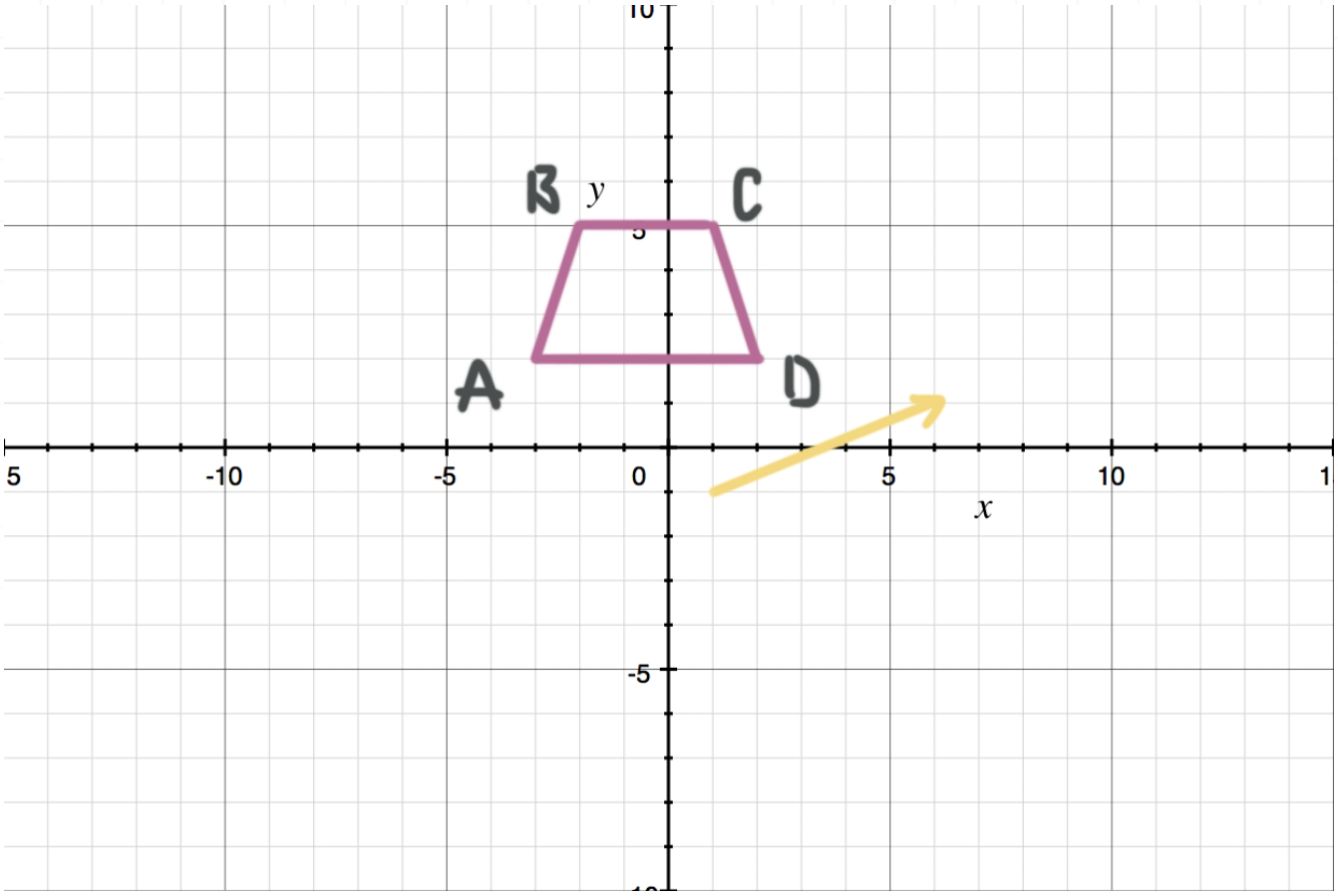
Topic: Translation vectors

Question: If trapezoid $ABCD$ undergoes a translation to $A'B'C'D$ as indicated by the vector shown, what are the coordinates of point C'?



