Warm-up

Work on your Warm-up

Take out your homework.

Factor each expressions below completely:

#1. $2x^2 + 5x + 3$

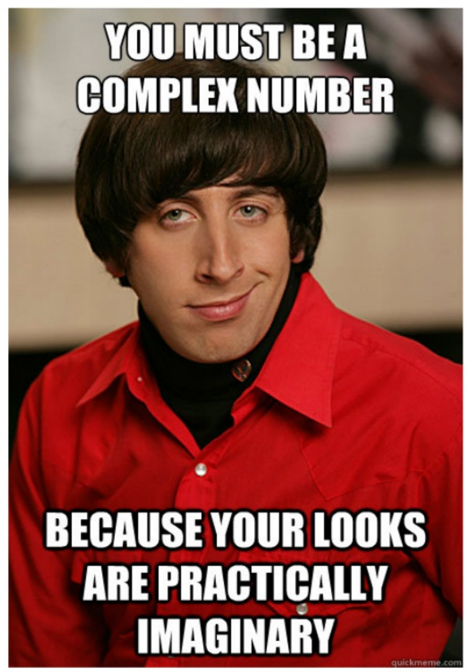
#2. $3x^2 + 15x + 12$

Homework Questions?

Agenda:

1)Complex Numbers! - Notes

2) Group work.



Prior knowledge - Different Number Systems...

1.NATURAL NUMBERS (N)

N = 1,2,3,4,...are positive whole numbers.

2.INTEGERS (Z)

Z = ...-3,-2,-1, 0, 1, 2, 3,...are positive and negative whole numbers.

3.RATIONAL NUMBERS (Q)

These are numbers that can be written in the form a/b (fraction) where a, b $\in$ Z and b $\neq$ 0.

Q =...-4.6, -4, -3.5, -2.07, -1, 0, 0.82,...

Q =... $-\frac{46}{10}$, $-\frac{4}{1}$, $-\frac{7}{2}$, $-\frac{207}{100}$, $-\frac{1}{1}$, $\frac{9}{1}$, $\frac{82}{100}$...

All repeating decimals can be written as rational numbers:

$0.\dot{3} = 0.333... = \frac{1}{3}$

$0.1\dot{6} = 0.1666... = \frac{1}{6}$

$0.\dot{1}4285\dot{7} = 0.142857142857... = \frac{1}{7}$

IRRATIONAL NUMBERS

These are numbers that cannot be written in the form a/b where $a, b, \in$ Z and $b \neq 0$.

Irrational numbers are non terminating, non repeating decimals such as $\sqrt{2}$, $\sqrt{3}$, $\sqrt[3]{4}$, π, e.

Pythagoras came across the existence of these numbers around 500 BC.

$c^2 = a^2 + b^2$

$c^2 = 1^2 + 1^2$

$c^2 = 2$

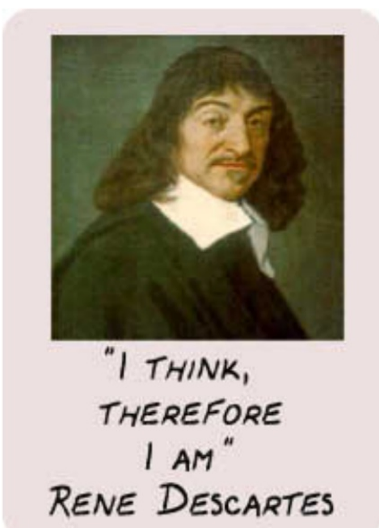
$c = \sqrt{2}$

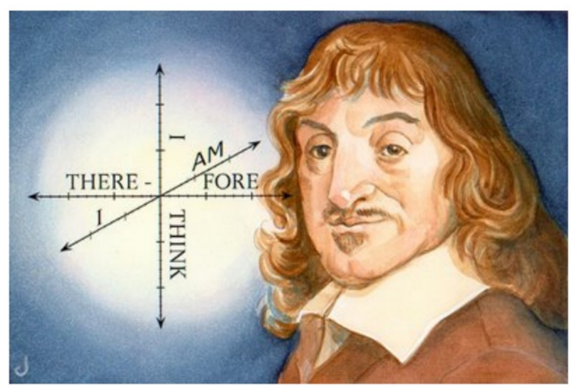
4.REAL NUMBERS (R)

This is the number system we get when we put all the Rational Numbers together with all the Irrational Numbers. The Rationals and Irrationals form a continuum (no gaps) of Real Numbers provided that the Real Numbers have a one to one correspondence with points on the Number Line.

