

Example of Correct Reasoning Path

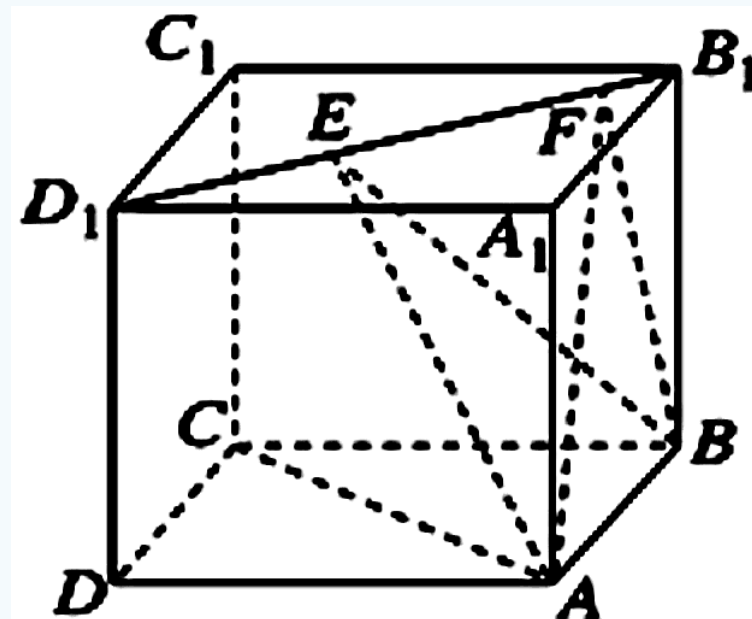
Question

As shown in the figure, in a cube $ABCD-A_1B_1C_1D_1$ with edge length 1, there are two moving points E and F on segment B_1D_1 , where $EF = 1/2$. Consider the following four conclusions:

- ① $AC \perp BE$
- ② $EF \parallel \text{plane } ABCD$
- ③ The volume of triangular pyramid $A-BEF$ is constant
- ④ The area of triangle AEF equals the area of triangle BEF .

The number of incorrect conclusions is ()

A. 0 B. 1 C. 2 D. 3



Model's response

To solve this problem, we need to analyze the correctness of each conclusion step by step.

****Conclusion ①: $AC \perp BE$ ****

- 1. In the cube $ABCD-A_1B_1C_1D_1$, AC is perpendicular to plane DD_1B_1B .
- 2. Since BE is in plane DD_1B_1B , therefore $AC \perp BE$.

****Conclusion ②: $EF \parallel \text{plane } ABCD$ ****

- 1. EF is in the plane containing BD_1 , while BD_1 is parallel to BC and BC is in plane $ABCD$.
- 2. Therefore $EF \parallel \text{plane } ABCD$.

****Conclusion ③: The volume of triangular pyramid $A-BEF$ is constant****

- 1. The area of triangle BEF is constant, because EF and the distance from B to E and F do not change.
- 2. The distance from point A to plane BEF is constant, as it is one height of the cube.
- 3. Therefore the volume of triangular pyramid $A-BEF$ is constant.

****Conclusion ④: The area of triangle AEF equals the area of triangle BEF ****

- 1. Since the distances from points A and B to segment EF are different, the heights of the two triangles are different.
- 2. Therefore the area of triangle AEF is actually not equal to the area of triangle BEF .

In summary, only conclusion ④ is incorrect.

This problem tests basic geometric relationships, with a rigorous analysis of each option.

The answer to this problem is B (1 incorrect conclusion).

ORM's Feedback

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