LESSON MAKER PRO

Space Design Coordinates

Find midpoints and distances in three dimensions.

HIGH SCHOOL · MM.D3D.A.11

MM.D3D.A.11 "Plot coordinates on a three-dimensional Cartesian coordinate system and use relationships between coordinates to solve design problems. a..."

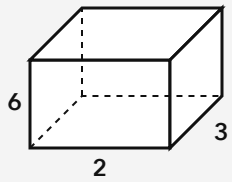
NAME _____ DATE _____

THE BIG IDEA

A point (x, y, z) shows its position along three perpendicular axes. To find a midpoint, average matching coordinates. To find a distance, square and add the changes in x, y, and z, then take the square root.

WORKED EXAMPLE

One corner of the prism is (0,0,0). Its length, width, and height run along the positive x, y, and z axes. How far is the opposite corner?



1. Read the opposite corner: (2,3,6).
2. Find the distance: $\sqrt{(2^2 + 3^2 + 6^2)}$.
3. Simplify: $\sqrt{49} = 7$.

Answer: 7 units

PRACTICE 4 problems

1 Find the midpoint of A(0,-4,8) and B(10,4,0).

ANSWER _____

2 Find the distance between A(-5,1,1) and B(0,13,1).

ANSWER _____

3 Find the midpoint of A(-8,5,-1) and B(4,-1, 9).

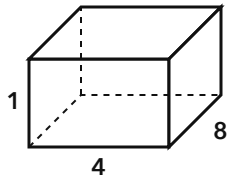
ANSWER _____

4 Find the distance between A(5,-5,0) and B(5,0,12).

ANSWER _____

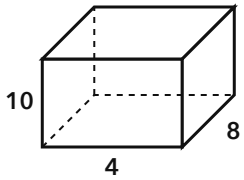
APPLY IT Show your work

1 A VR room has the shape shown. Sensors sit at opposite corners. How far apart are they? The prism's length, width, and height run along the x, y, and z axes.



ANSWER _____

2 A game designer places a camera halfway between opposite corners of the prism. One corner is (1,-5,0). Its length, width, and height point along the positive x, y, and z axes. Where is the camera?



ANSWER _____

CHALLENGE One step up

A relay must sit halfway between drones A(-4,0,1) and B(8,5,1). Find its coordinates and its distance from either drone.

WORK SPACE AND ANSWER

ANSWER KEY

Space Design Coordinates

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the midpoint of A(0,-4,8) and B(10,4,0).	**(5,0,4)**
2	Find the distance between A(-5,1,1) and B(0,13,1).	**13 units**
3	Find the midpoint of A(-8,5,-1) and B(4,-1,9).	**(-2,2,4)**
4	Find the distance between A(5,-5,0) and B(5,0,12).	**13 units**

PART 2 · APPLY IT

1. **9 units** The coordinate changes are 4, 8, and 1. The distance is $\sqrt{(16 + 64 + 1)} = 9$ units.
2. **(3,-1,5)** The opposite corner is (5,3,10). Average its coordinates with (1,-5,0) to get (3,-1,5).

CHALLENGE

Coordinates: (2,5/2,1); distance: 13/2 units

Accept 2.5 for 5/2 and 6.5 for 13/2 in the challenge.