Graph and label each figure with the given vertices. Now graph the image of the figure after the indicated translation and write the coordinates of its vertices. Then use translation notation to describe the translation.

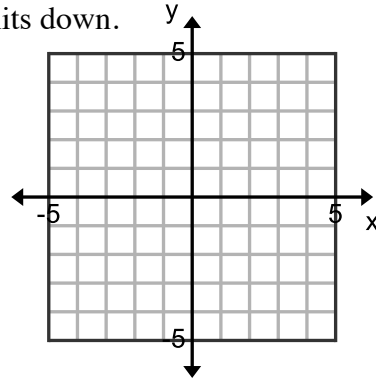1. $\triangle ABC$ with vertices $A(1,2)$, $B(3,1)$, and $C(3,4)$ translated 2 units left and 1 unit up.
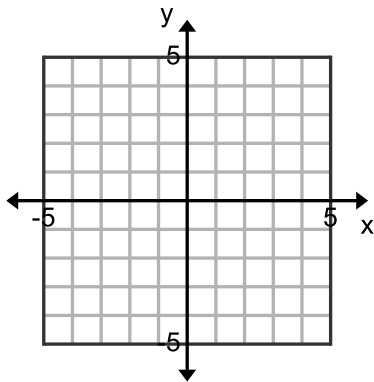
$A'($ $)$

$B'($ $)$

$C'($ $)$

Translation notation: $(x,y)\rightarrow($ $)$

2. Rectangle $JKLM$ with vertices $J(-3,2)$, $K(3,5)$, $L(4,3)$, and $M(-2,0)$ translated 1 unit right and 4 units down.

$J'($ $)$

$K'($ $)$

$L'($ $)$

$M'($ $)$

Translation notation: $(x,y)\rightarrow($ $)$

Triangle PQR has vertices $P(0,0)$, $Q(5,-2)$, and $R(-3,6)$. Find the vertices of $P'Q'R'$ after the translation. Then use <u>translation</u> notation to describe the translation.

3. 6 units right and 5 units up

$P'($ $)$, $Q'($ $)$, $R'($ $)$

Translation notation: $(x,y)\rightarrow($ $)$

4. 8 units left and 1 unit down

$P'($ $)$, $Q'($ $)$, $R'($ $)$

Translation notation: $(x,y)\rightarrow($ $)$

5. Quadrilateral $KLMN$ has vertices $K(-2,-2)$, $L(1,1)$, $M(0,4)$, and $N(-3,5)$. It is first <u>translated</u> by $(x+2,\ y-1)$ and then <u>translated</u> by $(x-3,\ y+4)$. When a figure is translated twice, a double prime symbol is used. Find the coordinates of quadrilateral $K''L''M''N''$ after both translations.
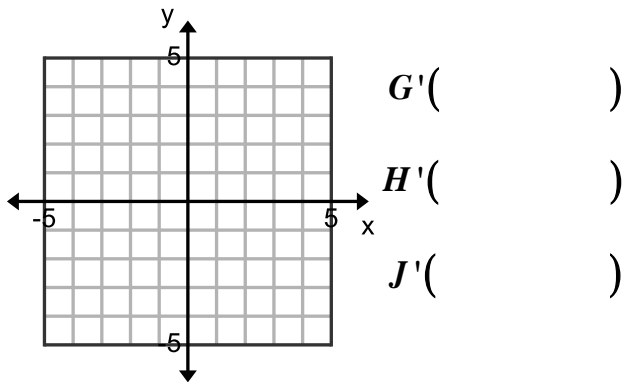
$K'($ $)$, $L'($ $)$, $M'($ $)$, $N'($ $)$