Answer choices:

A (6,7)

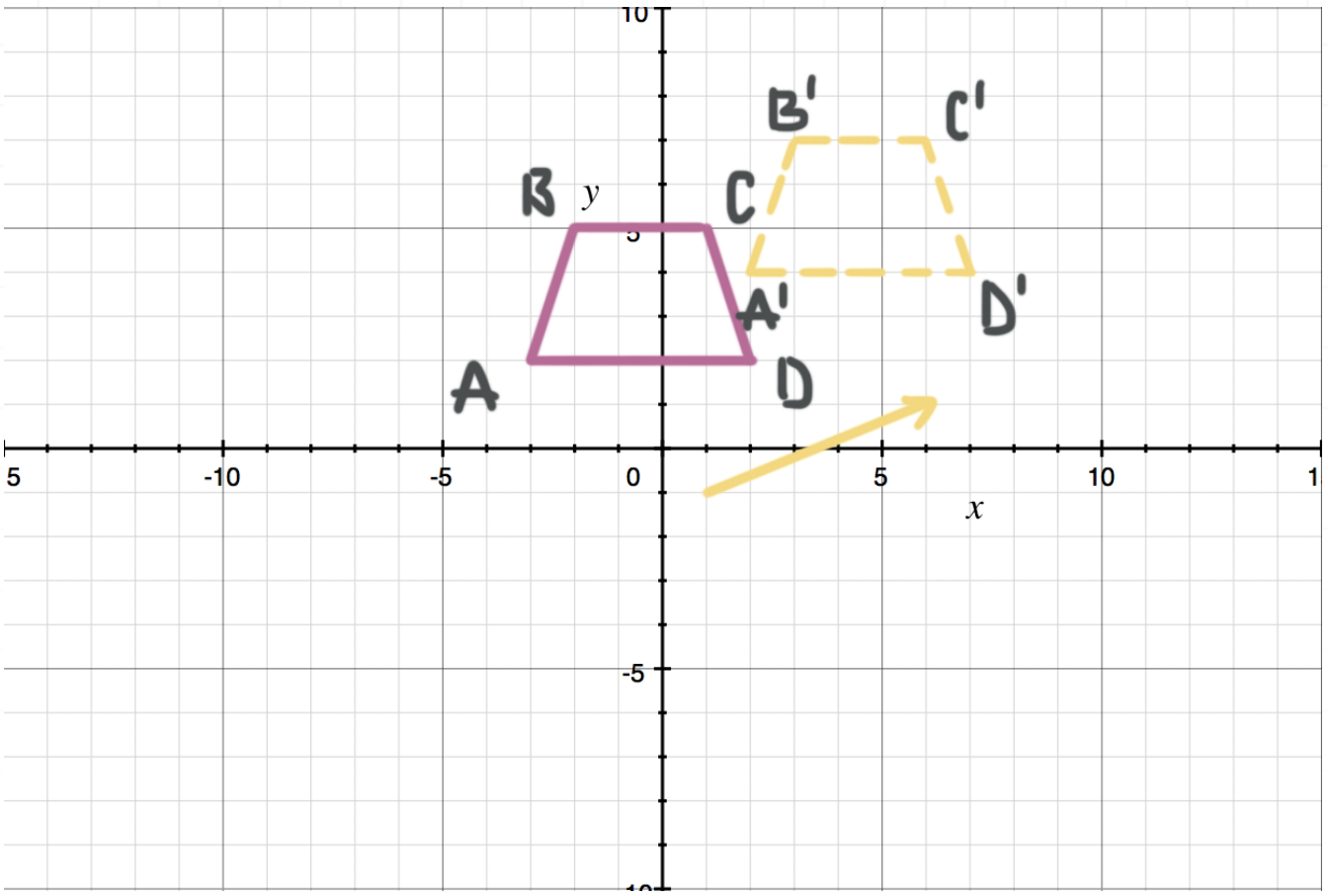
B (5,2)

C (3,10)

D (2,4)

