Name: _____ Date: _____

Rational and Irrational Numbers Notes

Today's Question: What is the result of the product of a rational and irrational number? (MCC9-12.N.RN.3)

Rational Numbers:
Can be expressed as the quotient of two integers (i.e. a fraction) with a denominator that is not zero. Many people are surprised to know that a repeating decimal is a rational number.

Examples: -5, 0, 7, 3/2, $0.\overline{26}$

- $\sqrt{9}$ is rational - you can simplify the square root to 3 which is the quotient of the integers 3 and 1.

Irrational Numbers:
Can't be expressed as the quotient of two integers (i.e. a fraction) such that the denominator is not zero.

Examples: $\sqrt{7}$, $\sqrt{5}$, π

Now, 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
$\sqrt{2}$	$5+\sqrt{2}$	$\frac{1}{2}+\sqrt{2}$	$0+\sqrt{2}$	$2\sqrt{2}$	0	$\pi+\sqrt{2}$
$-\sqrt{2}$	$6-\sqrt{2}$	$\frac{1}{2}-\sqrt{2}$	$-\sqrt{2}$	0	$-2\sqrt{2}$	$\pi-\sqrt{2}$
π	$5+\pi$	$\frac{1}{2}+\pi$	π	$\pi+\sqrt{2}$	$\pi-\sqrt{2}$	2π

Complete the multiplication table.

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

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

1. The sum of a rational number and a rational number is rational. Always
2. The sum of a rational number and an irrational number is irrational. Always
3. The sum of an irrational number and an irrational number is irrational. Sometimes
4. The product of a rational number and a rational number is rational. Always
5. The product of a nonzero rational number and an irrational number is irrational. Alwa
6. The product of an irrational number and an irrational number is irrational. Sometim