

Warm Up: Solve for x in the following equations

$$x^2 - 4 = 0$$

$$\sqrt{x^2} = \sqrt{4}$$

$$x = \pm 2$$

$$x^2 + 9 = 0$$

$$\sqrt{x^2} = \sqrt{-9}$$

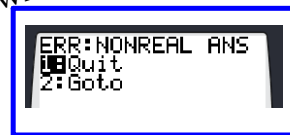
$$x = \pm 3i$$

$$(x+2)(x-2) = 0$$

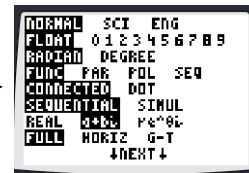
$$x+2=0 \quad x-2=0$$

$$x=-2 \quad x=2$$

Take the square root of -9 using your calculator... what does it say?



Now change the mode on the calculator



...and try taking the square root again

What do you think the i means?

imaginary

Where did the other part of the answer come from?

PLEASE put your calculator back in REAL MODE for the next class!

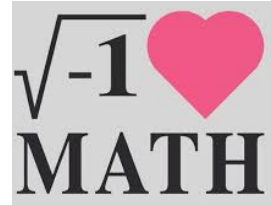
$$\sqrt{-9} = 3i$$

$$\sqrt{9} \cdot i = 3i$$

$$3\sqrt{-1} = 3i$$

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

Imaginary Numbers



Example:

$$\sqrt{-300} \rightarrow i\sqrt{300}$$

$$i\sqrt{100 \cdot 3}$$

$$10i\sqrt{3}$$

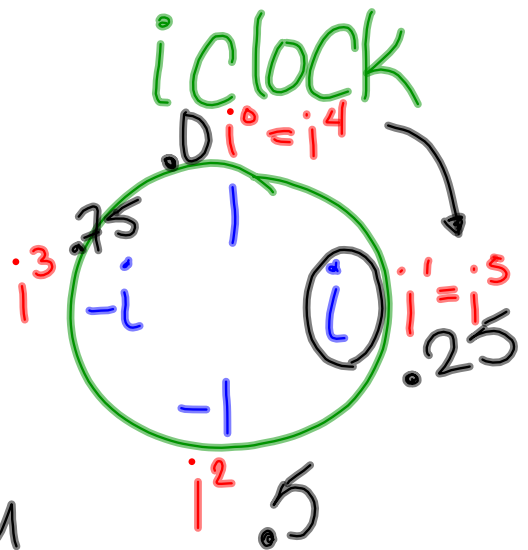
Copy the table shown below & leave a few lines below for any work:

$i^0 = 1$	$i^1 = i$	$i^2 = -1$	$i^3 = -i$
$i^4 = 1$	$i^5 = i$	$i^6 = -1$	$i^7 = -i$
$i^8 = 1$	$i^9 = i$	$i^{10} = -1$	$i^{11} = -i$
$i^{12} = 1$	$i^{13} = i$	$i^{14} = -1$	$i^{15} = -i$

Any time i is Raised to a power, it must be Reduced.

$$i^{117} = i$$

$$117 \div 4 = 29.25$$



- ① Divide exponent by 4
- ② The decimal tells you where to stop

EXAMPLES:

$2i^2 + 3i^3$

$16 \div 4 = 4$

$6 \div 4 = 1.5$

$5 \div 4 = 1.25$

$13 \div 4 = 3.25$

$i^{16} + i^6 - 2i^5 + i^{13}$

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

$-2i + i$

$\boxed{-i}$

$i^0 \cdot i^1 \cdot i^2 \cdot i^3 \cdot i^4$

Determine the value of n in simplest form:

