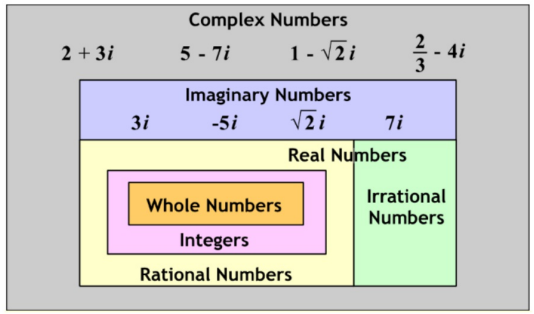

Complex Numbers

A Complex Number is a combination of a Real Number and an Imaginary Number:

Standard Form of a Complex Number

$a + bi$

Real Part

Imaginary Part

$\sqrt{-1}$

If a=0, then you have an Imaginary Number: bi

If b=0, then you have a Real Number: a

Topic 6: Polynomial Equations

Exploring "Complex Numbers"

SAS3 - Question #2

2. Compute $(2 + 3i) - (5 - 7i)$

$= 2 - 5 + 3i - -7i$

$-3 + 10i$

Adding and Subtracting Complex numbers is just like combining Like-Terms

Topic 6: Polynomial Equations

Exploring "Complex Numbers"

SAS3 - Question #3

Answers to SAS3 - Question #3

Since $i = \sqrt{-1}$

$i^2 = ?$

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

Whenever you see i^2 *replace it with -1 and simplify*

SAS3 - Question #6

Topic 6: Polynomial Equations

Agilemind website: Exploring "Complex Numbers" Page 6

Answer to SAS3 - Question #6

Expand like you would normally expand the product of two binomials.

$(3-2i)(5+4i)$

	3	-2i
5	15	-10i
+4i	+12i	$-8i^2$ $= -8(-1)$ $= +8$

23 + 2i

Topic 6: Polynomial Equations

Exploring "Complex Numbers"

SAS3 - Question #7

The product of two Complex Numbers will be another Complex Number (unless they are conjugates)

In other words, it will never be a trinomial!

Find this product. (6 - 4i)(2 - 5i)

	6	-4i
2	12	-8i
-5i	-30i	$20i^2$ $= 20(-1)$ $= -20$

-8 - 38i

Simplify: $(6 - i)^2 = (6-i)(6-i)$

	6	$-i$
6	36	$-6i$
$-i$	$-6i$	$+i^2 = -1$

$35 - 12i$

These are Conjugates!

The product of Complex Conjugates is always a CONSTANT

Find this product. $(7 - 3i)(7 + 3i)$

	7	$-3i$
7	49	$-21i$
$+3i$	$+21i$	$-9i^2 = +9$

$= 58$

Hwk #31

Agilemind Workbook and Website

Topic 6: Polynomial Equations
Exploring "Quadratic Equations"

SAS3: questions 10 & 11 (Workbook)
and
More Practice 6-8 (Online)

Powers of *i*

	Process	
i^0		1
i^1		i
i^2		-1
i^3	$i^2 \cdot i$	$-i$
i^4	$i^3 \cdot i = -i \cdot i = -i^2$	1
i^5	$i^4 \cdot i = 1 \cdot i$	i
i^6	$i^5 \cdot i = i \cdot i = i^2$	-1
i^7	$i^6 \cdot i = -1 \cdot i$	$-i$
i^8	$i^7 \cdot i = -i \cdot i = -i^2$	1

this pattern repeats

Simplify each power of i

$i^{19} =$

4 r 3

$4\overline{)19}$

16

3

} $4 \rightarrow$ four full times through the pattern

$r3 \rightarrow$ 3 steps into the next pattern $= i^3 = -1$

$i^{19} = -1$