

IMAGINARY NUMBERS

Square root of
a negative number.

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

$$i^1 = \underline{i}$$

$$i^2 = \sqrt{-1} \cdot \sqrt{-1} = \underline{-1}$$

$$i^3 = i^2 \cdot i^1 = -1 \cdot i = \underline{-i}$$

$$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = \underline{1}$$

$$i^5 = i^4 \cdot i^1 = 1 \cdot i = \underline{i}$$

$$i^6 = i^4 \cdot i^2 = 1 \cdot -1 = \underline{-1}$$

$$\frac{351}{4} = 87.75 \quad \frac{10000}{4} = 2500 \quad \frac{625}{4} = 156.25$$

$$2i^{351} - 4i^{10000} + 7i^{625}$$

$$i^3 \quad i^4 \quad i^1$$

$$2(-i) - 4(1) + 7(i)$$

$$= -2i - 4 + 7i$$

$$= \underline{5i - 4}$$

0.25	$i^1 = i$
0.5	$i^2 = -1$
0.75	$i^3 = -i$
1.00	$i^4 = 1$

I won!
I won!

(with 2
negatives
in the
middle)

$$i^{17} = \frac{17}{4} = 4.25 \frac{1}{4}$$

$$= \boxed{i}$$

$$\sqrt{-6} \circ \sqrt{-32}$$

$$+16 \cdot 2$$

$$i\sqrt{6} \circ 4i\sqrt{2}$$

$$= 4 \cancel{i} \sqrt{12}$$

$$(-1)$$

$$= -4 \sqrt{12}$$

$$2 \times 3$$

$$= -8\sqrt{3}$$

← must.
take i
out first.

Solve

$$3x^2 + 65 = 11$$

$$-65 \quad -65$$

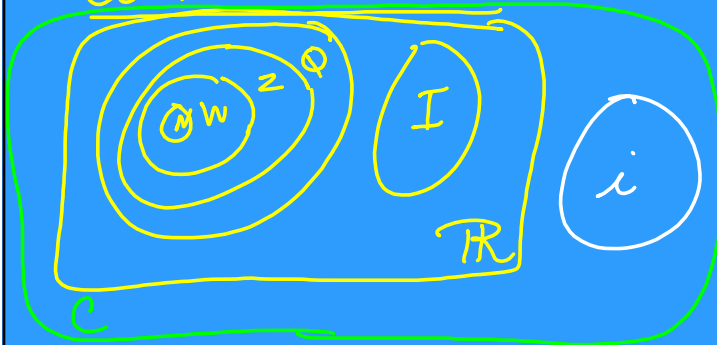
$$\frac{3x^2}{3} = \frac{-54}{3}$$

$$\sqrt{x^2} = \sqrt{-18}$$

$$-1 \cdot 9 \cdot 2$$

$$x = \pm 3i\sqrt{2}$$

COMPLEX NUMBERS



→ real part
imaginary part

$$a + bi$$

↑ ↑
real imag

$$2 + 7i$$

$$-9 - 6i$$

$$8 + 0i$$

$$0 - 4i$$

Add/Subtract

$$(5+3i) + (7-8i) = 12-5i$$

$$(9-6i) + (13+7i) = 22+1i$$

Multiplication - FOIL!

$$(6-8i)(5+2i)$$

$$= 30 + 12i - 40i + 16i^2$$

$$= 46 - 28i$$

$$(2-7i)^2 =$$

$$(2-7i)(2-7i)$$

$$= 4 - 14i - 14i + 49i^2$$

$$= -45 - 28i$$

$$\frac{3+2i \cdot i}{5i \cdot i}$$

$$= \frac{3i + \cancel{2i^2}}{\cancel{-5i^2}}$$

$$= \frac{-3i + 2}{+5}$$

FOIL $\frac{4+2i}{3+5i} (3-5i)$

FL $\frac{4+2i}{3+5i} (3-5i)$

$$\frac{12 - 20i + 6i + 10i^2}{9 + 25i^2}$$

$$\frac{22 - 14i}{34} = \frac{11 - 7i}{17}$$

FRACTAL - 1980



Benoit Mandelbrot



$$f(x) = x^2 + C$$

$$f(x) = x^2 + (1+0i)$$

$$f(0) = 0^2 + 1+0i = 1$$

$$f(1) = 1^2 + 1 = 2$$

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

$$f(5) = 5^2 + 1 = 26$$

iteration
Sub previous
answer in the
function to
create the next
value.