Solution: A

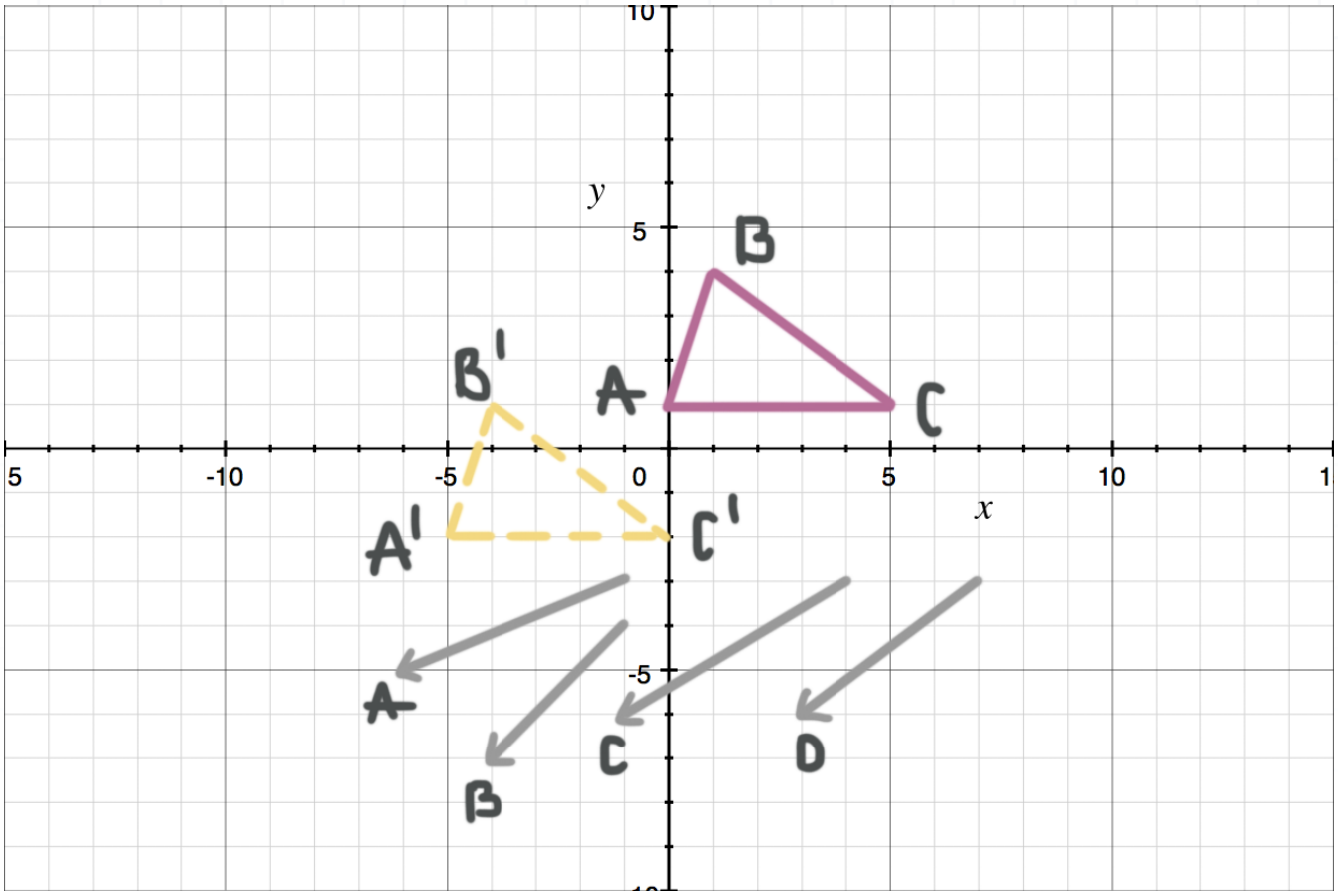
Though it's not totally necessary for solving the problem, the figure below shows the entire trapezoid being translated.



The tail and head of the translation vector are at $(1, -1)$ and $(6,1)$, respectively, which indicates a translation of $6 - 1 = 5$ units to the right and $1 - (-1) = 2$ units up. Point C is at $(1,5)$, so we need to add 5 to its x-coordinate and 2 to its y-coordinate. The result, $(6,7)$, is the location of C'.

Topic: Translation vectors

Question: $\triangle ABC$ undergoes a translation to $\triangle A'B'C'$. Which of the vectors shown would produce that translation?



Answer choices:

