

1. Point $J(p, q)$ is a vertex of quadrilateral $JKLM$. What are the coordinates of J' after $JKLM$ is rotated 180° about the origin?
- A $(-p, -q)$
- B $(-p, q)$
- C $(p, -q)$
- D $(q, -p)$
2. $\triangle GHI$ will be dilated by a scale factor of 3, resulting in $\triangle G'H'I'$. What rule describes this transformation?
- A $(x', y') = \left(\frac{1}{3}x, \frac{1}{3}y\right)$
- B $(x', y') = (3x, 3y)$
- C $(x', y') = (x + 3, y + 3)$
- D $(x', y') = (x - 3, y - 3)$
3. $\triangle P'Q'R'$ is the image produced after reflecting $\triangle PQR$ across the y -axis. If vertex P has coordinates (s, t) , what are the coordinates of P' ?
- A (t, s)
- B $(s, -t)$
- C $(-s, -t)$
- D $(-s, t)$

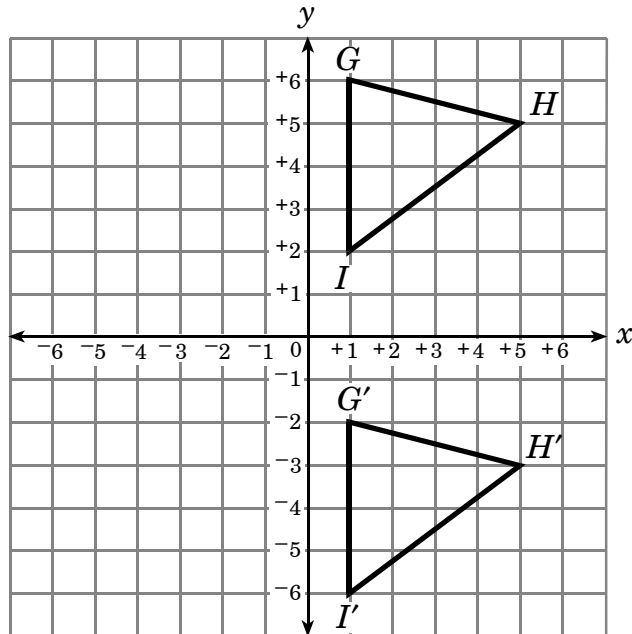
4. What is the rule for the transformation formed by a translation 2 units to the left and 3 units up followed by a 90° counterclockwise rotation?

- A $(x'', y'') = (-3y, -2x)$
- B $(x'', y'') = (x - 2, y + 3)$
- C $(x'', y'') = [-(y + 3), x - 2]$
- D $(x'', y'') = [-(y - 2), x + 3]$

5. The point $G(2, -7)$ is transformed according to the rule $(x', y') = (x + 2, y - 3)$. The image G' of the transformation is then reflected over the line $y = x$, resulting in point G'' . What are the coordinates of G'' ?

- A $(4, 10)$
- B $(4, -10)$
- C $(-10, 4)$
- D $(-4, 10)$

6. $\triangle G'H'I'$ is the image of $\triangle GHI$ after a transformation.



Which choice describes the transformation shown?

- A reflection over x -axis
- B reflection over y -axis
- C $(x', y') = (x - 8, y)$
- D $(x', y') = (x, y - 8)$

7. Point $J(p, q)$ is a vertex of $\triangle JKL$. What are the coordinates of J' after $\triangle JKL$ is reflected across the line $y = x$?

A $(-p, -q)$

B $(p, -q)$

C $(q, -p)$

D (q, p)

8. $\triangle XYZ$ is dilated by a factor of $\frac{1}{2}$. What is the ratio of the area of $\triangle XYZ$ to the area of its image, $\triangle X'Y'Z'$?

