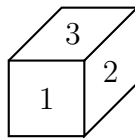


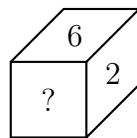
When appropriate, consider this the “start” position.



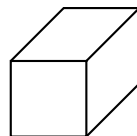
1. True or False: If \mathbf{a} is a scalar multiple of \mathbf{b} , then \mathbf{b} is a scalar multiple of \mathbf{a} . Explain your answer!
2. Give a parametric representation of the line through the points $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ and $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$.
3. Find all x such that $\det \begin{bmatrix} 3 & -2 \\ x & 4 \end{bmatrix} > 0$.
4. In matrix form, write the affine transformation which first reflects across the x -axis, rotates 90° clockwise, and then moves to the right 7.
5. Write the affine transformations, in matrix form, you would need to create the following fractal. Indicate which transformations correspond to the black, gray, and light gray areas, respectively.



6. Find the following matrix product: $\begin{bmatrix} 7 & -2 \\ -1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 1 \\ -2 & -4 \end{bmatrix}$.
7. Write the matrix which transforms the die to the following position:



8. Fill in the die after performing the transformation $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.



9. Find a vector \mathbf{u} such that the line $6x - 11y = 0$ is perpendicular \mathbf{u} .
10. If $\mathbf{v} = (7, a, 3)$ and $\mathbf{w} = (a, -5, 6)$, find a such that $\mathbf{v} \cdot \mathbf{w} = 0$.
11. The matrix $\begin{bmatrix} 9/10 & -3/10 \\ -3/10 & 1/10 \end{bmatrix}$ is the matrix for the projection on a line L . Find a matrix for the reflection across the line L .
12. How many direct symmetries of the cube are 180° rotations about an axis?
13. Find $(3, -1, 2) \times (-4, 2, 1)$.
14. What are the three geometric properties of the cross product?
15. Find symmetric equations of the line through the points $(3, 2, -1)$ and $(6, 4, 3)$.
16. Find an equation for the plane with normal $(1, 4, -3)$ which passes through the point $(3, -2, 5)$.
17. Find the distance from the point $(-1, 2, 0)$ to the plane $y = -3$.
18. What is your favorite food?

EXTRA CREDIT: A rectangular box has opposite corners $(0, 0, 0)$ and $(3, 1, 2)$. Make an accurate sketch of the box after is transformed by the affine transformation

$$T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} + \begin{pmatrix} -1 \\ 4 \\ 1 \end{pmatrix}.$$