further ops

Complex Numbers Class Work (Continued)

☞ **Objective:** *You will be able to simplify expressions using the complex number system, and operate within the complex number system.*

Select all values in the table for which the product of the row and column values is equal to 1.

	i^2	i^3	i^8
i	$i \cdot i^2 = i^3$ ✗	$i^4 (i^2)^2 = (-1)^2 = 1$ ✓	
i^4	$i^6 = (i^2)^3 = (-1)^3 = -1$ ✗		$i^{12} = (i^2)^6 = (-1)^6 = 1$ ✓
i^5	$i^7 = (i^2)^3 i = -i$ ✗	$i^8 = (i^2)^4 = (-1)^4 = 1$ ✓	
i^7		$i^{10} = (i^2)^5 = (-1)^5 = -1$ ✗	

✱ Distribute & eliminate ( ).

Simplify each expression. State the real and imaginary components.

1. $(4i + 2) - i(3i - 1)$ 2. $2i(i + 8) - 3i(7i - 1)$ 3. $\sqrt{-162}$

2.
$$2i^2 + 16i - 21i^2 + 3i$$
$$-19i^2 + 19i \quad \boxed{i^2 = -1}$$
$$-19(-1) + 19i$$
$$\boxed{19 + 19i} \quad \text{real: } 19 \quad \text{imag: } 19i$$

3.
$$\sqrt{81} \cdot \sqrt{-1} \cdot \sqrt{2}$$
$$\boxed{9i\sqrt{2}}$$
$$\boxed{\text{real: } 0 \quad \text{imag: } 9i\sqrt{2}}$$

★ Multiplying Complex Numbers

Guided Example: Write the product in standard form.

$$(2 + 3i)(3i - 4)$$

$$6i - 8 + 9i^2 - 12i \qquad \text{✱ Distribute/FOIL}$$
$$-6i - 8 + 9i^2 \qquad \text{✱ Combine Like Terms}$$
$$-6i - 8 + 9(-1) \qquad \text{✱ Replace } i^2 \text{ with } -1!$$
$$-6i - 17$$
$$\boxed{-17 - 6i}$$

Practice: Write each product in standard form.

1. $(5-i)(3+8i)$

$15+40i-3i-8i^2$

$15+37i-8i^2$ $i^2=-1$

$15 \quad 37i+8$ $-8(-1)=8$

$\boxed{23+37i}$

real im

2. $(5i-9)(5i+9)$

$25i^2-81$

$25(-1)-81$

$-25-81$

$\boxed{-106+0i}$

3. $(3i^2+i)(2i-2)$

$6i^3-6i^2+2i^2-2i$

$6i^3+6-2-2i$

$6i^2 i+6-2-2i$

$-6i+4-2i$

$-8i+4$

$\boxed{4-8i}$

R I

4. $(i^3-i)(4i+4)$

$\boxed{8-8i}$

5. $(9i^2+7)(3-2i)$

6. $(i^3-i)(2i+2i^2)$

further ops

7. Select all cells in the table for which the product of the row and the column is a real number.

	$9+5i$	4	i
$9-5i$			
$8i$			
-3			
$2i^2 + 3$			

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8. Select all of the expressions that evaluate to a complex number.

☐ $(-3i)^{13}$

☐ $(-10i)^{18}$

☐ $(2 - 8i)^2$

☐ $(\sqrt{(-5)})^2$

☐ $(3 - 8i)(3 + 8i)$

☐ $(4 + 3i)(3 + 4i)$

Write down any important reminder from the work you completed today, or any questions you have regarding the work you completed today.