Warm Up (5 min) – yes it's a short one

We don't waste time on the path to success

1. $5(2x-3)$

2. $\frac{3}{5} \bullet \frac{5}{2} =$

3. $\frac{3}{4} + \frac{3}{6} =$

4. $\frac{4}{11} - \frac{1}{5} =$

1. $5(2x-3)$

$5 \cdot 2x - 3 \cdot 5$

$10x - 15$

2. $\frac{3}{5} \bullet \frac{5}{2} = \frac{15}{10} \div \frac{5}{5} = \frac{3}{2}$

3. $\frac{3}{4} + \frac{3}{6} = \frac{6 \cdot 3}{6 \cdot 4} + \frac{3 \cdot 4}{6 \cdot 4} = \frac{18}{24} + \frac{12}{24} = \frac{30}{24}$

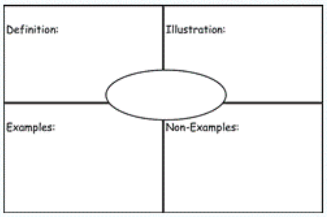
$\frac{30}{24} \div \frac{6}{6} = \frac{5}{4}$

4. $\frac{4}{11} - \frac{1}{5} = \frac{5 \cdot 4}{5 \cdot 11} - \frac{1 \cdot 11}{5 \cdot 11} = \frac{20}{55} - \frac{11}{55} = \frac{9}{55}$

Rational vs. Irrational

Rational

Def.) A rational number is any number that can be written as a Ratio (Fraction) of integers.



def. ex.

Ex.)

0 because $0 = \frac{0}{1}$ $\quad 1 = \frac{1}{1}$ $\quad \sqrt{9} = 3 = \frac{3}{1}$

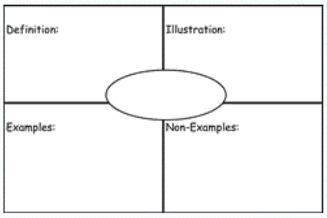
$1\frac{1}{2} = \frac{3}{2}$ $\quad \frac{4}{5}$ $\quad -19 = \frac{-19}{1}$ and $2^2 = 4 = \frac{4}{1}$

$.\overline{3} = .3333\ldots$ Any Decimal with an end or with a Pattern.

Rational vs. Irrational

Irrational

Def) Any number that Can NOT be written as a Ratio of integers



def. ex.

Examples)

← Decimals with no pattern and no end

$\pi = 3.1415\ldots$

$\sqrt{5}$, $\sqrt{17}$ and $5 \cdot \sqrt{3}$

Rational vs. Irrational

Closure for Addition

Irrational #'s are open for Addition

take:

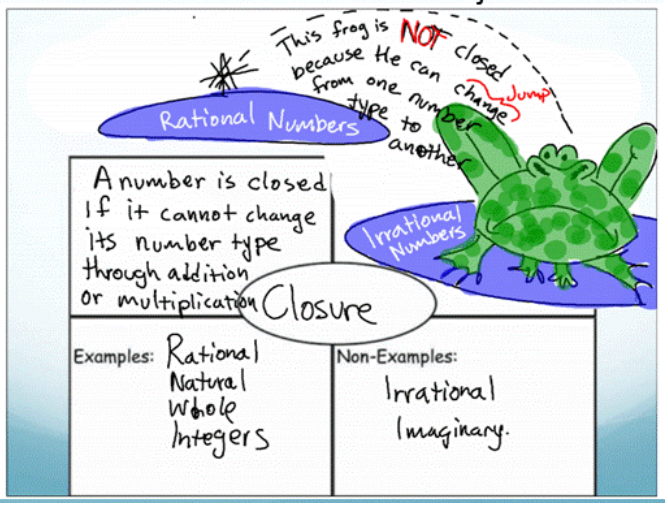
Irrational + Irrational = zero

$\pi + (-\pi) = 0$

$\pi - \pi = 0$ ✓

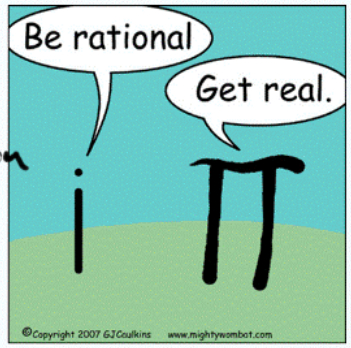
So I just got the irrational numbers to change!

Found on: sinclairjohnston.com



Rational vs. Irrational

Closure for Multiplication



Irrational # are open for multiplication

Take:

Ex1.) Irrational • Irrational = Rational

$\pi \cdot \frac{1}{\pi} = \frac{\pi}{\pi} = 1$

Boom! they jump out!

Ex2.) $\sqrt{5} \cdot \sqrt{5} = \sqrt{5 \cdot 5} = \sqrt{25} = 5$

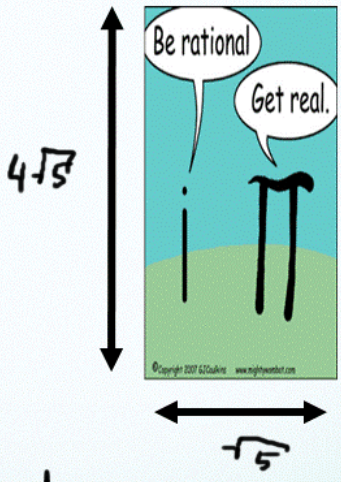
It can break free!