A A

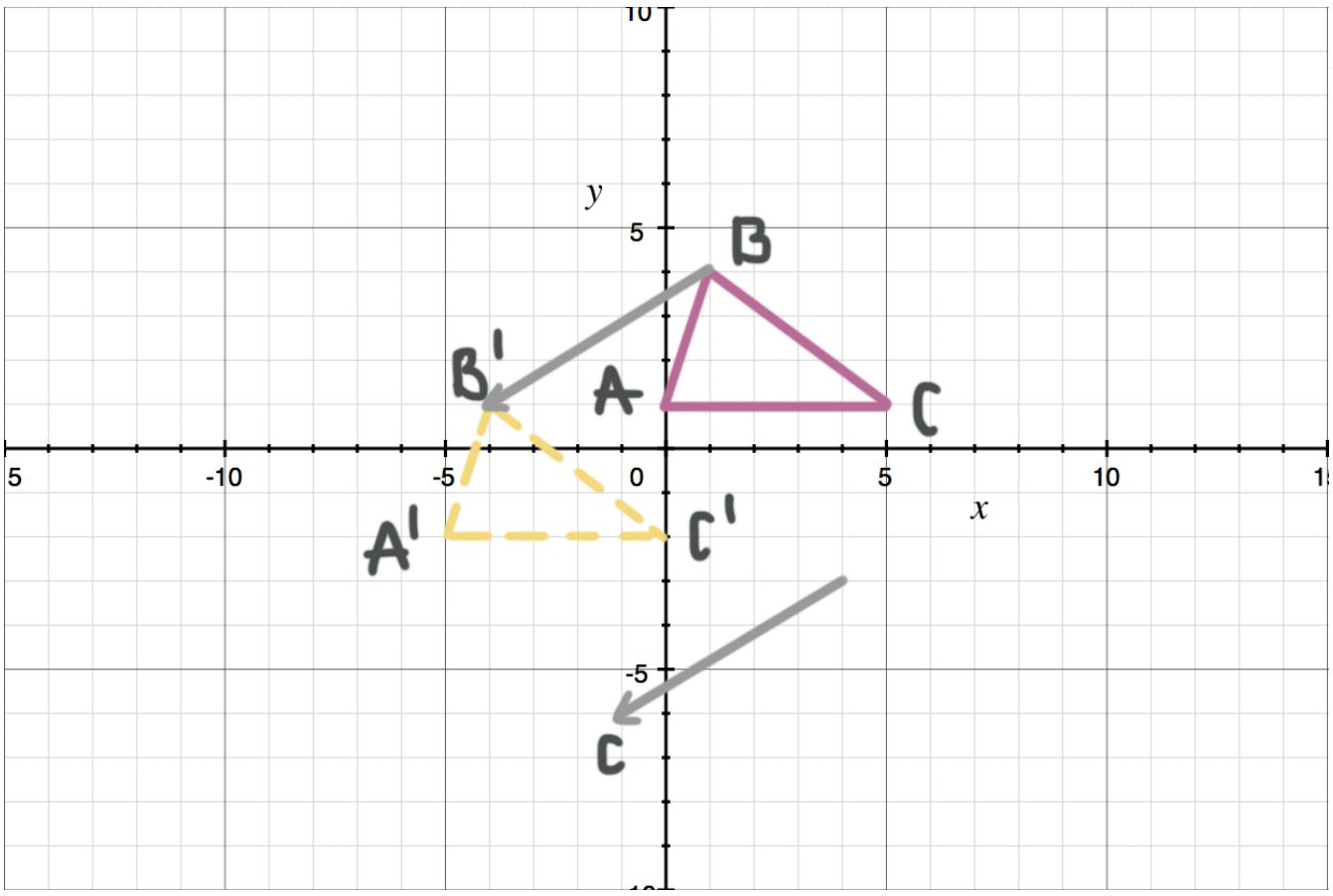
B B

C C

D D

Solution: C

The coordinates of points B and B' are $(1,4)$ and $(-4,1)$, respectively. The x-coordinate of B' is 5 less than that of B, and the y-coordinate of B' is 3 less than that of B, so we have to move 5 units to the left and 3 units down to get from B to B'.



Vector C is the vector that matches that translation, since its tail and head are at $(4, -3)$ and $(-1, -6)$, respectively, which means that C indicates a horizontal translation of $-1 - 4 = -5$ units (5 units to the left) and a vertical translation of $-6 - (-3) = -3$ units (3 units down).

Topic: Translation vectors

Question: The tail and head of translation vector A are at $(3,1)$ and $(0,7)$, respectively. The tail and head of a second translation vector B are at $(0,7)$ and $(-1,4)$, respectively. Determine a single translation vector that would accomplish the same translation as the given two vectors in succession (vector A followed by vector B). What is its length?

