

# RATIONAL NUMBERS

- Any number that can be written as a simple fraction
- Terminating or repeating decimals

OR  
WHOLE  
NUMBER

0, 5, -2,  $\frac{3}{2}$ , .111, 1.75  
1.5



# IRRATIONAL NUMBER

- Any number that CANNOT be written as a simple fraction
  - Decimal that goes on forever without repeating

$$\pi, \frac{22}{7}, \sqrt{2}$$



# Recognizing rational and irrational numbers (examples) | Algebra I | Khan Academy

Which of the following real numbers are irrational?

$$\frac{\sqrt{8}}{2}$$

I

$$\pi$$

I

$$5.0$$

R

$$\frac{25}{5}$$

$$0.325$$

R

$$\frac{13}{40}$$

$$7.77\ldots = 7.\overline{7}$$

R

$$8\frac{1}{2}$$

R

$$\frac{17}{2}$$

Which of the following real numbers are irrational?

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# RATIONAL OR IRRATIONAL?

$\sqrt{5}$  IRRATIONAL

$\frac{1}{2}$  RATIONAL

2 RATIONAL

2.7854602582...  
IRRATIONAL

1.3333 $\bar{3}$  RATIONAL

$\sqrt{10}$  IRRATIONAL

$\frac{\sqrt{4}}{2}$  RATIONAL

$\frac{407}{528}$  RATIONAL



# IRRATIONAL AND RATIONAL RULES

- 1) An irrational number  $\pm$  irrational number = irrational number
- 2) A rational  $\pm$  rational number = rational number
- 3) An irrational number  $\pm$  rational number = irrational number



# ARE THE FOLLOWING RATIONAL OR IRRATIONAL?

$$1) \begin{array}{c} \sqrt{2} + 3 \\ \text{I} + \text{R} \end{array} = \text{I IRRATIONAL}$$

$$2) \begin{array}{c} \sqrt{2} + \sqrt{2} \\ \text{I} + \text{I} \end{array} = \text{I IRRATIONAL} \\ \searrow 2\sqrt{2}$$

$$3) \begin{array}{c} \frac{1}{2} + \frac{1}{4} \\ \text{R} \quad \text{R} \end{array} = \text{RATIONAL}$$

$$4) \begin{array}{c} 5 - 5 \\ \text{R} \quad \text{R} \end{array} = \text{RATIONAL}$$

$$5) \begin{array}{c} \frac{1}{3} - 0.211 \\ \text{R} \quad \text{R} \end{array} = \text{RATIONAL}$$



# RADICAL PRACTICE

1)  $\sqrt{108x^7}$

Handwritten work for problem 1:  
 $\sqrt{108x^7}$   
 $\sqrt{2^2 \cdot 3^3 \cdot 3 \cdot x^6 \cdot x}$   
 $\sqrt{2^2 \cdot 3^4 \cdot x^6 \cdot x}$   
 $2 \cdot 3^2 \cdot x^3 \sqrt{x}$   
 $6x^3\sqrt{3x}$

2)  $-3\sqrt{8x}$

Handwritten work for problem 2:  
 $\sqrt{4 \cdot 2 \cdot x}$   
 $2\sqrt{2x}$

Handwritten work for problem 2:  
 $-3\sqrt{2 \cdot 2 \cdot 2x}$

Handwritten work for problem 2:  
 $-6\sqrt{2x}$

3)  $7x^2\sqrt{18x^2}$

Handwritten work for problem 3:  
 $\sqrt{9 \cdot 2 \cdot x^2}$   
 $3\sqrt{2x^2}$

Handwritten work for problem 3:  
 $7x^2\sqrt{2 \cdot 3 \cdot 3 \cdot x \cdot x}$   
 $21x^3\sqrt{2}$

4)  $5x\sqrt{56}$

Handwritten work for problem 4:  
 $\sqrt{2 \cdot 28}$   
 $\sqrt{7 \cdot 4}$   
 $\sqrt{7 \cdot 2 \cdot 2}$   
 $2\sqrt{14}$

Handwritten work for problem 4:  
 $5x\sqrt{2 \cdot 2 \cdot 7}$

Handwritten work for problem 4:  
 $10x\sqrt{14}$



# MULTIPLY

$$3x\sqrt{7} \cdot \sqrt{24x^2}$$

$$3x\sqrt{168x^2}$$

$$\begin{array}{r} \sqrt{168} \\ 2 \overline{) 84} \\ 2 \overline{) 42} \\ 7 \overline{) 6} \\ 2 \overline{) 3} \end{array}$$

$$3x\sqrt{2 \cdot 2 \cdot 2 \cdot 3 \cdot 7 \cdot x \cdot x}$$

$$6x^2\sqrt{42}$$

$$5a^2\sqrt{25a} \cdot 4\sqrt{12a^4}$$

$$20a^2\sqrt{300a^5}$$

$$\begin{array}{r} \sqrt{300} \quad \sqrt{a^5} \\ 30 \quad 10 \\ 6 \quad 5 \quad 5 \quad 2 \\ 2 \quad 3 \end{array}$$

$$20a^2\sqrt{2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot a \cdot a \cdot a \cdot a}$$

$$200a^4\sqrt{3a}$$





# ADD/SUBTRACT

$$5\sqrt{3} + 2\sqrt{75}$$

$$\begin{array}{c} \nearrow \quad \nwarrow \\ 25 \quad 3 \\ \hline 65 \end{array}$$

$$5\sqrt{3} + 10\sqrt{3}$$

$$15\sqrt{3}$$

$$6\sqrt{2} - 3\sqrt{2}$$

$$3\sqrt{2}$$

$$5\sqrt{8} - 3\sqrt{18} + \sqrt{3}$$

$$\begin{array}{c} \nearrow \quad \nwarrow \quad \nearrow \quad \nwarrow \\ 4 \quad 2 \quad 9 \quad 2 \\ \hline 22 \quad 33 \end{array}$$

$$10\sqrt{2} - 9\sqrt{2} + \sqrt{3}$$

$$\sqrt{2} + \sqrt{3}$$

