

# Operations Between Rational and Irrational Numbers

## 1. Multiplication: Rational x Irrational

Usually results in an irrational number.

Example:

$$2 \times \sqrt{3} = 2\sqrt{3} \text{ -----> irrational}$$

Exception:

$$0 \times (\text{any irrational number}) = 0 \text{ -----> rational}$$

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## 2. Division: Rational ÷ Irrational and Irrational ÷ Rational

Usually results in an irrational number.

**Example 1 (Rational ÷ Irrational):**

$$5 \div \sqrt{2} = 5/\sqrt{2} \text{ -----> irrational}$$

**Example 2 (Irrational ÷ Rational):**

$$\sqrt{3} \div 2 = \sqrt{3}/2 \text{ -----> irrational}$$

Exception:

$$0 \div (\text{any non-zero number}) = 0 \text{ -----> rational}$$

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## 3. Addition: Rational + Irrational

Always results in an irrational number.

Example:

$$3 + \sqrt{2} \text{ -----> irrational}$$

Exception (rare and constructed):

$$(5 + \sqrt{2}) + (-\sqrt{2}) = 5 \text{ -----> rational}$$

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## 4. Subtraction: Rational - Irrational

Usually results in an irrational number.

Example:

$$7 - \sqrt{5} = \text{-----> irrational}$$

Exception (only when designed to cancel):  $(5 + \sqrt{2}) - \sqrt{2} = 5$  -----> rational

## 5. Subtraction: Irrational - Rational

Usually results in an irrational number.

Example:

$\sqrt{2} - 2$  -----> irrational

Exception (rare and constructed):

$(4 + \sqrt{2}) - 4 = \sqrt{2}$  -----> irrational

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