

Topic: Distance between two points in three dimensions

Question: Calculate the distance between P_1 and P_2 .

$$P_1 = (3,6,1)$$

$$P_2 = (0,1,5)$$

Answer choices:

A 5

B $5\sqrt{2}$

C $3\sqrt{5}$

D 7



Solution: B

Plug the coordinates of the given points into the distance formula.

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(3 - 0)^2 + (6 - 1)^2 + (1 - 5)^2}$$

$$d = \sqrt{9 + 25 + 16}$$

$$d = \sqrt{50}$$

$$d = \sqrt{25 \cdot 2}$$

$$d = \sqrt{25}\sqrt{2}$$

$$d = 5\sqrt{2}$$



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Question: Calculate the distance between P_1 and P_2 .

$$P_1 = (-5, -2, 6)$$

$$P_2 = (1, 2, 4)$$

Answer choices:

A $2\sqrt{14}$

B $2\sqrt{5}$

C 6

D $2\sqrt{10}$



Solution: A

Plug the coordinates of the given points into the distance formula.

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(-5 - 1)^2 + (-2 - 2)^2 + (6 - 4)^2}$$

$$d = \sqrt{36 + 16 + 4}$$

$$d = \sqrt{56}$$

$$d = \sqrt{4 \cdot 14}$$

$$d = \sqrt{4}\sqrt{14}$$

$$d = 2\sqrt{14}$$



Topic: Distance between two points in three dimensions

Question: Which point is closest to the point $P = (2,4,6)$?

Answer choices:

A $Q_1 = (5, -2, 3)$

B $Q_2 = (4, 5, 10)$

C $Q_3 = (6, 1, 9)$

D $Q_4 = (1, 8, 5)$



Solution: D

We'll use the distance formula to find the distance of each of the four points from P . To make it easier to identify the point that's closest to P , we won't simplify the radicals.

The distance between P and Q_1 is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(2 - 5)^2 + (4 - (-2))^2 + (6 - 3)^2}$$

$$d = \sqrt{(-3)^2 + 6^2 + 3^2}$$

$$d = \sqrt{9 + 36 + 9}$$

$$d = \sqrt{54}$$

The distance between P and Q_2 is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(2 - 4)^2 + (4 - 5)^2 + (6 - 10)^2}$$

$$d = \sqrt{(-2)^2 + (-1)^2 + (-4)^2}$$

$$d = \sqrt{4 + 1 + 16}$$

$$d = \sqrt{21}$$



The distance between P and Q_3 is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(2 - 6)^2 + (4 - 1)^2 + (6 - 9)^2}$$

$$d = \sqrt{(-4)^2 + 3^2 + (-3)^2}$$

$$d = \sqrt{16 + 9 + 9}$$

$$d = \sqrt{34}$$

The distance between P and Q_4 is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

$$d = \sqrt{(2 - 1)^2 + (4 - 8)^2 + (6 - 5)^2}$$

$$d = \sqrt{1^2 + (-4)^2 + 1^2}$$

$$d = \sqrt{1 + 16 + 1}$$

$$d = \sqrt{18}$$

The distances of Q_1 , Q_2 , Q_3 , and Q_4 from P are $\sqrt{54}$, $\sqrt{21}$, $\sqrt{34}$, and $\sqrt{18}$, respectively, so Q_4 is the point closest to P .

