COMPLEX NUMBERS

Complete the following problems to reinforce your understanding of the concept covered in this module.

Problem 1:

Simplify $\sqrt{-18}$

Problem 2:

Write the following complex number is standard form:

$$\frac{3}{9-i}$$

Problem 3:

Multiply the following and write the answer in standard form:

$$(2-\sqrt{-100})(1+\sqrt{-36})$$

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Solution 1:

Recall that it's not possible to get a real number out of a square root of a negative number. However, $\sqrt{-18}$ can be reduced and rewritten as:

$$\sqrt{18}\sqrt{-1}$$

Which can be further reduced to:

$$\sqrt{9}\sqrt{2}\sqrt{-1}$$

This original number is now in its reduced form. Recalling that $\sqrt{-1} = i$ we can rewrite the complex number as:

$$3\sqrt{2}i$$

Therefore, $\sqrt{-18} = 3\sqrt{2}i$

Solution 2:

The standard form of a complex number is $a + bi$, therefore, we need to get rid of the fraction. To do that, multiply by the conjugate of the denominator, such that:

$$\frac{3}{(9-i)}\frac{(9+i)}{(9+i)} = \frac{27+3i}{9^2+1}$$

Rearranging in to the standard form:

$$\frac{27}{82}+\frac{3}{82}i$$

Solution 3:

Before multiplying these numbers, the first step is to convert the square root of the negative numbers in there complex representations, so:

$$\sqrt{-100}=\sqrt{100}\sqrt{-1}=10i$$

$$\sqrt{-36}=\sqrt{36})\sqrt{-1}=6i$$

Which gives the new formula as:

$$(2-10i)(1+6i)$$

This is much easier to deal with and multiplying gives the result:

$$(2-10i)(1+6i)=2+2i-60i^2$$

Recall that $i^2=-1$. Putting the result in to the standard form gives:

$$(2-10i)(1+6i)=62+2i$$