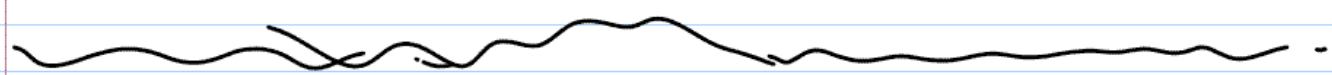


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Math 145 Topic 2.6

Question of the day: True or False Every number can be written as a fraction.

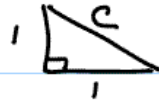


True False
8 5

Rational Number: A number that can be written in the form $\frac{A}{B}$ where A and B are both whole numb.



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



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

$$1 + 1 = c^2$$

$$2 = c^2$$

$$\sqrt{2} = c$$

Greek Mind Set : Prove $\sqrt{2}$ is rational.

American Mind Set : Prove $\sqrt{2}$ is not rational.

Assume $\sqrt{2}$ is rational.

Then $\sqrt{2} = \frac{c}{d}$ where c and d are whole numbers.

and $\frac{c}{d}$ is the reduced form of the fraction.

$$(\sqrt{2})^2 = \left(\frac{c}{d}\right)^2$$

$$2 = \frac{c^2}{d^2}$$

$$2d^2 = c^2$$

$$d^2 = \frac{c^2}{2} = \frac{c \cdot c}{2}, \text{ must be a whole number}$$

because d was a whole number,
 so c must be divisible by 2 or
 $c = 2n$, where n is a whole number
 By substitution into $d^2 = \frac{c^2}{2}$ we get $d^2 = \frac{(2n)^2}{2}$

$$d^2 = \frac{\cancel{2}n)(2n)}{\cancel{2}}$$

$$d^2 = 2n^2$$

$$\frac{d^2}{2} = n^2$$

$$\frac{d \cdot d}{2} = n^2$$

$\therefore d$ must be divisible by 2. so $d = 2m$
 since d is divisible by 2 and c is divisible by 2

$$\frac{c^2}{d^2} = \frac{c \cdot c}{d \cdot d} = \frac{\cancel{2}n \cdot \cancel{2}n}{\cancel{2}m \cdot \cancel{2}m} = \frac{n^2}{m^2}$$

$\frac{c^2}{d^2}$ is reducible to $\frac{n^2}{m^2}$

We contradicted the
assumption that

$\frac{c}{a}$ was in lowest terms

\therefore our assumption is false.

and $\sqrt{2}$ is not rational.