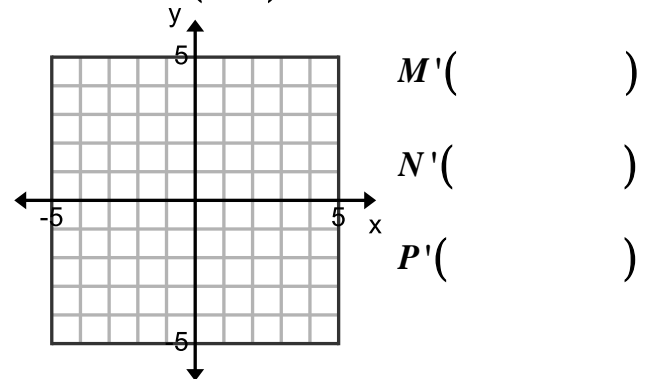$K''($ $)$, $L''($ $)$, $M''($ $)$, $N''($ $)$

6. What are the coordinates of the point (x,y) after being <u>translated</u> m units left and n units up?

Graph and label each figure and its reflection over the indicated axis. Then find the coordinates of the reflected image.
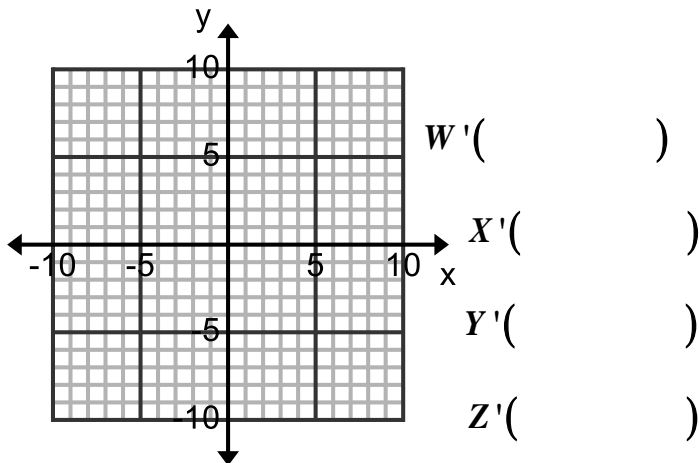
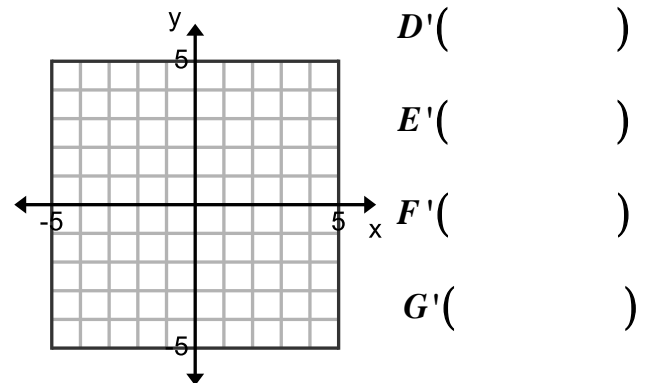7. ΔGHJ with vertices $G(4,2)$, $H(3,-4)$, and $J(1,1)$ reflected over the y-axis.

$G'($ $)$

$H'($ $)$

$J'($ $)$

8. ΔMNP with vertices $M(2,1)$, $N(-3,1)$, and $P(-1,4)$ reflected over the x-axis.

$M'($ $)$

$N'($ $)$

$P'($ $)$

9. Quadrilateral $WXYZ$ with vertices $W(-1,-1)$, $X(4,1)$, $Y(4,5)$, and $Z(1,7)$ reflected over the x-axis.

$W'($ $)$

$X'($ $)$

$Y'($ $)$

$Z'($ $)$

10. Quadrilateral $DEFG$ with vertices $D(1,0)$, $E(1,-5)$, $F(4,-1)$, and $G(3,2)$ reflected over the y-axis.

$D'($ $)$

$E'($ $)$

$F'($ $)$

$G'($ $)$

11. Roberto is finding the coordinates of the image of a triangle with vertices $A(1,1)$, $B(4,1)$, and $C(1,5)$ after a reflection over the x-axis. Describe his mistake and correct it.

