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

$$-\sqrt{\frac{9216}{144}}$$

The solution is Integer, which is option E.

A. Irrational

These cannot be written as a fraction of Integers.

B. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

C. Rational

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

D. Not a Real number

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

E. Integer

* This is the correct option!

General Comment: First, you **NEED** to simplify the expression. This question simplifies to -96.

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

$$1 - 18 \div 8 * 13 - (15 * 7)$$

The solution is -133.250, which is option C.

A. $[-105.17, -98.17]$

-104.173, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[103.83, 106.83]$

105.827, which corresponds to not distributing addition and subtraction correctly.

C. $[-133.25, -127.25]$

* -133.250, which is the correct option.

D. $[-306.75, -297.75]$

-302.750, which corresponds to not distributing a negative correctly.

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

$$10 - 7 \div 5 * 12 - (14 * 4)$$

The solution is -62.800, which is option C.

A. $[-49.12, -44.12]$

-46.117, which corresponds to an Order of Operations error: not reading left-to-right for multiplication/division.

B. $[-85.2, -81.2]$

-83.200, which corresponds to not distributing a negative correctly.

C. $[-64.8, -61.8]$

* -62.800, which is the correct option.

D. $[62.88, 66.88]$

65.883, which corresponds to not distributing addition and subtraction correctly.

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

$$\sqrt{\frac{1584}{12}} + \sqrt{156}i$$

The solution is Nonreal Complex, which is option A.

A. Nonreal Complex

* This is the correct option!

B. Pure Imaginary

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

C. Irrational

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

D. 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!

E. Rational

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

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

$$(3 + 9i)(5 - 4i)$$

The solution is $51 + 33i$, which is option D.

A. $a \in [49, 55]$ and $b \in [-35.3, -32.9]$

$51 - 33i$, which corresponds to adding a minus sign in both terms.

B. $a \in [-26, -18]$ and $b \in [56.9, 59.9]$

$-21 + 57i$, which corresponds to adding a minus sign in the second term.

C. $a \in [12, 17]$ and $b \in [-37.1, -35.5]$

$15 - 36i$, 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.

D. $a \in [49, 55]$ and $b \in [32.3, 33.6]$

* $51 + 33i$, which is the correct option.

E. $a \in [-26, -18]$ and $b \in [-57.3, -53.8]$

$-21 - 57i$, which corresponds to adding a minus sign in the first 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.

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

$$\frac{63 + 11i}{2 - 8i}$$

The solution is $0.56 + 7.74i$, which is option B.

A. $a \in [37.5, 39]$ and $b \in [7, 8.5]$

$38.00 + 7.74i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [-0.5, 1]$ and $b \in [7, 8.5]$

* $0.56 + 7.74i$, which is the correct option.

C. $a \in [30, 33]$ and $b \in [-1.5, -1]$

$31.50 - 1.38i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [-0.5, 1]$ and $b \in [525.5, 527]$

$0.56 + 526.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

E. $a \in [1.5, 4.5]$ and $b \in [-7.5, -6.5]$

$3.15 - 7.09i$, 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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7. Choose the **smallest** set of Complex numbers that the number below belongs to.

$$\frac{-13}{20} + \sqrt{234}i$$

The solution is Nonreal Complex, which is option B.

A. Pure Imaginary

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

B. Nonreal Complex

* This is the correct option!

C. 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!

D. Rational

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

E. Irrational

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

General Comment: 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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8. Simplify the expression below into the form $a + bi$. Then, choose the intervals that a and b belong to.

$$(4 + 9i)(-6 - 3i)$$

The solution is $3 - 66i$, which is option E.

A. $a \in [-57, -48]$ and $b \in [-45, -39]$

$-51 - 42i$, which corresponds to adding a minus sign in the second term.

B. $a \in [3, 5]$ and $b \in [60, 69]$

$3 + 66i$, which corresponds to adding a minus sign in both terms.

C. $a \in [-29, -17]$ and $b \in [-32, -22]$

$-24 - 27i$, 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.

D. $a \in [-57, -48]$ and $b \in [38, 44]$

$-51 + 42i$, which corresponds to adding a minus sign in the first term.

E. $a \in [3, 5]$ and $b \in [-68, -62]$

* $3 - 66i$, which is the correct option.

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.

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

$$\frac{-63 - 44i}{-5 + i}$$

The solution is $10.42 + 10.88i$, which is option E.

A. $a \in [270.5, 272.5]$ and $b \in [10, 11.5]$

$271.00 + 10.88i$, which corresponds to forgetting to multiply the conjugate by the numerator and using a plus instead of a minus in the denominator.

B. $a \in [9, 11]$ and $b \in [280.5, 284]$

$10.42 + 283.00i$, which corresponds to forgetting to multiply the conjugate by the numerator.

C. $a \in [12, 13.5]$ and $b \in [-44.5, -43]$

$12.60 - 44.00i$, which corresponds to just dividing the first term by the first term and the second by the second.

D. $a \in [13, 15.5]$ and $b \in [5.5, 6.5]$

$13.81 + 6.04i$, which corresponds to forgetting to multiply the conjugate by the numerator and not computing the conjugate correctly.

E. $a \in [9, 11]$ and $b \in [10, 11.5]$

* $10.42 + 10.88i$, which is the correct option.

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

$$-\sqrt{\frac{279841}{529}}$$

The solution is Integer, which is option C.

A. Irrational

These cannot be written as a fraction of Integers.

B. Not a Real number

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

C. Integer

* This is the correct option!

D. Whole

These are the counting numbers with 0 (0, 1, 2, 3, ...)

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 -529.

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.