Answer choices:

A 5

B 4

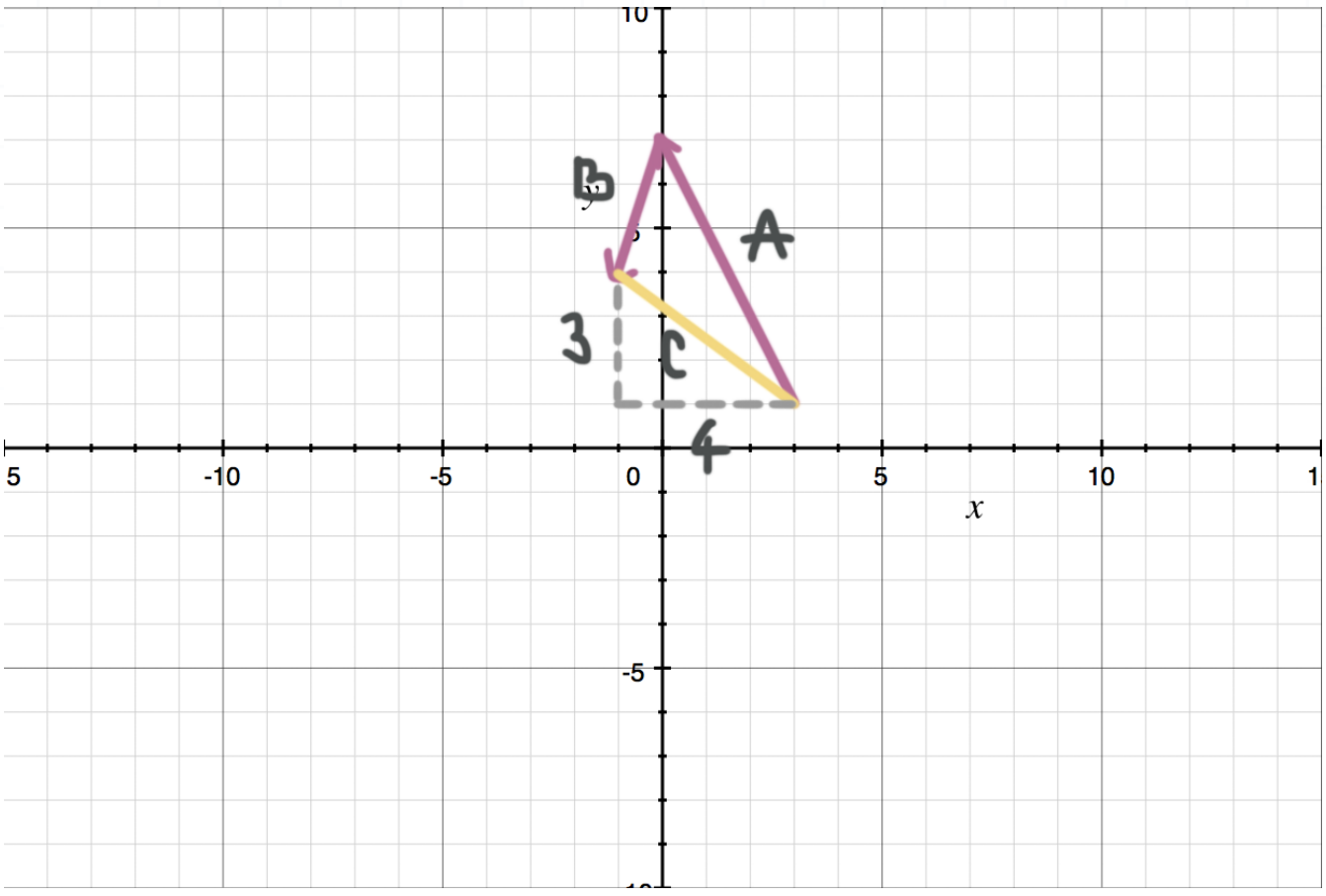
C 3

D 2

Solution: A

Since translation vector C must produce the same translation in one step as the translation vectors A and B in succession, the tail and head of vector C are at the tail of vector A and the head of vector B.

Therefore, the tail and head of vector C are at $(3,1)$ and $(-1,4)$, respectively, so translation vector C indicates a horizontal translation of $-1-3=-4$ units (4 units to the left) and a vertical translation of $4-1=3$ units (3 units up).



Notice that the line segment that represents vector C is the hypotenuse of a right triangle in which the lengths of the legs are 4 and 3 (the absolute values of the horizontal and vertical translations, respectively, indicated by vector C), so the length of vector C must be the length of the hypotenuse of that right triangle, which is

$$\sqrt{(4^2) + (3^2)} = \sqrt{16 + 9} = \sqrt{25} = 5$$