

Properties of Irrational Numbers

 Guide Notes

Math 8

Properties of Irrational Numbers

1. The decimal expansion of an irrational number is non-terminating non-recurring.

Example: $\sqrt{5} = 2.23606797 \dots \dots \dots$

2. The sum or difference of a rational number and an irrational number is irrational.

Example: $5 + \sqrt{3} = 5 + 1.73215 \dots \dots = 6.73215 \dots \dots$

$$5 - \sqrt{3} = 5 - 1.73215 \dots \dots = 3.2679 \dots \dots$$

3. The product or quotient of a non-zero rational number with an irrational number is irrational.

Example: $2 * \sqrt{2} = 2\sqrt{2}$

$$\sqrt{2} \div (-3) = -\frac{\sqrt{2}}{3}$$

4. If you add, subtract, multiply or divide two irrationals, the result may be rational or irrational.

Example: $\sqrt{2} + \sqrt{3} = 1.41421 \dots + 1.73215 \dots = 3.14626 \dots \dots$

$$\sqrt{3} - \sqrt{3} = 1.73215 \dots - 1.73215 \dots = 0$$

$$\sqrt{2} - \sqrt{3} = 1.41421 \dots - 1.73215 \dots = -0.3178 \dots \dots$$

$$\sqrt{2} * \sqrt{3} = 1.41421 \dots * 1.73215 \dots = 2.49962 \dots \dots$$

$$\sqrt{2} * \sqrt{2} = 2$$

$$\sqrt{2} \div \sqrt{3} = 1.41421 \dots \div 1.73215 \dots = 0.816447 \dots \dots$$

$$\sqrt{2} \div \sqrt{2} = 1$$

Sample Problem 1: Identify if the answer will be rational or irrational.

a. $3\pi + 2\pi$

b. $\sqrt{6} - \sqrt{6}$

Properties of Irrational Numbers Guide Notes

Math 8

c. $\sqrt{5} * \frac{1}{\sqrt{5}}$

d. $\sqrt{3} \div \sqrt{11}$

Sample Problem 2: Identify if the answer will be rational or irrational.

a. $3 + 5\pi$

b. $\sqrt{7} - (-8)$

c. $\sqrt{5} * (-12)$

d. $\sqrt{33} \div 33$

| | | |
|------------------------------|-------------------------------------|--|
| Commutative Property | for Addition for Multiplication | $a + b = b + a$ $a * b = b * a$ |
| Associative Property | for Addition: for Multiplication | $(a + b) + c = b + (a + c)$ $(a * b) * c = b * (a * c)$ |
| Distributive Property | | $a(b + c) = ab + ac$ |
| Additive Identity | | $a + 0 = 0 + a = a$ |

Name: _____ Period: _____ Date: _____

Properties of Irrational Numbers

Guide Notes

Math 8

Sample Problem 3: Insert a rational and an irrational number between each numbers

a. 2 and 3

b. 5 and 6