

Example of Correct Reasoning Path

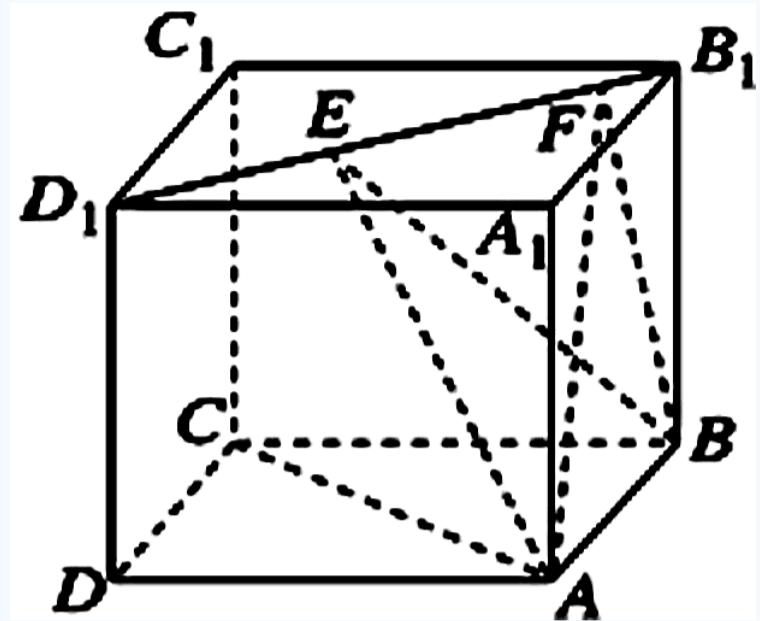
Question

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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