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.

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1. Choose the **smallest** set of Real numbers that the number below belongs to.

$$\sqrt{\frac{225}{256}}$$

The solution is Rational

A. Rational

B. Whole

C. Irrational

D. Not a Real number

E. Integer

General Comments: The only ways to *not* be a Real number are: dividing by 0 or taking the square root of a negative number. Irrational numbers are more than just square root of 3: adding or subtracting values from square root of 3 is also irrational.

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2. Simplify the expression below and choose the interval the simplification is contained within.

$$19 - 8 \div 16 * 15 - (3 * 11)$$

The solution is -21.5

A. $[-18, -10]$

Messed up their order of operations.

B. $[47, 57]$

Did not distribute addition and subtraction correctly.

C. $[-23, -16]$

* Correct option.

D. $[89, 95]$

Did not distribute negative correctly.

E. $[257, 268]$

This is just an arbitrary distractor.

General Comments: While you may remember (or were taught) PEMDAS is done in order, it is actually done as P/E/MD/AS. When we are at MD or AS, we read left to right.

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3. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{20\pi}{0} + 9i^2$$

The solution is Not a Complex Number

A. Nonreal Complex

B. Pure Imaginary

C. Not a Complex Number

D. Irrational

E. Rational

General Comments: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number.

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

$$(10 - 9i)(-4 - 6i)$$

The solution is $-94.0 - 24.0i$

A. $a \in [11, 16]$ and $b \in [-97, -94]$

Corresponds to adding a minus sign in the first term.

B. $a \in [11, 16]$ and $b \in [94, 107]$

Corresponds to adding a minus sign in the second term.

C. $a \in [-99, -88]$ and $b \in [21, 30]$

Corresponds to adding a minus sign in both terms.

D. $a \in [-46, -37]$ and $b \in [53, 57]$

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. $a \in [-99, -88]$ and $b \in [-27, -17]$

* Correct option.

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

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

$$\frac{36 - 55i}{3 - 1i}$$

The solution is $16.3 - 12.9i$

A. $a \in [15, 18]$ and $b \in [-16, -7]$

* Correct option.

B. $a \in [152, 165]$ and $b \in [-16, -7]$

Forgot to multiply the conjugate by the numerator and added a plus instead of a minus in the denominator.

C. $a \in [0, 6]$ and $b \in [-22, -19]$

Forgot to multiply the conjugate by the numerator and didn't compute the conjugate correctly

D. $a \in [15, 18]$ and $b \in [-133, -128]$

Forgot to multiply the conjugate by the numerator.

E. $a \in [7, 16]$ and $b \in [51, 62]$

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 $2 - 3i$.
