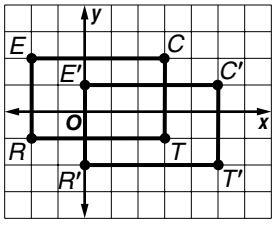
NAME _____ DATE _____ PERIOD _____

9-2 Study Guide and Intervention

Translations

Translations Using Coordinates A transformation called a **translation** slides a figure in a given direction. In the coordinate plane, a translation moves every preimage point $P(x, y)$ to an image point $P(x + a, y + b)$ for fixed values a and b. In words, a translation shifts a figure a units horizontally and b units vertically; in symbols, $(x, y) \rightarrow (x + a, y + b)$.

Example **Rectangle *RECT* has vertices $R(-2, -1)$, $E(-2, 2)$, $C(3, 2)$, and $T(3, -1)$. Graph *RECT* and its image for the translation $(x, y) \rightarrow (x + 2, y - 1)$.**



The translation moves every point of the preimage right 2 units and down 1 unit.

$(x, y) \rightarrow (x + 2, y - 1)$

$R(-2, -1) \rightarrow R'(-2 + 2, -1 - 1)$ or $R'(0, -2)$

$E(-2, 2) \rightarrow E'(-2 + 2, 2 - 1)$ or $E'(0, 1)$

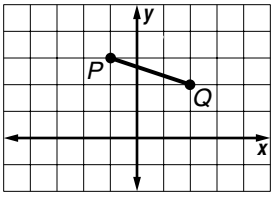
$C(3, 2) \rightarrow C'(3 + 2, 2 - 1)$ or $C'(5, 1)$

$T(3, -1) \rightarrow T'(3 + 2, -1 - 1)$ or $T'(5, -2)$

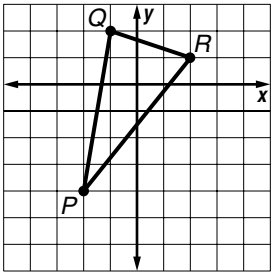
Exercises

Graph each figure and its image under the given translation.

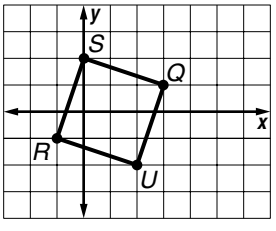
1. $\overline{PQ}$ with endpoints $P(-1, 3)$ and $Q(2, 2)$ under the translation left 2 units and up 1 unit



2. $\triangle PQR$ with vertices $P(-2, -4)$, $Q(-1, 2)$, and $R(2, 1)$ under the translation right 2 units and down 2 units



3. square $SQUR$ with vertices $S(0, 2)$, $Q(3, 1)$, $U(2, -2)$, and $R(-1, -1)$ under the translation right 3 units and up 1 unit



Lesson 9-2

NAME _____ DATE _____ PERIOD _____

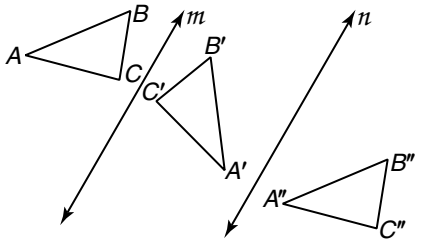
9-2 Study Guide and Intervention *(continued)*

Translations

Translations by Repeated Reflections Another way to find the image of a translation is to reflect the figure twice in parallel lines. This kind of translation is called a **composite of reflections**.

Example **In the figure, $m \parallel n$. Find the translation image of $\triangle ABC$.**

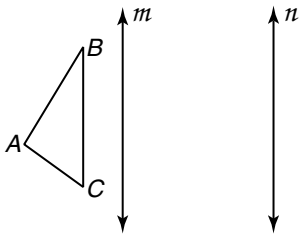
$\triangle A'B'C'$ is the image of $\triangle ABC$ reflected in line m.
$\triangle A''B''C''$ is the image of $\triangle A'B'C'$ reflected in line n.
The final image, $\triangle A''B''C''$, is a translation of $\triangle ABC$.