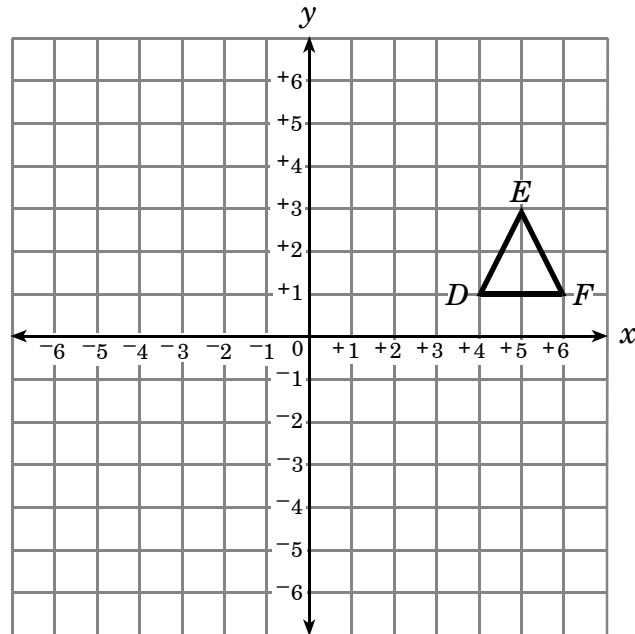
A 4 : 1

B 2 : 1

C 1 : 2

D 1 : 4

9. $\triangle DEF$ is reflected across the line $y = x$.



Which matrix multiplication shows how to find $\triangle D'E'F'$?

- A $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 4 & 5 & 6 \\ 1 & 3 & 1 \end{bmatrix}$
- B $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 4 & 5 & 6 \\ 1 & 3 & 1 \end{bmatrix}$
- C $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 4 & 5 & 6 \\ 1 & 3 & 1 \end{bmatrix}$
- D $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 4 & 5 & 6 \\ 1 & 3 & 1 \end{bmatrix}$

10. Triangle MRT has vertices at $M(3, 8)$, $R(7, -2)$, and $T(-5, -4)$. If the triangle is to be translated by the rule $(x', y') = (x + 3, y - 2)$, which matrix expression models the translation?

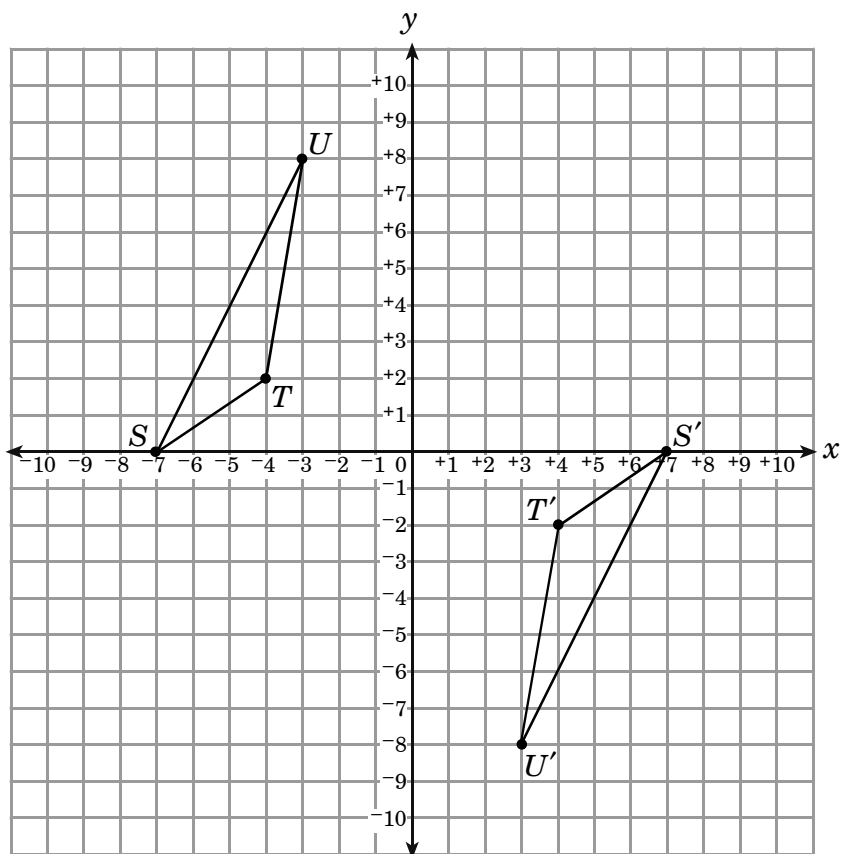
A
$$\begin{bmatrix} 3 & 7 & -5 \\ 8 & -2 & -4 \end{bmatrix} + \begin{bmatrix} 3 & 3 & 3 \\ -2 & -2 & -2 \end{bmatrix}$$

