

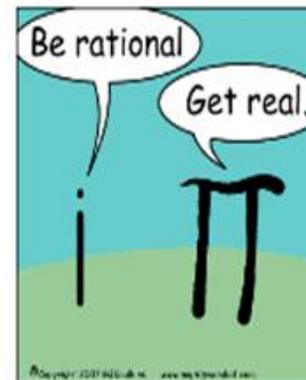
TIMELINE OF i

- **50 A.D.**, Heron of Alexandria studied the volume of an impossible section of a pyramid
- **1545** - Girolamo Cardano wrote a book titled *Ars Magna*. He solved the equation $x(10-x)=40$, finding the answer to be 5 plus or minus $\sqrt{-15}$.
- **1572** - Rafael Bombelli first set down the rules for multiplication of complex numbers
- **1637** - Rene Descartes came up with the standard form for complex numbers, which is $a+bi$. Created term “imaginary” (derogatory).
- **1685** - John Wallis said that a complex number was just a point on a plane
- More than a century later, Caspar Wessel published a paper showing how to represent complex numbers in a plane.
- **1777** - Euler made the symbol i stand for $\sqrt{-1}$, which made it a little easier to understand.
- **1804** - Abbe Buee agreed with John Wallis’s idea about graphing imaginary numbers
- **1806** - Jean Robert Argand wrote how to plot them in a plane, and today the plane is called the Argand diagram.
- **1831** - Carl Friedrich Gauss made Argand’s idea popular, and introduced it to many people. In addition, Gauss took Descartes’ $a+bi$ notation, and called this a complex number.
- **1833** - Hamilton showed that pairs of numbers with an **appropriately defined multiplication** form a number system, and that Euler's " i " can simply be interpreted as one of these pairs of numbers. That was the point at which the modern formulation of complex numbers can be considered to have begun.



WHY i?

- In the “real” world, engineers use i and complex numbers (*real & imaginary numbers combined*) to study stresses on beams and to study resonance (vibration).
- i and complex numbers used to study the flow of fluid around objects, such as water around a pipe (physics).
- They are used in electric circuits, and help in transmitting radio waves. (Think about listening to the radio and talking on cell phones)
- Complex numbers are the basis for quaternions which are used to program 3D video games.
- Importantly, they are used in quantum mechanics to describe the fluctuation of a function (wave) that has intensity and phase – two numbers are needed and complex numbers meet this need.
- Mathematically, imaginary numbers help in studying infinite series.
- For students of algebra, every polynomial equation has a solution if complex numbers are used.



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