

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.

$$(5 + 4i)(-3 - 10i)$$

The solution is $25 - 62i$, which is option B.

A. $a \in [-57, -52]$ and $b \in [-38.8, -36.1]$

$-55 - 38i$, which corresponds to adding a minus sign in the first term.

B. $a \in [22, 28]$ and $b \in [-64.3, -59.9]$

* $25 - 62i$, which is the correct option.

C. $a \in [22, 28]$ and $b \in [60.9, 64.4]$

$25 + 62i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-21, -14]$ and $b \in [-42.4, -39.1]$

$-15 - 40i$, 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.

E. $a \in [-57, -52]$ and $b \in [36.8, 38.8]$

$-55 + 38i$, which corresponds to adding a minus sign in the second 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.

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

$$\frac{72 - 77i}{4 + 5i}$$

The solution is $-2.37 - 16.29i$, which is option D.

A. $a \in [16, 17]$ and $b \in [1, 2.5]$

$16.41 + 1.27i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

B. $a \in [17, 19]$ and $b \in [-16, -14.5]$

$18.00 - 15.40i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-97.5, -96]$ and $b \in [-16.5, -16]$

$-97.00 - 16.29i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-4, -2]$ and $b \in [-16.5, -16]$

* $-2.37 - 16.29i$, which is the correct option.

E. $a \in [-4, -2]$ and $b \in [-669, -667.5]$

$-2.37 - 668.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

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 $2 - 3i$.

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

$$\frac{54 - 33i}{-8 - 5i}$$

The solution is $-3.00 + 6.00i$, which is option B.

A. $a \in [-3.05, -2.97]$ and $b \in [533.85, 534.2]$

$-3.00 + 534.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

B. $a \in [-3.05, -2.97]$ and $b \in [5.75, 6.4]$

* $-3.00 + 6.00i$, which is the correct option.

C. $a \in [-267.09, -266.92]$ and $b \in [5.75, 6.4]$

$-267.00 + 6.00i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

D. $a \in [-6.72, -6.69]$ and $b \in [-0.45, 0.2]$

$-6.71 - 0.07i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [-6.8, -6.72]$ and $b \in [6.25, 7.05]$

$-6.75 + 6.60i$, which corresponds to just dividing the first term by the first term and the second by the second.

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 $2 - 3i$.

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

$$(-8 - 2i)(-6 - 5i)$$

The solution is $38 + 52i$, which is option B.

A. $a \in [35, 40]$ and $b \in [-59, -49]$

$38 - 52i$, which corresponds to adding a minus sign in both terms.

B. $a \in [35, 40]$ and $b \in [51, 57]$

* $38 + 52i$, which is the correct option.

C. $a \in [52, 63]$ and $b \in [28, 31]$

$58 + 28i$, which corresponds to adding a minus sign in the first term.

D. $a \in [45, 49]$ and $b \in [7, 12]$

$48 + 10i$, 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.

E. $a \in [52, 63]$ and $b \in [-28, -24]$

$58 - 28i$, which corresponds to adding a minus sign in the second 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.