The vertices of triangle A'B'C' are A'(−1, 1), B'(−4, 1) and C'(−1, 5).
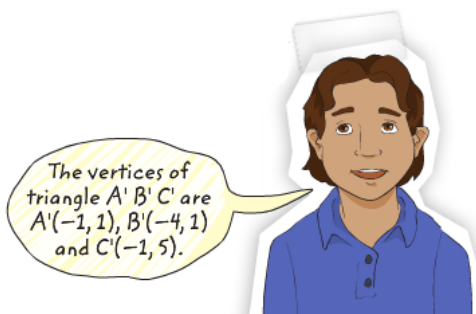
12. Triangle JKL has vertices $J(-7,4)$, $K(7,1)$, and $L(2,-2)$. Without graphing, find the new coordinates of the vertices of the triangle after **two reflections** first over the x-axis and then over the y-axis.

Graph and label each figure and its reflection over the indicated axis. Then find the coordinates of the reflected image.

13. Square $ABCD$ with vertices $A(2,4)$, $B(-2,4)$, $C(-2,8)$ and $D(2,8)$ reflected over the x-axis.

$A'($ $\quad\quad)$

$B'($ $\quad\quad)$

$C'($ $\quad\quad)$

$D'($ $\quad\quad)$
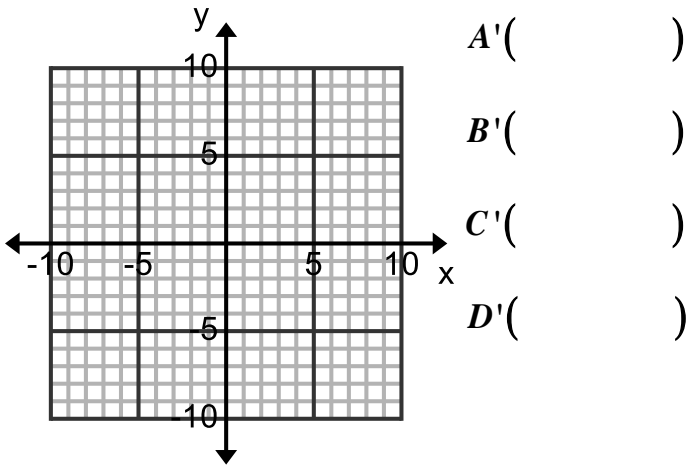
14. $\triangle RST$ with vertices $R(-5,3)$, $S(-4,-2)$, and $T(-2,3)$ reflected over the y-axis.

$R'($ $\quad\quad)$

$S'($ $\quad\quad)$

$T'($ $\quad\quad)$
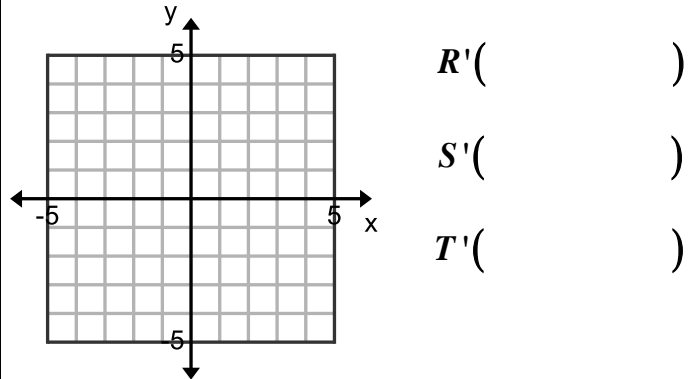
The coordinates of a point and its image after a reflection are given. Which axis is the point _reflected_ across?

15. $X(-1,-4) \rightarrow X'(-1,4)$
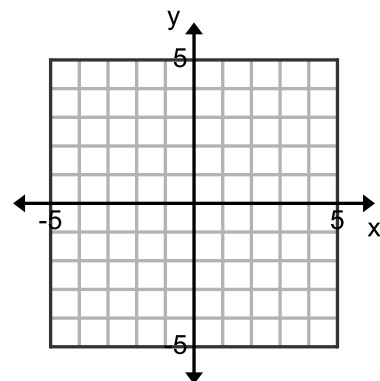
16. $A(-3,5) \rightarrow A'(3,5)$

17. $M(3,3) \rightarrow M'(3,-3)$

18. $W(-4,0) \rightarrow W'(4,0)$

Graph and label the rectangle with the given vertices. Now graph the image of the figure after the indicated translation and write the coordinates of its vertices. Then use translation notation to describe the _translation_.

