

3D Space Diagonal: Two Steps



Key idea

In 3D you use Pythagoras **twice**: once for a face diagonal, then again with an edge for the space diagonal.

Method

1. Pythagoras on one face $\Rightarrow$ face diagonal.
2. Combine it with the last edge $\Rightarrow$ space diagonal.

Example: cuboid $6 \times 8 \times 24$

Face: $6^2 + 8^2 = 100 \Rightarrow d = 10.$

Space: $10^2 + 24^2 = 676 \Rightarrow D = 26.$

Common mistake

Only use edges that lie in the *same* right-angled triangle — not any two 3D corners.



Choosing the Right Face



Key idea



Start with the face the line actually crosses. Carry that face diagonal into the second triangle, and keep it exact.

Example: box $3 \times 4 \times 12$



Face: $3^2 + 4^2 = 25 \Rightarrow d = 5$.

Space: $5^2 + 12^2 = 169 \Rightarrow D = 13$.

Which edges first?



Pick the two dimensions of the face that holds the diagonal you need; the third edge is used in the second step.

Common mistake

Do not lose the face diagonal halfway — keep it exact (or a clear rounded value) for the second step.

