

Sums and Products of Rational and Irrational Numbers

- Addition of two rational numbers will result in a sum that is a rational number.
- Multiplication of two rational numbers will result in a product that is a rational number.
- Addition of a rational number and an irrational number will result in an irrational sum.
- Multiplication of a non-zero rational number and an irrational number results in an irrational product.
- The sum or product of two irrational numbers may be rational or irrational.

Algebra RH

HW

1. For which values of N and Q is $N + Q$ a rational number?

(1) $N = \sqrt{15}$, $Q = \sqrt[3]{1} = 1$ (3) $N = \sqrt[3]{27}$, $Q = \sqrt{20}$
 $= 3$

(2) $N = \sqrt{12}$, $Q = \sqrt{48}$ (4) $N = \frac{1}{\sqrt{25}}$, $Q = \frac{\sqrt{64}}{7}$
 $= \frac{1}{5}$ $= \frac{8}{7}$

(4) sum of two rational numbers is always rational

2. Ms. Fonseca asked her class "Is the sum of $-2\sqrt{20}$ and $\sqrt{80}$ rational or irrational?" Jeremy answered that the sum would be irrational. State whether Jeremy is correct or incorrect. Justify your response.

Jeremy is incorrect. When you simplify $\sqrt{80}$, it becomes the additive inverse of $-2\sqrt{20}$ resulting in the answer of zero.

3. Given: $A = \sqrt{6}$ $B = 5\sqrt{10}$ $C = \sqrt{25}$ $D = \sqrt[3]{64}$
 $= 5$ $= 4$

Which expression does *not* result in an irrational number?

(1) $A + B$
 $\sqrt{6} + 5\sqrt{10}$

(2) $B + C$
 $5\sqrt{10} + 5$

(3) $C + D$
 $5 + 4$

(4) $A + D$
 $\sqrt{6} + 4$

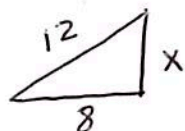
4. Liam says that the sum of $415.0\bar{2}$ and $\frac{3}{\sqrt{100}}$ is an irrational number. Do you agree or disagree? Explain your reasoning.

I disagree. Both are rational numbers, a repeating decimal and a fraction.

$$\begin{array}{r} 415.0\bar{2} \\ + .3 \\ \hline 415.3\bar{2} \end{array}$$

$$\frac{3}{\sqrt{100}} = \frac{3}{10} = .3$$

5. One leg of a right triangle measures 8 units and the hypotenuse measures 12 units. The perimeter of the triangle is irrational. (True or False? Justify your response.)



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

$$8^2 + x^2 = 12^2$$

$$64 + x^2 = 144$$

$$\sqrt{x^2} = \sqrt{80}$$

$$x = \sqrt{16} \sqrt{5}$$

$$x = 4\sqrt{5}$$

The sum of two rational numbers and an irrational number

6. Experiment with sums and products of two numbers from the following list to answer the questions that follow: will be irrational.

$$5, \frac{1}{2}, 0, \sqrt{2}, -\sqrt{2}, \frac{1}{\sqrt{2}}, \pi.$$

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

- A a) The sum of a rational number and a rational number is rational. ex. $0 + \frac{1}{2} = \frac{1}{2}$
 A b) The sum of a rational number and an irrational number is irrational. ex. $\sqrt{2} + 5$
 S c) The sum of an irrational number and an irrational number is irrational. $\sqrt{2} + \pi, \sqrt{2} - \sqrt{2}$
 A d) The product of a rational number and a rational number is rational. $\frac{1}{2} \cdot 5 = \frac{5}{2}$
 S e) The product of a rational number and an irrational number is irrational. ex. $5\sqrt{2}, 0 \times \sqrt{2}$
 S f) The product of an irrational number and an irrational number is irrational.

$$\begin{array}{l} \text{ex. } \sqrt{2} \cdot \pi, \\ \sqrt{2} \cdot \sqrt{2} = 2 \end{array}$$