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

$$i^2 = \left(\sqrt{-1}\right)^2 = -1$$

When simplifying, every i^2 can be replaced with -1 then look to continue simplifying.

Simplify each.

1. $7i(2 - 8i)$

$= 14i - 56i^2$

$= 14i - 56(-1)$

$= 14i + 56$

$= 56 + 14i$

2. $(1 + 6i)(4 - 3i)$

	1	$+6i$
4	4	$+24i$
$-3i$	$-3i$	$-18i^2 = -18(-1) = +18$

$22 + 21i$

When dealing with Real Numbers only:

(x + 5)(3x + 2) is a Trinomial

* When dealing with Imaginary Numbers only:

(5 + i)(2 + 3i) is a Binomial

* The product of two imaginary numbers is Another Imaginary Number.

Simplify:

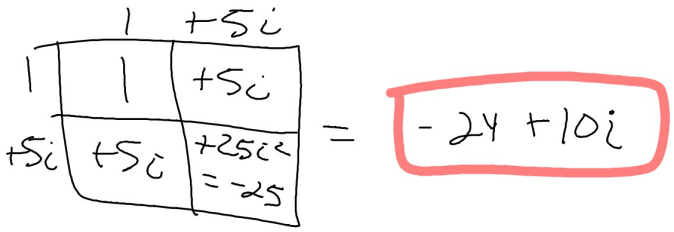
(7 + 9i)(3 - 2i)

	7	$+9i$
3	21	$+27i$
$-2i$	$-14i$	$-18i^2 = +18$

$= 39 + 13i$

Simplify:

$(1 + 5i)^2$



$= -24 + 10i$

However.....

$(1 + 5i)^2 = (1)^2 + 2(1)(5i) + (5i)^2$

$= 1 + 10i + 25i^2 = 1 + 10i - 25$ ($+25(-1)$)

$= -24 + 10i$

When you square a complex number you get another complex number.

$(x + 5)^2$ is never just 2 terms!!!

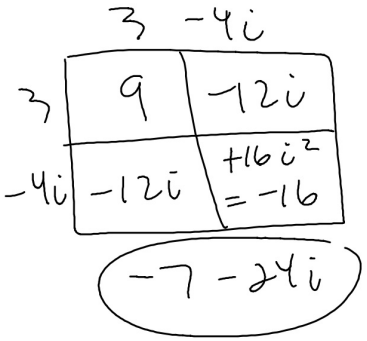
$(a + b)^2 = a^2 + 2ab + b^2$

$(x + 5)^2 = (x)^2 + 2(1)(5)x + (5)^2$

$= x^2 + 10x + 25$

Simplify.

$(3 - 4i)^2$



$-7 - 24i$

Simplify.

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

	4	$+2i$
4	16	$+8i$
$-2i$	$-8i$	$-4i^2 = +4$

$= 16+4 = 20$

Simplify each.

1. $(2x - 3)(2x + 3)$

	$2x$	-3
$2x$	$4x^2$	$-6x$
$+3$	$+6x$	-9

$= 4x^2 - 9$

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

	2	$-3i$
2	4	$-6i$
$+3i$	$+6i$	$-9i^2 = +9$

$4 + 9 = 13$

When a and b are REAL #'s

$(a + b)(a - b) = a^2 - b^2$

With Imaginary Numbers:

$(a + bi)(a - bi) = a^2 + b^2$

$(4+2i)(4-2i) = 4^2+2^2 = 16+4 = 20$

$a=4$ $b=2$

Factors such as (a + b) and (a - b) are called CONJUGATES

Conjugate

The conjugate is where we **change the sign in the middle** of two terms like this:

$3x + 1$

Conjugate: $3x - 1$

Complex Conjugates: a + bi and a - bi

$(7 + 4i)(7 - 4i) =$

$a = 7 \quad b = 4$

	7	$+4i$
7	49	$+28i$
$-4i$	$-28i$	$-16i^2 = +16$

$= 49 + 16 = 65$

OR $a^2 + b^2 = 7^2 + 4^2 = 49 + 16 = 65$

The product of complex conjugates is always a constant

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

$i^2 = -1$

$i^3 = i^2 \cdot i = (-1)(i) = -i$

$i^4 = (i \cdot i)(i \cdot i) = (-1)(-1) = 1$

$i^5 = (i \cdot i) \cdot (i \cdot i) \cdot i = (-1)(-1)(i) = i$

$i^6 = i^3 \cdot i^3 = (-i)(-i) = i^2 = -1$

Powers of i repeat every 4:

$i = i$	$i^5 = i$	$i^9 = i$	$i^{13} = i$
$i^2 = -1$	$i^6 = -1$	$i^{10} = -1$	$i^{14} = -1$
$i^3 = -i$	$i^7 = -i$	$i^{11} = -i$	$i^{15} = -i$
$i^4 = 1$	$i^8 = 1$	$i^{12} = 1$	$i^{16} = 1$

etc.

Simplify each.

1. $(9 - 5i)^2$

	9	$-5i$
9	81	$-45i$
$-5i$	$-45i$	$+25i^2 = -25$

$= 56 - 90i$

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

$a = 6 \quad b = 3$

$= 6^2 + 3^2$

$= 36 + 9$

$= 45$

Simplify each.

1. $7i(5 + 2i)$

$= 35i + 14i^2$

$= 35i + 14(-1)$

$= 35i - 14$

$= -14 + 35i$

2. (3i)(5i)(2i) =

$= 30i^3$

$= 30(-i)$

$= \boxed{-30i}$

3. (-2i)(10i)(i)(4i) =

$= -80 \cdot i^4$

$= -80(1)$

$= \boxed{-80}$

You can now finish Hwk #16

Sec 5-6

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Problems 37, 40, 50-52, 57, 62, 65