MA484 Day 1

Legend has it that the Pythagorean who first showed the other Pythagoreans that the square root of 2 is irrational (cannot be written as a reduced ratio of whole numbers) - was thrown overboard.

They weren't ready to to acknowledge the existence of irrational numbers.

What you need to know to understand this proof is this.

I If you can (logically) reduce a given statement to an absurd one, then the original statement cannot be true. This is an RAA proof. (reductio ad absurdum)

II If it's true that the square root of 2 is rational then

$\sqrt{2} = \frac{a}{b}$ w/ a & b have no common divisors (a reduced fraction)

III You also need to know some basics about numbers, like the product of two odds is odd and so if "a-squared" is even then so is "a".

$\underset{2k+1}{\underset{\shortparallel}{\text{odd}}} \cdot \underset{2m+1}{\underset{\shortparallel}{\text{odd}}} = \text{odd}$ b/c $(2k+1)(2m+1) = 4km + 2k + 2m + 1$

$= 2(km+k+m)+1$

$= \underbrace{2N+1}_{\text{odd}}$

This shows that if "a" were odd, then so would "a times a". Thus (contra-positively) if "a-squared" is even then "a" is even too.

With all the above, we assume that the square root of 2 IS rational, and show that a contradiction results.

Since it IS rational, it IS a reduced fraction. → $\sqrt{2} = \frac{a}{b}$ Can you arrive @ a contradiction?