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.

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

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

The solution is $24 - 114i$

A. $a \in [93, 98]$ and $b \in [-68, -62]$

$96 - 66i$, which corresponds to adding a minus sign in the second term.

B. $a \in [55, 62]$ and $b \in [32, 38]$

$60 + 36i$, 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.

C. $a \in [23, 29]$ and $b \in [-115, -113]$

* $24 - 114i$, which is the correct option.

D. $a \in [93, 98]$ and $b \in [64, 71]$

$96 + 66i$, which corresponds to adding a minus sign in the first term.

E. $a \in [23, 29]$ and $b \in [106, 116]$

$24 + 114i$, which corresponds to adding a minus sign in both terms.

General Comment: 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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2. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{\sqrt{70}}{10} + 2i^2$$

The solution is Irrational

A. Not a Complex Number

This is not a number. The only non-Complex number we know is dividing by 0 as this is not a number!

B. Irrational

These cannot be written as a fraction of Integers. Remember: π is not an Integer!

C. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3 + 5)

D. Nonreal Complex

This is a Complex number $(a + bi)$ that is not Real (has i as part of the number).

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E. Pure Imaginary

This is a Complex number $(a + bi)$ that **only** has an imaginary part like $2i$.

General Comment: General Comments: Be sure to simplify $i^2 = -1$. This may remove the imaginary portion for your number. If you are having trouble, you may want to look at the *Subgroups of the Real Numbers* section.

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

$$\sqrt{\frac{180625}{289}}$$

The solution is Whole

A. Integer

These are the negative and positive counting numbers (..., -3, -2, -1, 0, 1, 2, 3, ...)

B. Irrational

These cannot be written as a fraction of Integers.

C. Whole

* This is the correct option!

D. Not a Real number

These are Nonreal Complex numbers **OR** things that are not numbers (e.g., dividing by 0).

E. Rational

These are numbers that can be written as fraction of Integers (e.g., -2/3)

General Comment: First, you **NEED** to simplify the expression. This question simplifies to 425.

Be sure you look at the simplified fraction and not just the decimal expansion. Numbers such as 13, 17, and 19 provide **long but repeating/terminating decimal expansions!**

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

$$\frac{-63 + 66i}{8 + 3i}$$

The solution is $-4.19 + 9.82i$

A. $a \in [-308.5, -305.5]$ and $b \in [8.5, 10.5]$

$-306.00 + 9.82i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [-12, -8.5]$ and $b \in [2, 6.5]$

$-9.62 + 4.64i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

C. $a \in [-4.5, -3.5]$ and $b \in [8.5, 10.5]$

* $-4.19 + 9.82i$, which is the correct option.

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D. $a \in [-8, -7.5]$ and $b \in [19, 24.5]$

$-7.88 + 22.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

E. $a \in [-4.5, -3.5]$ and $b \in [716.5, 719]$

$-4.19 + 717.00i$, 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 $2 - 3i$.

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

$$4 - 14^2 + 11 \div 3 * 8 \div 9$$

The solution is -188.741

A. $[198.1, 203]$

200.051000, which corresponds to two Order of Operations errors.

B. $[-193.5, -190.1]$

-191.949000, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[-189.5, -185.8]$

* -188.741000, this is the correct option

D. $[202.4, 203.4]$

203.259000, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

E. None of the above

You may have gotten this by making an unanticipated error. If you got a value that is not any of the others, please let the coordinator know so they can help you figure out what happened.

General Comment: 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.
