

## A Rational Multiplied By An Irrational Is Irrational

Let  $a \in \mathbb{Q}$  and  $b \in \mathbb{R}, b \notin \mathbb{Q}$

Then  $a*b \in \mathbb{R}$  and  $a*b \notin \mathbb{Q}$

**Proof:**

Proof by contradiction. Assume that  $a*b \in \mathbb{Q}$

Then  $a*b = \frac{m}{n} : m, n \in \mathbb{N}$

$$b = \frac{m}{n} * \frac{1}{a} \quad \text{Divide Each Side By } a$$

$$b = \frac{m}{na} \quad \text{Simplify}$$

This is a contradiction as  $b \notin \mathbb{Q}$  and cannot take the form  $\frac{m}{n}$