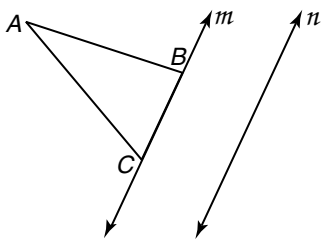
Exercises

In each figure, $m \parallel n$. Find the translation image of each figure by reflecting it in line m and then in line n.

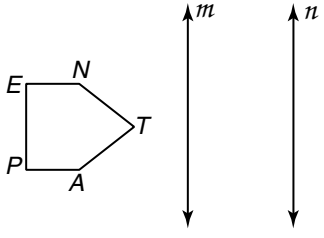
1.



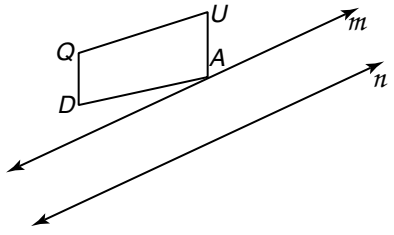
2.



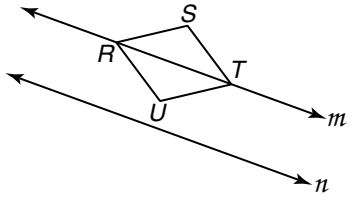
3.



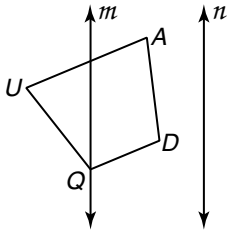
4.



5.



6.



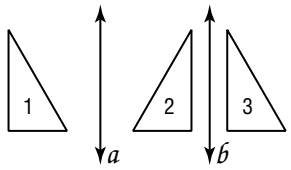
NAME _____ DATE _____ PERIOD _____

9-2 Skills Practice

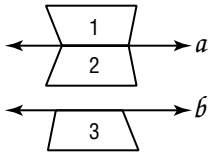
Translations

In each figure, $a \parallel b$. Determine whether figure 3 is a translation image of figure 1. Write *yes* or *no*. Explain your answer.

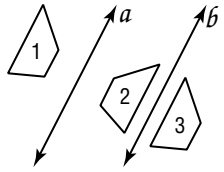
1.



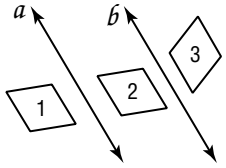
2.



3.

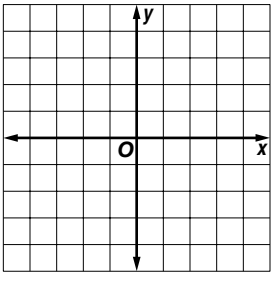


4.

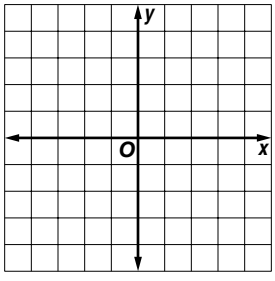


COORDINATE GEOMETRY Graph each figure and its image under the given translation.

5. $\triangle JKL$ with vertices $J(-4, -4)$, $K(-2, -1)$, and $L(2, -4)$ under the translation $(x, y) \rightarrow (x + 2, y + 5)$



6. quadrilateral $LMNP$ with vertices $L(4, 2)$, $M(4, -1)$, $N(0, -1)$, and $P(1, 4)$ under the translation $(x, y) \rightarrow (x - 4, y - 3)$



Lesson 9-2

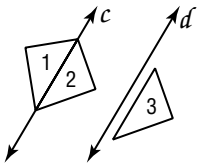
NAME _____ DATE _____ PERIOD _____

9-2 Practice

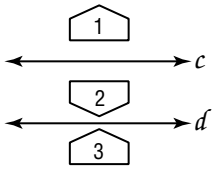
Translations

In each figure, $c \parallel d$. Determine whether figure 3 is a translation image of figure 1. Write *yes* or *no*. Explain your answer.

