

■ = Rational ■ = Irrational

We want to investigate when you add or multiply rationals with rationals, rationals with irrationals, and irrationals with irrationals to see what the result will be.

Complete the addition table.

	5	1/2	0	$\sqrt{2}$	$-\sqrt{2}$	π
5	10	5.5	5	$5+\sqrt{2}$	$5-\sqrt{2}$	$5+\pi$
1/2	5.5	1	$\frac{1}{2}$	$\frac{1}{2}\sqrt{2}$	$\frac{1}{2}-\sqrt{2}$	$\frac{1}{2}+\pi$
0	5	$\frac{1}{2}$	0	$\sqrt{2}$	$-\sqrt{2}$	π
$\sqrt{2}$	$5+\sqrt{2}$	$\frac{1}{2}+\sqrt{2}$	$\sqrt{2}$	$2\sqrt{2}$	0	$\pi+\sqrt{2}$
$-\sqrt{2}$	$5-\sqrt{2}$	$\frac{1}{2}-\sqrt{2}$	$-\sqrt{2}$	0	$-2\sqrt{2}$	$\pi-\sqrt{2}$
π	$5+\pi$	$\frac{1}{2}+\pi$	π	$\sqrt{2}+\pi$	$\pi-\sqrt{2}$	2π

Complete the multiplication table.

	5	1/2	0	$\sqrt{2}$	$\frac{1}{\sqrt{2}}$	π
5	25	2.5	0	$5\sqrt{2}$	$\frac{5}{\sqrt{2}}$	5π
1/2	2.5	$\frac{1}{4}$	0	$\frac{1}{2}\sqrt{2}$	$\frac{1}{2\sqrt{2}}$	$\frac{1}{2}\pi$
0	0	0	0	0	0	0
$\sqrt{2}$	$5\sqrt{2}$	$\frac{1}{2}\sqrt{2}$	0	2	1	$\pi\sqrt{2}$
$\frac{1}{\sqrt{2}}$	$\frac{5}{\sqrt{2}}$	$\frac{1}{2\sqrt{2}}$	0	1	$\frac{1}{2}$	$\frac{\pi}{\sqrt{2}}$
π	5π	$\frac{1}{2}\pi$	0	$\pi\sqrt{2}$	$\frac{\pi}{\sqrt{2}}$	π^2

X · X
 $\pi \cdot \pi$

Based on the above information, conjecture which of the statements is ALWAYS true, which is SOMETIMES true, and which is NEVER true?

- The sum of a rational number and a rational number is rational.

Always

- The sum of a rational number and an irrational number is irrational.

Always

- The sum of an irrational number and an irrational number is irrational.

Sometimes

- The product of a rational number and a rational number is rational.

Always

- The product of a ~~nonzero~~ rational number and an irrational number is irrational.

Sometimes

- The product of an irrational number and an irrational number is irrational.

Sometimes

$R+R=R$	$R \cdot R=R$
$R+I=I$	$R \cdot I=I \text{ or } R$
$I+I=I \text{ or } R$	$I \cdot I=I \text{ or } R$