19. Rectangle $KLMN$ with vertices $K(1,-1)$, $L(1,1)$, $M(5,1)$, and $N(5,-1)$ translated 4 units left and 3 units up.

$K'($ $\quad\quad)$ $\quad\quad$ $L'($ $\quad\quad)$

$M'($ $\quad\quad)$ $\quad\quad$ $N'($ $\quad\quad)$

Translation Notation: $(x,y) \rightarrow ($ $\quad\quad)$

Quadrilateral $ABCD$ has vertices $A(-5,-1)$, $B(-3,0)$, $C(2,-2)$, and $D(0,-6)$. Find the vertices of $A'B'C'D'$ after each <u>translation</u>. Then use <u>translation</u> notation to describe the translation.

20. 4 units up

$A'($ $)$, $B'($ $)$,
$C'($ $)$, $D'($ $)$

Translation Notation:

$(x,y) \rightarrow ($ $)$

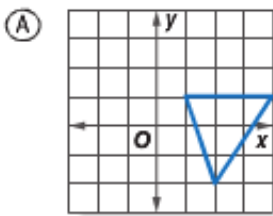**21.** 2 units right and 2 units down

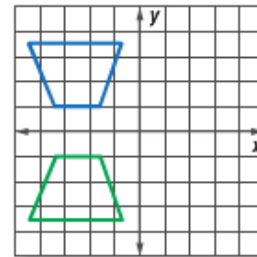$A'($ $)$, $B'($ $)$,
$C'($ $)$, $D'($ $)$

Translation Notation:

$(x,y) \rightarrow ($ $)$

22. Which of the following is the reflection of $\triangle ABC$ with vertices $A(1, -1)$, $B(4, -1)$, and $C(2, -4)$ over the x-axis?

Ⓐ
Ⓒ
Ⓑ
Ⓓ
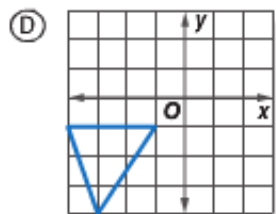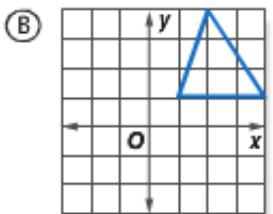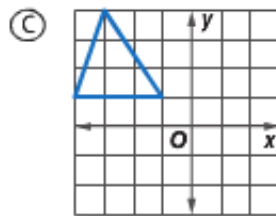
23. The figure shown was transformed from Quadrant II to Quadrant III.

This transformation best represents which of the following?

Ⓕ translation 2 units up
Ⓖ translation 2 units down
Ⓗ reflection over the x-axis
Ⓘ reflection over the y-axis

Simplify the following expressions . Answer should have positive exponents.

24. $b^{17} \cdot b^8$
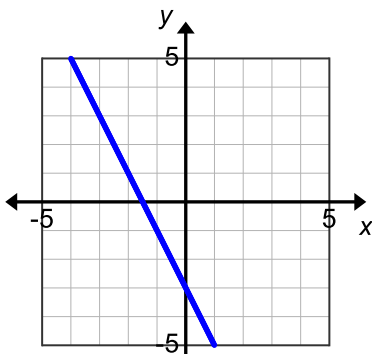
25. a^{-3}

26. $y^6 x^2 y^3$

27. $x^{-3} y^6$

28. $x^9 x^{-2}$

29. $\dfrac{14x^5 y^6}{2xy^2}$

Pick two points on the line and then find the slope.

30.

31.