1.

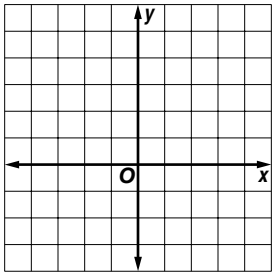


2.

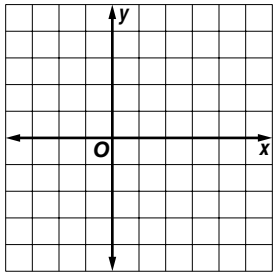


COORDINATE GEOMETRY Graph each figure and its image under the given translation.

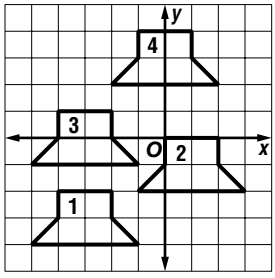
3. quadrilateral $TUWX$ with vertices $T(-1, 1)$, $U(4, 2)$, $W(1, 5)$, and $X(-1, 3)$ under the translation $(x, y) \rightarrow (x - 2, y - 4)$



4. pentagon $DEFGH$ with vertices $D(-1, -2)$, $E(2, -1)$, $F(5, -2)$, $G(4, -4)$, $H(1, -4)$ under the translation $(x, y) \rightarrow (x - 1, y + 5)$



ANIMATION Find the translation that moves the figure on the coordinate plane.



5. figure 1 → figure 2

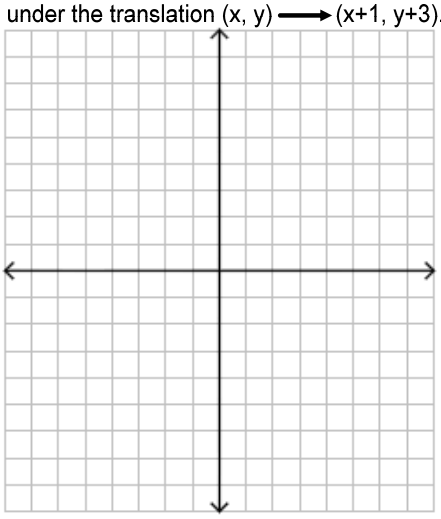
6. figure 2 → figure 3

7. figure 3 → figure 4

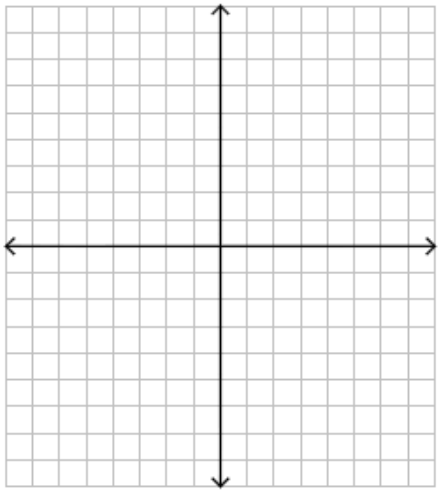
Homework 9.2

Problems 1-6. Graph each figure and its image under the given translation.

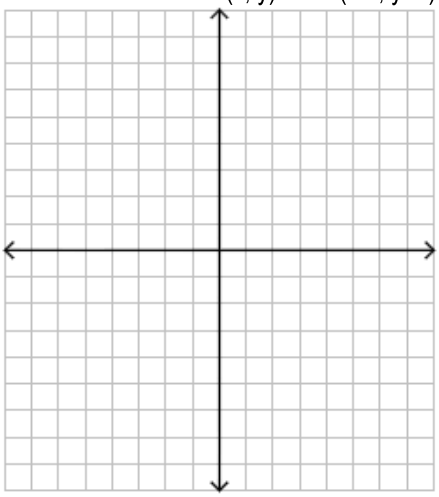
1. The line segment from D(-3, -4) to E(4, 2) under the translation $(x, y) \longrightarrow (x+1, y+3)$.



