LESSON MAKER PRO

Space Between Points

Find the point halfway between two locations in 3-D space.

HIGH SCHOOL · MM.D3D.A.11.d

MM.D3D.A.11.d "Find the midpoint between two objects in space given the coordinates of each."

NAME _____ DATE _____

MIDPOINT IN 3-D

A point in space has three coordinates: (x, y, z). To find the midpoint of two points, add their x-coordinates and divide by 2, then do the same for y and z.

WORKED EXAMPLE

Find the midpoint of A(21, 33, 45) and B(27, 39, 51).

1. x-coordinate: (21 + 27)/2 = 24
2. y-coordinate: (33 + 39)/2 = 36
3. z-coordinate: (45 + 51)/2 = 48

Answer: (24, 36, 48)

PRACTICE 6 problems

1 Find the midpoint of A(0, 2, 4) and B(6, 8, 10).

ANSWER _____

2 Find the midpoint of C(-4, 6, -2) and D(8, -2, 12).

ANSWER _____

3 Find the midpoint of E(-9, -5, -1) and F(-3, 7, 11).

ANSWER _____

4 Find the midpoint of G(1, -8, 3) and H(4, 2, -5).

ANSWER _____

5 Find the midpoint of J(-7, 0, 14) and K(5, -6, -4).

ANSWER _____

6 Find the midpoint of P(2/3, -1/2, 5) and Q(4/3, 3/2, -3).

ANSWER _____

APPLY IT Show your work

1 A drone flies from (-6, 15, 8) to (10, -3, 20). The first two coordinates give its horizontal location, and the third gives its height, all in meters. What are the coordinates of the point halfway along a straight flight between these locations?

WORK SPACE

ANSWER _____

2 In a VR game, two floating sound sources are at (-12, 4, 6) and (8, 10, 2). The designer wants to place a third sound source halfway between them. What coordinates should the designer use?

WORK SPACE

ANSWER _____

CHALLENGE One step up

In a 3-D game, one portal is at (-8, 3, 7). The midpoint between it and a second portal is (1, -2, 5). Find the second portal's coordinates. Explain how you found them.

WORK SPACE AND ANSWER

ANSWER KEY # Space Between Points

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the midpoint of A(0, 2, 4) and B(6, 8, 10).	**(3, 5, 7)**
2	Find the midpoint of C(-4, 6, -2) and D(8, -2, 12).	**(2, 2, 5)**
3	Find the midpoint of E(-9, -5, -1) and F(-3, 7, 11).	**(-6, 1, 5)**
4	Find the midpoint of G(1, -8, 3) and H(4, 2, -5).	**(5/2, -3, -1)**
5	Find the midpoint of J(-7, 0, 14) and K(5, -6, -4).	**(-1, -3, 5)**
6	Find the midpoint of P(2/3, -1/2, 5) and Q(4/3, 3/2, -3).	**(1, 1/2, 1)**

PART 2 · APPLY IT

1. **(2, 6, 14)** Average the matching coordinates: (-6 + 10)/2 = 2, (15 + -3)/2 = 6, and (8 + 20)/2 = 14.
2. **(-2, 7, 4)** Average the matching coordinates: (-12 + 8)/2 = -2, (4 + 10)/2 = 7, and (6 + 2)/2 = 4.

CHALLENGE

The second portal is at (10, -7, 3). Doubling each midpoint coordinate and subtracting the matching coordinate of the first portal gives (2(1) - (-8), 2(-2) - 3, 2(5) - 7) = (10, -7, 3).

Accept equivalent forms for fractional coordinates, such as 2.5 for 5/2. For the challenge, accept any explanation that correctly reverses the midpoint calculation for all three coordinates.