

This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found [here](#).

If you have a suggestion to make the keys better, please fill out the short survey [here](#).

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

1. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$\frac{54 + 77i}{-1 + 4i}$$

The solution is $[14.941176470588236, -17.235294117647058]$, which is option D.

- A. $a \in [-56, -53.5]$ and $b \in [19, 21]$ $-54.00 + 19.25i$, which corresponds to just dividing the first term by the first term and the second by the second.
- B. $a \in [14.5, 17]$ and $b \in [-294.5, -292]$ $14.94 - 293.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.
- C. $a \in [-22, -19.5]$ and $b \in [8, 8.5]$ $-21.29 + 8.18i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.
- D. $a \in [14.5, 17]$ and $b \in [-18.5, -15.5]$ $14.94 - 17.24i$, which is the correct option.
- E. $a \in [253.5, 255.5]$ and $b \in [-18.5, -15.5]$ $254.00 - 17.24i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

General Comment: Multiply the numerator and denominator by the *conjugate* of the denominator, then simplify. For example, if we have $2+3i$, the conjugate is $2-3i$.

2. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(2 - 6i)(10 + 4i)$$

The solution is $44 - 52i$, which is option B.

- A. $a \in [-11, -3]$ and $b \in [-72, -62]$ $-4 - 68i$, which corresponds to adding a minus sign in the second term.
- B. $a \in [38, 49]$ and $b \in [-52, -45]$ $44 - 52i$, which is the correct option.
- C. $a \in [16, 22]$ and $b \in [-24, -23]$ $20 - 24i$, which corresponds to just multiplying the real terms to get the real part of the solution and the coefficients in the complex terms to get the complex part.
- D. $a \in [38, 49]$ and $b \in [50, 53]$ $44 + 52i$, which corresponds to adding a minus sign in both terms.
- E. $a \in [-11, -3]$ and $b \in [68, 71]$ $-4 + 68i$, which corresponds to adding a minus sign in the first term.

General Comment: You can treat i as a variable and distribute. Just remember that $i^2 = -1$, so you can continue to reduce after you distribute.