Introduction

We know that the square root of –1, or $\sqrt{-1}$, is not a real number because there is no number that when squared will result in –1. French mathematician René Descartes suggested the imaginary unit i be defined so that $i^2 = -1$. The imaginary unit enables us to solve problems that we would not otherwise be able to solve. Problems involving electricity often use the imaginary unit.

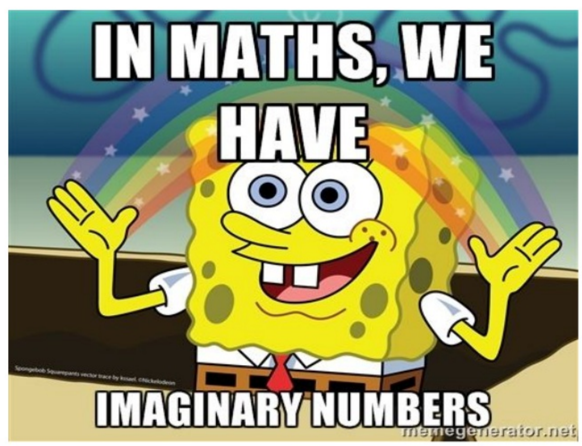




Let's define the "i"

- The **imaginary unit *i*** is used to represent the non-real value, $\sqrt{-1}$.
- An **imaginary number** is any number of the form *bi*, where *b* is a non-zero real number and $i = \sqrt{-1}$.
- Real numbers and imaginary numbers can be combined to create the **complex number system**.
- A **complex number** contains two parts: a real part and an imaginary part.

$a + bi$



Example 1

Identify the real and imaginary parts of the complex number $8+\frac{1}{3}i$.

real: 8

imaginary: $\frac{1}{3}i$

Example 2

Rewrite the complex number $2i$ using a radical.

$2\sqrt{-1}$

Example 3

Rewrite the radical $\sqrt{-32}$ using the imaginary unit i.

$\sqrt{-1} \cdot \sqrt{32}$

$i\sqrt{32}$

$8 \cdot 4$

$2 \cdot 4$

$4i\sqrt{2}$

$\sqrt{16}$

$4 \cdot 4$

$(\sqrt{-1})^2$

$x \cdot x^2 = x^3$

$-1 \cdot \sqrt{-1}$

Example 4

Simplify i^{57}.

$$\begin{array}{r} 14 \\ 4\overline{)57} \\ \underline{4} \\ 17 \\ \underline{-16} \\ 1 \end{array}$$

$i^{57} = i = \sqrt{-1}$

$i = \sqrt{-1}$

$i^2 = -1$

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

$i^4 = 1$

Example 5

Impedance, Z, is the measure of a circuit's opposition to the flow of current. Complex numbers are used to represent the impedance of a circuit. The resistance, R, is the real part of the impedance, and the reactance, X, is the coefficient of the imaginary unit i. So, impedance is $R + Xi$, where R and X are both measured in ohms. A certain circuit has a resistance of 18 ohms and a reactance of 2 ohms. Use a complex number to represent the circuit's impedance.

$R + Xi$

$\boxed{18 + 2i}$

Mini Group Project!

- You have two things to complete as a group today:

1. Student Activity Worksheet (front and back). Answers are at the front.

2. Visual Poster "i *is*..."

- Roles: Fact Checker, Supplies Picker, Presenter, Cleaner

Expectations:

- Work in groups of 3-4.
- Music volunme > Talking volume.
- 40 minutes.

1.) $i + 6i$ $\qquad$ $x + 6x$

$\boxed{= 7i}$ $\qquad$ $7x$

2.) $3 + 4 + 6i$

$\boxed{7 + 6i}$

16.) $(4 - 5i)(4 + i)$

$16 - 5i^2 + 4i - 20i$

$16 - 5(-1) - 16i$

$16 + 5 - 16i$

$\boxed{21 - 16i}$

15) $7i \cdot 3i(-8-6i)$

$21i^2(-8-6i)$

$21(-1)(-8-6i)$

$-21(-8-6i)$

$\boxed{168+126i}$