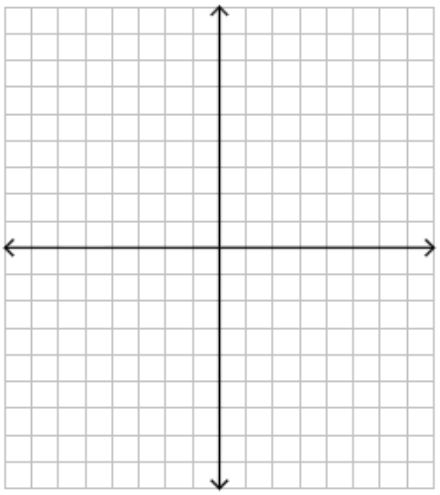
2. The triangle with vertices K(5, -2), L(-3, -1), M(0, 5) under the translation $(x, y) \longrightarrow (x-3, y-4)$.



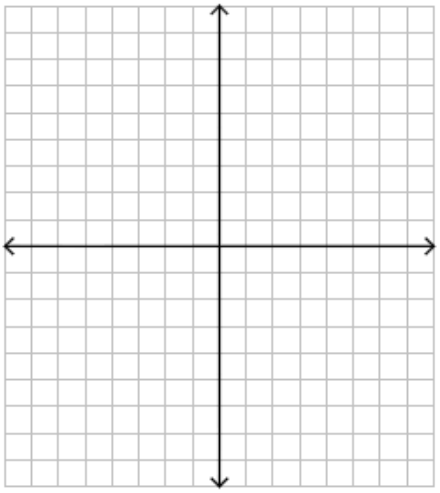
3. The line segment from P(2, -4) to Q(4, 2) under the translation $(x, y) \longrightarrow (x-3, y+4)$.



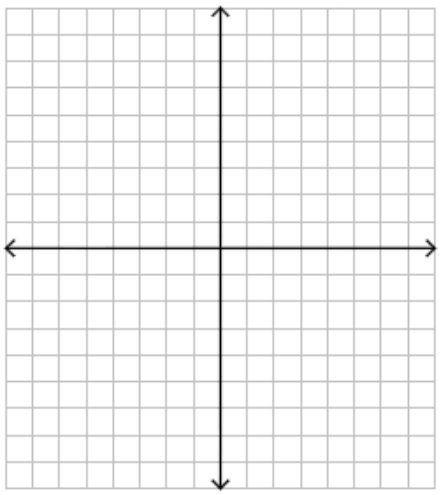
4. The line segment from A(-3, 7) to B(-6, -6) under the translation $(x, y) \longrightarrow (x+4, y-2)$.



5. The triangle with vertices M(-2, -2), J(-5, 2), P(0, 4) under the translation $(x, y) \longrightarrow (x+1, y+4)$.



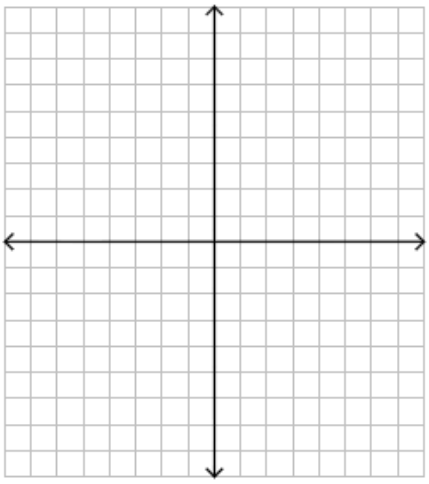
6. The triangle with vertices E(0, -4), F(-4, -4), G(0, 2) under the translation $(x, y) \longrightarrow (x+2, y-1)$.



