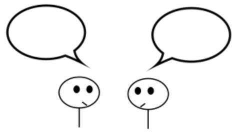
Unit 1 – The Real Number System

Let's work together.



1. Given the numerical expressions: $-\frac{\sqrt{36}}{11}$ $\quad 42.1\overline{6}$ $\quad (\sqrt{2})(\sqrt{32})$

   Identify the expression(s) that represent a rational number. Justify your response.

   All expressions are rational. See work below.

   $-\frac{\sqrt{36}}{11} = -\frac{6}{11}$ The expression is a fraction in which the numerator and denominator are both integers.

   $42.1\overline{6}$ is a repeating decimal. All repeating decimals are rational.

   $\sqrt{2} \bullet \sqrt{32} = \sqrt{64} = 8$ The product of these two irrational numbers is rational.

2. Determine if each radical expression is rational or irrational. If rational, find the integer value that is equivalent to the radical expression.

   a) $\sqrt{50}$ I

   b) $\sqrt[3]{512}$ R $\quad \sqrt[3]{512} = 8$

   c) $\sqrt[3]{-8}$ R $\quad \sqrt[3]{-8} = -2$

   d) $\sqrt{196}$ R $\quad \sqrt{196} = 14$

   e) $\sqrt[3]{15}$ I

3. Rewrite the following irrational expressions in simplest radical form.

   a) $\sqrt{75}$
   $\sqrt{25} \bullet \sqrt{3}$
   $\mathbf{5\sqrt{3}}$

   b) $\sqrt{48}$
   $\sqrt{16} \bullet \sqrt{3}$
   $\mathbf{4\sqrt{3}}$

   c) $\sqrt{72}$
   $\sqrt{36} \bullet \sqrt{2}$
   $\mathbf{6\sqrt{2}}$

4. Provide two examples to show that the <u>sum</u> of two irrational numbers could be irrational or rational.

Rational Sum = $\pi + (-\pi) = 0 \leftarrow rational$ Think opposites

Irrational Sum = $\pi + \pi = 2\pi \leftarrow irrational$

5. Provide two examples to show that the product of two irrational numbers could be irrational or rational.

Rational Product = $\pi \bullet \frac{1}{\pi} = 1 \leftarrow rational$ Think reciprocals

$\sqrt{2} \bullet \sqrt{2} = \sqrt{4} = 2 \leftarrow rational$

Irrational Product = $\pi \bullet \pi = \pi^2 \leftarrow irrational$

$\sqrt{2} \bullet \sqrt{5} = \sqrt{10} \leftarrow irrational$

6. Let ***a*** represent a non-zero rational number and let ***b*** represent an irrational number. Which expression could represent a rational number? Explain your reasoning.

Let ***a* = 3** and ***b* = $\sqrt{2}$**

(1) -*b*

$-\sqrt{2}$

irrational

(2) *a* + *b*

$3+\sqrt{2}$

irrational

(3) *ab*

$3\sqrt{2}$

irrational

(4) b^2

$\left(\sqrt{2}\right)^2 = \sqrt{2} \bullet \sqrt{2} = \sqrt{4} = 2$

rational

Explanation:

To answer this question, I substituted ***a*** with a non-zero rational number (3) and ***b*** with an irrational number $\left(\sqrt{2}\right)$. An irrational number squared can result in a rational product. See work shown above.

7. Fill in the real number property below that justifies each step in combining the binomials.

Given: (4x + 5) + (3x + 6)

4x + (5 + 3x) + 6	Associative Property of Addition
4x + (3x + 5) + 6	Commutative Property of Addition
(4x + 3x) + (5 + 6)	Associative Property of Addition
x(4 + 3) + (5 + 6)	Distributive Property (undistribute)
7x + 11	

8. The following is a proof of the algebraic equivalency of $(ab)^2$ and a^2b^2. Fill in each of the blanks with either the statement "commutative property" or "associative property".

$(ab)^2 = (ab)(ab)$

$= a(ba)b$ Associative Property of Multiplication

$=a(ab)b$ Commutative Property of Multiplication

$= (aa)(bb)$ Associative Property of Multiplication

$= a^2b^2$