B
$$\begin{bmatrix} 3 & 7 & -5 \\ 8 & -2 & -4 \end{bmatrix} - \begin{bmatrix} -2 & -2 & -2 \\ 3 & 3 & 3 \end{bmatrix}$$

C
$$\begin{bmatrix} 3 & 7 & -5 \\ 8 & -2 & -4 \end{bmatrix} + \begin{bmatrix} -2 & -2 & -2 \\ 3 & 3 & 3 \end{bmatrix}$$

D
$$\begin{bmatrix} 3 & 7 & -5 \\ 8 & -2 & -4 \end{bmatrix} - \begin{bmatrix} 3 & 3 & 3 \\ -2 & -2 & -2 \end{bmatrix}$$

11. Which matrix calculation was used to transform $\triangle STU$ to $\triangle S'T'U'$?



- A $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} -7 & -4 & -3 \\ 0 & 2 & 8 \end{bmatrix}$
- B $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} -7 & -4 & -3 \\ 0 & 2 & 8 \end{bmatrix}$
- C $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} -7 & -4 & -3 \\ 0 & 2 & 8 \end{bmatrix}$
- D $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} -7 & -4 & -3 \\ 0 & 2 & 8 \end{bmatrix}$

12. $\triangle GHJ$ with vertex matrix $\begin{bmatrix} -2 & 3 & 3 \\ 4 & 6 & -2 \end{bmatrix}$ is dilated by a factor of $\frac{1}{3}$. In the image $\triangle G'H'J'$, what are the coordinates of the vertex that lies in the second quadrant?
- A $\left(-\frac{7}{3}, \frac{13}{3}\right)$
- B $\left(-\frac{2}{3}, \frac{4}{3}\right)$
- C $\left(1, -\frac{2}{3}\right)$
- D $(1, 2)$
-

13. The vertices of quadrilateral $GHIJ$ are $G(-1, -1)$, $H(3, -2)$, $I(2, 4)$, and $J(-2, 3)$. $G'H'I'J'$ is the image produced by translating quadrilateral $GHIJ$ 6 units to the left. Which matrix represents $G'H'I'J'$?
- A $\begin{bmatrix} -7 & -3 & -4 & -8 \\ -7 & -8 & -2 & -3 \end{bmatrix}$
- B $\begin{bmatrix} -7 & -3 & -4 & -8 \\ -1 & -2 & 4 & 3 \end{bmatrix}$
- C $\begin{bmatrix} -1 & 3 & 2 & -2 \\ -7 & -8 & -2 & -3 \end{bmatrix}$
- D $\begin{bmatrix} 5 & 9 & 8 & 4 \\ -1 & -2 & 4 & 3 \end{bmatrix}$

14. $\triangle M'N'O'$ is the image of $\triangle MNO$ produced by a translation 3 units left and 1 unit up.

The vertex matrix for $\triangle M'N'O'$ is $\begin{bmatrix} -1 & 2 & 4 \\ 1 & 6 & -3 \end{bmatrix}$. Which is the vertex matrix for $\triangle MNO$?

A $\begin{bmatrix} 2 & 5 & 7 \\ 0 & 5 & -4 \end{bmatrix}$

B $\begin{bmatrix} -4 & -1 & 1 \\ 2 & 7 & -2 \end{bmatrix}$

C $\begin{bmatrix} -2 & 1 & 3 \\ 4 & 9 & 0 \end{bmatrix}$

D $\begin{bmatrix} 0 & 3 & 5 \\ -2 & 3 & -6 \end{bmatrix}$

15. Polygon $FGHI$ is represented by vertex matrix M .

$$M = \begin{bmatrix} 2 & 4 & 4 & 2 \\ -2 & -2 & -5 & -5 \end{bmatrix}$$

Which multiplication would be used to reflect polygon $FGHI$ across the x -axis?

A $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 2 & 4 & 4 & 2 \\ -2 & -2 & -5 & -5 \end{bmatrix}$

B $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 4 & 4 & 2 \\ -2 & -2 & -5 & -5 \end{bmatrix}$

C $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 2 & 4 & 4 & 2 \\ -2 & -2 & -5 & -5 \end{bmatrix}$

D $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix} \begin{bmatrix} 2 & 4 & 4 & 2 \\ -2 & -2 & -5 & -5 \end{bmatrix}$

End of Goal 3 Sample Items

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