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.

$$\sqrt{\frac{324}{625}}$$

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.

$$13 - 20 \div 17 * 11 - (16 * 3)$$

The solution is -47.941

A. $[-48.13, -47.85]$

* Correct option.

B. $[-35.26, -35.07]$

Messed up their order of operations.

C. $[60.68, 60.9]$

Did not distribute addition and subtraction correctly.

D. $[-47.84, -47.76]$

Did not distribute negative correctly.

E. $[29.82, 30.01]$

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.

$$\frac{\sqrt{65}}{20} + 6i^2$$

The solution is Irrational

A. Rational

B. Irrational

C. Pure Imaginary

D. Nonreal Complex

E. Not a Complex Number

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.

$$(10 - 9i)(6 - 7i)$$

The solution is $-3.0 - 124.0i$

A. $a \in [121, 125]$ and $b \in [-20, -7]$

Corresponds to adding a minus sign in the first term.

B. $a \in [58, 62]$ and $b \in [59, 67]$

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.

C. $a \in [-6, 2]$ and $b \in [-131, -118]$

* Correct option.

D. $a \in [121, 125]$ and $b \in [15, 22]$

Corresponds to adding a minus sign in the second term.

E. $a \in [-6, 2]$ and $b \in [122, 129]$

Corresponds to adding a minus sign in both terms.

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.

$$\frac{-9 - 55i}{2 + 3i}$$

The solution is $-14.08 - 6.38i$

A. $a \in [-5, 1]$ and $b \in [-19, -17]$

Corresponds to just dividing the first term by the first term and the second by the second.

B. $a \in [-16, -9]$ and $b \in [-84, -79]$

Forgot to multiply the conjugate by the numerator.

C. $a \in [-16, -9]$ and $b \in [-8, -4]$

* Correct option.

D. $a \in [-189, -178]$ and $b \in [-8, -4]$

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

E. $a \in [7, 15]$ and $b \in [-15, -9]$

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

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 $2 - 3i$.