$i^{13} + i^{18} + i^{31} + n = 0$

$\cancel{i^4} - 1 + \cancel{-i} + n = 0$

$-1 + n = 0$

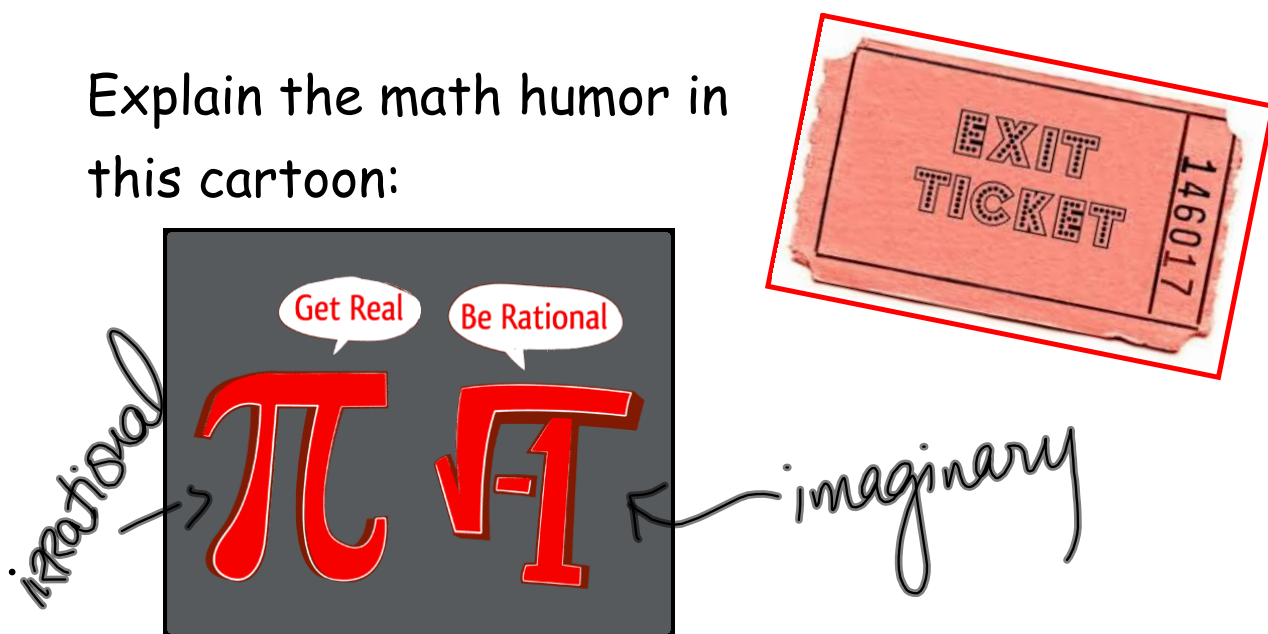
$\boxed{n = 1}$

$13 \div 4 = 3.25$

$18 \div 4 = 4.5$

$31 \div 4 = 7.75$

Explain the math humor in this cartoon:



HW: complex number maze

Complex Number Maze

Complete the maze by simplifying each expression. Simplify each expression and shade in the squares with imaginary numbers. You will have a path leading from the start square to the end square.

$(1+i)(1-i)$	$(2+3i)+(-4+5i)$	$(5-6i)(6-2i)$	$2i(3i^2)$	$3i(2i)$ <i>6i²</i> <i>6(-1)</i> <i>-6</i>	Start Here $\sqrt{-4}$ <i>2i</i>
$\sqrt{5-4}$	$-\sqrt{-49}$	$(3+2i)-(4+2i)$	$\sqrt{-36}$	$\sqrt{-25}+3$	$2(3+2i)$ <i>2(6+4i)</i> <i>12+8i</i>
$\sqrt{\frac{81}{25}}$	$(5+14i)-(10-2i)$	$(5+4i)-(-1-2i)$	$3+\sqrt{5}$	$-\sqrt{64}$	$2i-(3+2i)$
$(2+3i)(2-3i)$	$5i-\sqrt{-25}$	$(3+4i)(4-3i)$	$4-\sqrt{-25}$	$-\sqrt{-4}$	$3i(2+3i)$
$(6+2i)+(1-2i)$	i^2	$\sqrt{125}$	$4i^2$	$(1-3i)(1+3i)$	$(1+2i)(-1-2i)$
$\sqrt{-225}$	$(5+4i)-(1+2i)$	$(1+2i)+(2-3i)$	$(2i^2)(-3i^2)$	$2(3+4i)$	$(6+2i)(3i)$
$-\sqrt{-1}$	$-3i(-5i)$	$5i^2(2+i)$	$(2-3i)-3i$	$3-(2-i)$	$-\sqrt{625}$
End Here					

KEY ... Complex Number Maze ... KEY

	A	B	C	D	E	F
1	$(1+i)(1-i)$ =2	$(2+3i) + (-4+5i)$ = -2 + 8i	$(5-6i)(6-2i)$ =18-46i	$2i(3i^2)$ = -6i	$3i(2i)$ = -6	Start Here $\sqrt{-4}$ = 2i
2	$\sqrt{5-4}$ =1	$-\sqrt{-49}$ = -7i	$(3+2i) - (4+2i)$ = -1	$\sqrt{-36}$ = 6i	$\sqrt{-25} + 3$ = 3+5i	$2(3+2i)$ = 6+4i
3	$\frac{\sqrt{81}}{\sqrt{25}} = \frac{9}{5}$	$(5+14i) - (10-2i)$ = -5 + 16i	$(5+4i) - (-1-2i)$ = 6+6i	$3 + \sqrt{5}$	$-\sqrt{64}$ = -8	$2i \cdot (-3+2i)$ = 3
4	$(2+3i)(2-3i)$ =13	$5i - \sqrt{-25}$ = 0	$(3+4i)(4-3i)$ = 24 - 7i	$4 - \sqrt{-25}$ = 4-5i	$-\sqrt{-4}$ = -2i	$3i(2+3i)$ = -9 + 6i
5	$(6+2i) + (1-2i)$ = 7	i^2 = -1	$\sqrt{125}$ = 5 $\sqrt{5}$	$4i^2$ = -4	$(1-3i)(1+3i)$ = 10	$(1+2i)(-1-2i)$ = -6 + 4i
6	$\sqrt{-225} =$ -15i	$(5+4i) - (1+2i)$ = 4 + 2i	$(1+2i) + (2-3i)$ = 3 - i	$(2i^2)(-3i^2)$ = 6	$2(3+4i)$ = -6 + 8i	$(6+2i)(3i)$ = -6 + 18i
7	$-\sqrt{-1}$ = -i	$-3i(-5i)$ = -15	$5i^2(2+i)$ = -10 - 5i	$(2-3i) - 3i$ = -2 - 6i	$3 - (2-i)$ = 1 + i	$-\sqrt{625}$ = -25
	End Here					