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 and choose the interval the simplification is contained within.

$$14 - 3^2 + 11 \div 19 * 15 \div 7$$

The solution is 6.241

A. $[22.51, 23.38]$

23.006000, which corresponds to two Order of Operations errors.

B. $[4.34, 6.23]$

5.006000, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

C. $[24.03, 26.35]$

24.241000, which corresponds to an Order of Operations error: multiplying by negative before squaring. For example: $(-3)^2 \neq -3^2$

D. $[5.93, 7.33]$

* 6.241000, this is the correct option

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.

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

$$\frac{18 - 55i}{-6 - 1i}$$

The solution is $-1.43 + 9.41i$

A. $a \in [-54.4, -52.4]$ and $b \in [9.35, 10.6]$

$-53.00 + 9.41i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [-3.7, -2.65]$ and $b \in [54.65, 56]$

$-3.00 + 55.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

C. $a \in [-2.05, -1.3]$ and $b \in [9.35, 10.6]$

* $-1.43 + 9.41i$, which is the correct option.

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D. $a \in [-2.05, -1.3]$ and $b \in [347.85, 348.25]$

$-1.43 + 348.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [-6.7, -4.3]$ and $b \in [7.55, 9.1]$

$-4.41 + 8.43i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing 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 $2 - 3i$.

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

$$\sqrt{\frac{361}{36}} + \sqrt{85}i$$

The solution is Nonreal Complex

A. Irrational

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

B. 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!

C. Rational

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

D. Pure Imaginary

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

E. Nonreal Complex

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

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

$$\sqrt{\frac{50176}{256}}$$

The solution is Whole

A. Irrational

These cannot be written as a fraction of Integers.

B. Whole

* This is the correct option!

C. Integer

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

D. Not a Real number

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

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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 224.

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

$$(10 - 2i)(-9 - 8i)$$

The solution is $-106 - 62i$

A. $a \in [-94, -84]$ and $b \in [14, 19]$

$-90 + 16i$, 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.

B. $a \in [-79, -71]$ and $b \in [93, 99]$

$-74 + 98i$, which corresponds to adding a minus sign in the second term.

C. $a \in [-113, -103]$ and $b \in [58, 66]$

$-106 + 62i$, which corresponds to adding a minus sign in both terms.

D. $a \in [-113, -103]$ and $b \in [-69, -61]$

* $-106 - 62i$, which is the correct option.

E. $a \in [-79, -71]$ and $b \in [-105, -94]$

$-74 - 98i$, which corresponds to adding a minus sign in the first term.

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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