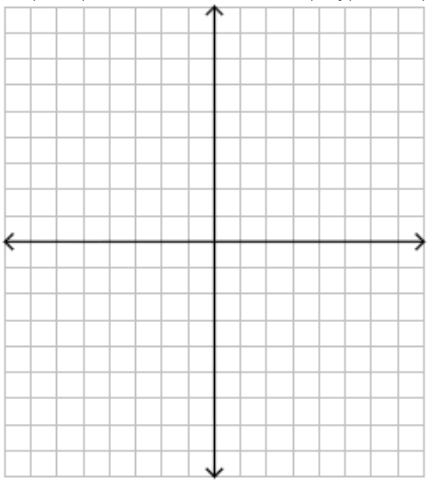
Homework 9.2

Problems 7-11. Graph each figure and its image under the given translation.

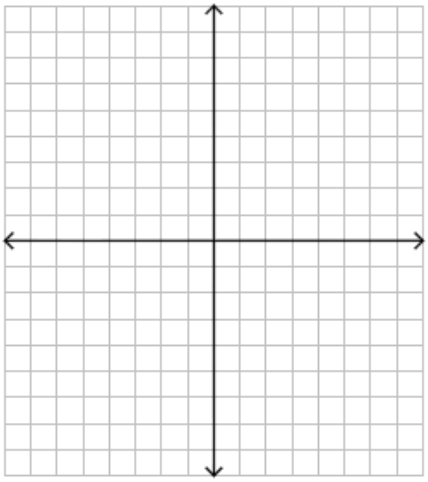
7. The quadrilateral with vertices P(1, 4), Q(-1, 4), R(-2, -4), S(2, -4) under the translation (x, y) ⟶ (x-5, y+3).



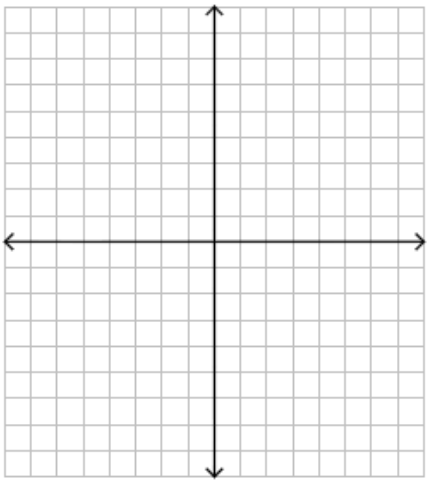
8. The triangle with vertices P(-3, -2), Q(-1, 4), R(2, -2) under the translation (x, y) ⟶ (x+2, y-4).



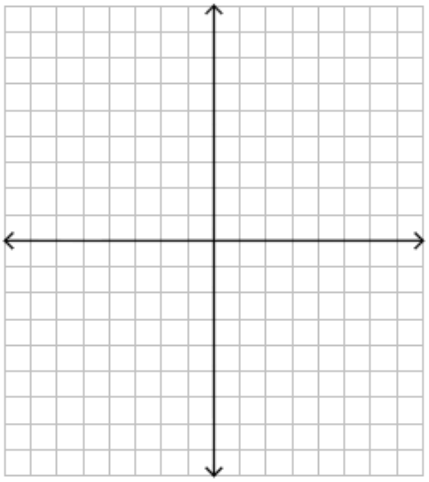
9. The pentagon with vertices V(-3, 0), W(-3, 2), X(-2, 3), Y(0, 2), Z(-1, 0) under the translation (x, y) ⟶ (x+4, y-3).



10. The triangle with vertices R(-4, -1), S(-1, 3), T(-1, 1) reflected in y = 2 and then y = -2.



11. Under the the translation (x, y) ⟶ (x-4, y+5) the image triangle has vertices A'(-8, 5), B'(2, 7), C'(3, 1). Find the preimage triangle ABC.



12. Find the sequence of translations that move the hexagons from 1 to 4 in the given order.