal side ratios.

Quick rubric: Item 1: correct scale factor and translation, 2 points; all three mapped coordinates, 2 points; similarity explanation, 1 point. Item 2: image (2,9), 1 point; comparison to F', 1 point; ratios, 2 points; supported non-similarity conclusion, 1 point.

Source credit: New York Next Generation Mathematics Standard GEO-G.SRT.2, teacher-provided task contract: https://lessonmakerpro.com/standards/ny-nextgen-math/geo-g-srt-2. Coordinate figures are original instructional diagrams.