LESSON MAKER PRO

Move the Model

Track points as 3D objects move.

HIGH SCHOOL · MM.D3D.A.12

MM.D3D.A.12 "Use technology and other tools to explore the results of simple transformations using three-dimensional coordinates, including translations in the x, y, and/or z directions; rotations of 90°, 180°, or 270° about the x, y, and z axes..."

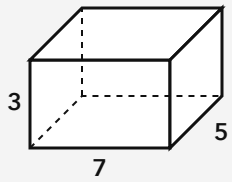
NAME _____ DATE _____

COORDINATE MOVES

A translation adds to coordinates, and a dilation from the origin multiplies each coordinate by the scale factor. Reflection over the yz-plane changes the sign of x; reflection over the xy-plane changes the sign of z. A positive 90° rotation follows the right-hand rule: about x, (x, y, z) becomes (x, -z, y); about y, it becomes (z, y, -x); about z, it becomes (-y, x, z).

WORKED EXAMPLE

Place one corner of the prism at the origin. Length follows +x, width follows +y, and height follows +z. Where is the opposite corner after a translation of (2, -1, 4)?



1. Opposite corner: (7, 5, 3).
2. Add the translation: (7 + 2, 5 - 1, 3 + 4).

Answer: (9, 4, 7)

PRACTICE 4 problems

1 Translate (6, -8, 9) by (10, 6, -9). Give the new point.

ANSWER _____

2 Rotate (6, 8, 10) by positive 90° about the z-axis. Give the new point.

ANSWER _____

3 Reflect (-6, 8, 10) over the yz-plane. Give the new point.

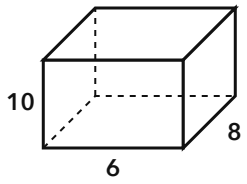
ANSWER _____

4 Dilate (8, -6, 10) from the origin by a factor of 1/2. Give the new point.

ANSWER _____

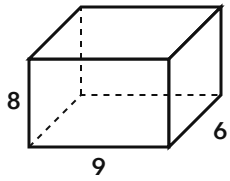
APPLY IT Show your work

1 A VR designer places one corner of this room at the origin. Length follows +x, width follows +y, and height follows +z. Where does the opposite corner land after a positive 90° rotation about the x-axis?



ANSWER _____

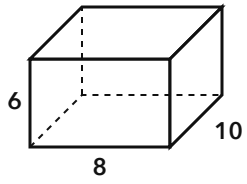
2 A game designer places one corner of this crate at the origin. Length follows +x, width follows +y, and height follows +z. Where does the opposite corner land after reflection over the xy-plane?



ANSWER _____

CHALLENGE One step up

A 3D artist places one corner of this prop at the origin. Length follows +x, width follows +y, and height follows +z. Rotate the opposite corner by positive 90° about the y-axis, then translate it by (0, -6, 9). Give its final coordinates.



WORK SPACE AND ANSWER

ANSWER KEY

Move the Model

HIGH SCHOOL · MM.D3D.A.12

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Translate (6, -8, 9) by (10, 6, -9). Give the new point.	**(16, -2, 0)**
2	Rotate (6, 8, 10) by positive 90° about the z-axis. Give the new point.	**(-8, 6, 10)**
3	Reflect (-6, 8, 10) over the yz-plane. Give the new point.	**(6, 8, 10)**
4	Dilate (8, -6, 10) from the origin by a factor of 1/2. Give the new point.	**(4, -3, 5)**

PART 2 · APPLY IT

1. **(6, -10, 8)** The opposite corner starts at (6, 8, 10). Rotating about x changes (x, y, z) to (x, -z, y).
2. **(9, 6, -8)** The opposite corner starts at (9, 6, 8). Reflection over the xy-plane changes only the sign of z.

CHALLENGE

(6, 4, 1)

For the challenge, the point after rotation is (6, 10, -8). Apply the translation to that point, not to the original corner.