

Translations, Reflections and Rotations Explained

Grade 10 – Geometry math · Test Answer Key · Standards: G-CO.A.2, G-CO.A.3, G-CO.A.4, G-CO.A.5

Each answer shows the rule applied to every point and how the points are earned. For sequences, the order of the motions is part of the answer.

Standards: G-CO.A.2, G-CO.A.3, G-CO.A.4, G-CO.A.5 · **Level:** Grade 10 Geometry

Question 1 Images of a point (2 points)

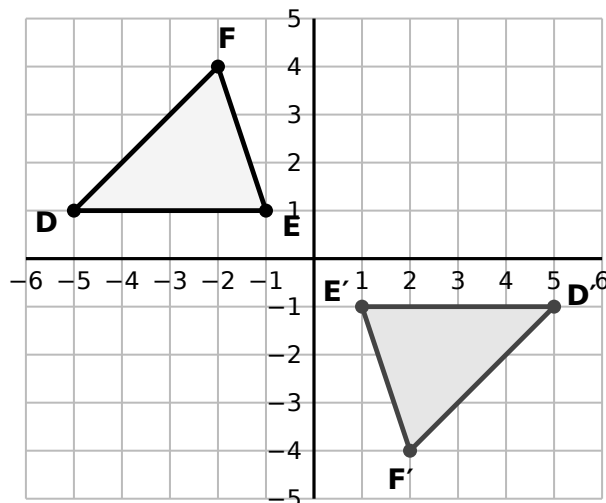
- a. $(-6 + 4, 2 - 7) = (-2, -5)$.
- b. Negate x : $(6, 2)$.

(a) $(-2, -5)$, (b) $(6, 2)$

Scoring: 1 point per image.

Question 2 Half-turn of a triangle (3 points)

Negate both coordinates of each vertex: $D'(5, -1)$, $E'(1, -1)$, $F'(2, -4)$.



Solved figure for Question 2.

$D'(5, -1)$, $E'(1, -1)$, $F'(2, -4)$

Scoring: 1 point per vertex.

Question 3 Reflect over $y = x$ (3 points)

Swap the coordinates: $G'(-3, 2)$, $H'(0, 5)$, $K'(-1, -4)$.

$G'(-3, 2)$, $H'(0, 5)$, $K'(-1, -4)$

Scoring: 1 point per point.

Question 4 Rigid or not (2 points)

- a. It is a translation. The segment from $(1, 1)$ to $(5, 1)$ goes to $(-5, 6)$ – $(-1, 6)$, still length 4: rigid.
- b. It shrinks lengths to a third. The segment from $(0, 0)$ to $(6, 0)$ goes to $(0, 0)$ – $(2, 0)$, length 2: not rigid.

(a) rigid, (b) not rigid

Scoring: 1 point per part, including the justification.

Question 5 Rotation about a center (3 points)

Subtract the center: $(6 - 1, 2 - (-1)) = (5, 3)$. Rotate with $(x, y) \rightarrow (-y, x)$: $(-3, 5)$. Add the center back: $(-3 + 1, 5 + (-1)) = (-2, 4)$.

$A'(-2, 4)$

Scoring: 1 point for translating to the origin, 1 point for the rotation, 1 point for the final point.

Question 6 Symmetry of polygons (3 points)

- a. A regular n -gon has n lines of symmetry: 15.
- b. $360^\circ \div 15 = 24^\circ$.
- c. Only the two diagonals: 2.

(a) 15, (b) 24° , (c) 2

Scoring: 1 point per part.

Question 7 Order of motions (2 points)

Reflect: $(4, 1)$; translate: $(1, 8)$.

Translate first: $(1, 6)$; reflect: $(1, -6)$.

$(1, 8)$, and $(1, -6)$ in the other order

Scoring: 1 point for each final point.

Question 8 Name the transformation (2 points)

Each y-coordinate stays the same and each x-coordinate changes sign, so the rule is $(x, y) \rightarrow (-x, y)$.

A reflection over the y-axis

Scoring: 1 point for the type of transformation, 1 point for the line or rule.