

Motion Maps

Use rigid motions to track figures and prove congruence.

HIGH SCHOOL • HSG-CO.B

CCSS.Math.Content.HSG-CO.B "Understand congruence in terms of rigid motions"

NAME _____

DATE _____

RIGID MOTIONS PRESERVE SHAPE

A translation, rotation, or reflection moves a figure without changing its side lengths or angle measures. Two figures are congruent when one can be mapped onto the other using one or more rigid motions. Apply the same motion rule to every vertex.

WORKED EXAMPLE

Map triangle ABC with A(21,34), B(26,34), and C(21,40) using the translation $\langle 13, -17 \rangle$. List the image coordinates and state whether the triangles are congruent.

1. Add 13 to each x-coordinate and subtract 17 from each y-coordinate.
2. A'(34,17), B'(39,17), and C'(34,23).
3. A translation is a rigid motion, so all corresponding lengths and angles are preserved.

Answer: A'(34,17), B'(39,17), and C'(34,23); triangle ABC is congruent to triangle A'B'C'.

PRACTICE 6 problems

- 1** Point A(-4,7) is translated by $\langle 6, -3 \rangle$. Give the coordinates of A'.

ANSWER _____

- 2** Point B(5,-2) is rotated 90° counterclockwise about the origin. Give the coordinates of B'.

ANSWER _____

- 3** Point C(-8,3) is reflected across the y-axis. Give the coordinates of C'.

ANSWER _____

- 4** Triangle DEF has D(1,1), E(4,1), and F(1,5). Translate the triangle by $\langle -2, 6 \rangle$. Give the image coordinates.

ANSWER _____

- 5** P(0,-9) maps to P'(7,-9), and Q(0,-3) maps to Q'(7,-3). Name the rigid motion that maps segment PQ to segment P'Q'.

ANSWER _____

- 6** Triangle JKL has J(2,-6), K(6,-6), and L(2,-1). Reflect the triangle across the x-axis. Give the image coordinates.

ANSWER _____

APPLY IT Show your work

1

A student media club places a photo frame on a digital banner. Its corners are $R(-7,2)$, $S(-3,2)$, $T(-3,6)$, and $U(-7,6)$. The club slides the frame 9 units right and 4 units down. What are the final coordinates, and is the final frame congruent to the original?

WORK SPACE

ANSWER _____

2

A game designer creates a mirrored map zone with vertices $M(1,1)$, $N(3,1)$, and $O(1,4)$. The designer reflects the zone across the y -axis, then translates it by $\langle -4,7 \rangle$. What are the final coordinates, and is the new zone congruent to the original?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Triangle ABC has $A(-5,1)$, $B(-1,1)$, and $C(-5,4)$. Triangle $A'B'C'$ has $A'(5,-1)$, $B'(5,3)$, and $C'(2,-1)$. Are the triangles congruent? If so, name a sequence of rigid motions that maps A to A' , B to B' , and C to C' . Explain briefly.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Point A(-4,7) is translated by $\langle 6, -3 \rangle$. Give the coordinates of A'.	A'(2,4)
2	Point B(5,-2) is rotated 90° counterclockwise about the origin. Give the coordinates of B'.	B'(2,5)
3	Point C(-8,3) is reflected across the y-axis. Give the coordinates of C'.	C'(8,3)
4	Triangle DEF has D(1,1), E(4,1), and F(1,5). Translate the triangle by $\langle -2, 6 \rangle$. Give the image coordinates.	D'(-1,7), E'(2,7), F'(-1,11)
5	P(0,-9) maps to P'(7,-9), and Q(0,-3) maps to Q'(7,-3). Name the rigid motion that maps segment PQ to segment P'Q'.	Translation $\langle 7, 0 \rangle$
6	Triangle JKL has J(2,-6), K(6,-6), and L(2,-1). Reflect the triangle across the x-axis. Give the image coordinates.	J'(2,6), K'(6,6), L'(2,1)

PART 2 • APPLY IT

- R'(2,-2), S'(6,-2), T'(6,2), U'(2,2); the final frame is congruent to the original.** Add 9 to every x-coordinate and subtract 4 from every y-coordinate. The move is a translation, which preserves all lengths and angle measures.
- M'(-5,8), N'(-7,8), O'(-5,11); the new zone is congruent to the original.** First reflect each point across the y-axis, then add -4 to each x-coordinate and 7 to each y-coordinate. A reflection followed by a translation is a sequence of rigid motions.

CHALLENGE

Yes. Rotate triangle ABC 90° counterclockwise about the origin, then translate it by $\langle 6, 4 \rangle$. The rotation sends A, B, and C to (-1,-5), (-1,-1), and (-4,-5), and the translation sends those points to A', B', and C'.

Accept ordered pairs written with or without prime labels when the matching vertices are clear. For the challenge, accept any equivalent coordinate-rule description that rotates 90° counterclockwise first and then translates by $\langle 6, 4 \rangle$.