Name: _____ Date: _____ Period: _____

$i^2 = -1$

1.5B Multiply/Divide Complex Numbers

When you multiply complex numbers use the FOIL / BOX distribute method that you are already familiar with. Then combine like parts. However you must simplify further by replacing i^2 with -1.

$(2 + 4i)(9 - 3i)$

$18 - 6i + 36i - 12i^2$

$18 + 30i - 12(-1)$

$18 + 30i + 12$

$\boxed{30 + 30i}$

$(1 + 4i)(3 - 6i)$

$3 - 6i + 12i - 24i^2$

$3 + 6i - 24(-1)$

$3 + 6i + 24$

$\boxed{27 + 6i}$

Note:

$(1+5i)^2$ this equals $(1+5i)(1+5i)$

COMPLEX CONJUGATES - When dividing complex numbers, your final answer can't have i in the denominator.

Pairs of complex numbers of the form $a + bi$ and $a - bi$, called **complex conjugates**

To write the quotient of $a + bi$ and $c + di$ in standard form, where c and d are not both zero, multiply the numerator and denominator by the complex conjugate of the *denominator* to obtain

$$\frac{a + bi}{c + di} = \frac{a + bi}{c + di}\left(\frac{c - di}{c - di}\right)$$

Special Note:

$(a+bi)(a-bi)$

$a^2 - abi + abi - b^2i^2$

$a^2 - b^2(-1)$

$a^2 + b^2$

CC - complex conjugate

$\left(\frac{2+3i}{i}\right)\left(\frac{-i}{-i}\right)$

$-i$ is the CC of i

$\frac{-2i - 3(-1)}{-(-1)}$

$\frac{-2i+3}{1}$

$\boxed{3-2i}$

$\frac{8}{(1+2i)}\cdot\frac{(1-2i)}{(1-2i)}$

$1-2i$ is the CC of $1+2i$

$\frac{8-16i}{1^2+2^2}$

$\frac{8-16i}{5}$

$\boxed{\frac{8}{5} - \frac{16}{5}i}$

$\frac{(2+i)(1+i)}{(1-i)(1+i)}$

$1+i$ is the CC of $1-i$

$\frac{2+2i+i+i^2}{1^2+1^2}$

$\frac{2+3i-1}{2}$

$\frac{1+3i}{2}$

$\boxed{\frac{1}{2} + \frac{3}{2}i}$

14.16.18

Algebra 2 Name_____ ID: 1

1.5B Multiply Divide Complex #'s Practice

Date_____ Period___

Simplify.

1) $(3-4i)^2$

2) $(2+8i)^2$ $(2+8i)(2+8i)$ $4+16i+16i+64i^2$ $-60+32i$

3) $(-5+7i)(5-7i)$

4) $(7+8i)^2$

5) $(-7+2i)(7-2i)$

6) $5i \cdot -7i(2-3i)$

7) $(-6-3i)^2$

8) $(5+7i)(3+3i)$ $15+15i+21i+21i^2$ $15+36i-21$ $-6+36i$

9) $5i \cdot 5i(6-5i)$

10) $-i \cdot -2i(2-2i)$

11) $\frac{5}{i}$

12) $\frac{-4}{-7i}$

13) $\frac{9}{-6i}$

14) $\frac{9-2i}{10i} \cdot \frac{-10i}{-10i} = \frac{(9-2i)(-10i)}{-100i^2} = \frac{-90i+20i^2}{100} = \frac{-20-90i}{100} = \frac{-2}{10} - \frac{9}{10}i$

15) $\frac{-6+3i}{-5+3i}$

16) $\frac{4+i}{1-5i} \cdot \frac{1+5i}{1+5i} = \frac{4+20i+i+5i^2}{1^2+5^2} = \frac{4+21i-5}{26} = \frac{-1+21i}{26} = \frac{-1}{26} + \frac{21}{26}i$

17) $\frac{2-2i}{4+2i}$

18) $\frac{4i}{-5+2i} \cdot \frac{(-5-2i)}{-5-2i} = \frac{-20i-8i^2}{(-5)^2+2^2} = \frac{8-20i}{29} = \frac{8}{29} - \frac{20}{29}i$

19) $\frac{3}{-5-3i}$

20) $\frac{2}{-6+5i}$