Rational vs. Irrational

This picture has a height of $4\sqrt{5}$ inches and a width of $\sqrt{5}$ inches. Is the picture's area Irrational or Rational?

height = $4\sqrt{5}$

width = $\sqrt{5}$



area = h • w

$4\sqrt{5} \cdot \sqrt{5}$

$4\sqrt{5 \cdot 5}$

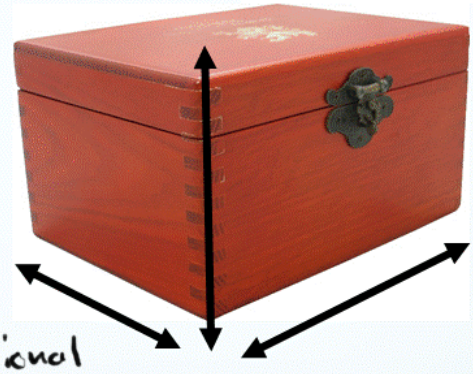
$4\sqrt{25}$

$4 \cdot 5 = 20$

Rational

Pop Quiz

This secret box has a height of $2\sqrt{3}$ inches and a width of $4\sqrt{3}$ inches and a length of 2 inches. Is the volume Irrational or Rational?



Note:

$$Volume = Height \cdot Width \cdot Length$$

$2\sqrt{3} \cdot 4\sqrt{3} \cdot 2$

$2 \cdot 4 \cdot 2 \cdot \sqrt{3} \cdot \sqrt{3}$

$8 \cdot 2 \cdot \sqrt{3 \cdot 3}$

$16\sqrt{9} = 16 \cdot 3$ → Rational

True or False:

1. Irrational numbers are closed under addition. Fake
2. Rational numbers can be multiplied together in a way to get an Irrational number. fake
3. An irrational numbers times a rational number is always irrational. True

Exponent Review

$$x^{\frac{2}{3}} \cdot x^{\frac{3}{4}} = x^{\frac{2}{3}+\frac{3}{4}} = x^{\frac{17}{12}} = \sqrt[12]{x^{17}}$$

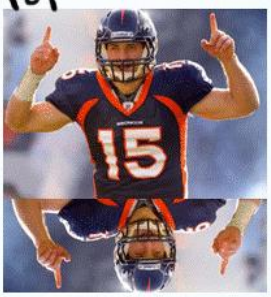
$$\frac{4}{4}\cdot\frac{2}{3} + \frac{3}{4}\cdot\frac{3}{3} = \frac{8}{12} + \frac{9}{12} = \frac{17}{12}$$

$$\left(x^{\frac{2}{5}}\right)^{\frac{3}{2}} = x^{\frac{2}{5}\cdot\frac{3}{2}} = x^{\frac{6}{10}} = x^{\frac{3}{5}} = \sqrt[5]{x^{3}}$$

Exponent Review

$$x^{\frac{3}{4}} = \sqrt[4]{x^3}$$

Top In

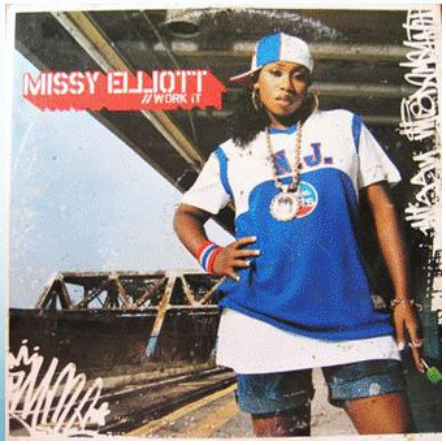


Bottom Out

Exponent Review

$$x^2 \cdot x^{-6} = x^{2+-6} = x^{2-6} = x^{-4} = \frac{1}{x^4}$$

$$\frac{x^{-3}}{x^4 y^{-2}} = \frac{y^2}{x^4 x^3} = \frac{y^2}{x^7}$$



Exponent Review

The **factors of 108**. Answer : 1,2,3,4,6,9,12,18,27,36,54,108,

$108^{\frac{1}{3}} = \sqrt[3]{108^1} = \sqrt[3]{2\cdot2\cdot3\cdot3\cdot3} = \sqrt[3]{2\cdot2}\cdot\sqrt[3]{3\cdot3\cdot3}$

look for groups of 3

$\sqrt[3]{4}\cdot\sqrt[3]{3^3}$

$\sqrt[3]{4}\cdot 3$

I like it

$3\cdot\sqrt[3]{4}$

$2\cdot54$

$2\cdot6\cdot9$

$2\cdot2\cdot3\cdot3\cdot3$

Exponent Review

$5^3 = 125$ The factors of 125: 1,5,25,125,

$5^4 = 625$ The factors of 625: 1,5,25,125,625,

Look for groups of three

$5^{\frac{4}{3}} = \sqrt[3]{5^4} = \sqrt[3]{5\cdot5\cdot5\cdot5} = \sqrt[3]{5}\cdot\sqrt[3]{5\cdot5\cdot5}$

$\sqrt[3]{5}\cdot\sqrt[3]{5^3}$

$\sqrt[3]{5}\cdot 5$

$5^{\frac{4}{3}} = 5^{1\frac{1}{3}} = 5^1\cdot5^{1/3} = 5\sqrt[3]{5} = 5\cdot\sqrt[3]{5}$

Same Answer

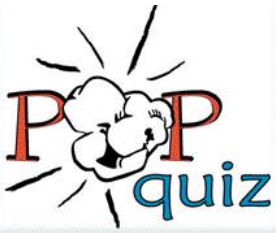
$5^3 = 125$

The factors of 125 : 1,5,25,125,

$5^{\frac{3}{2}} = \sqrt[2]{5^3} = \sqrt[2]{5 \cdot 5 \cdot 5} = \sqrt[2]{5}\sqrt[2]{5 \cdot 5}$

$\sqrt[2]{5} \cdot 5$

Ans = $5 \cdot \sqrt[2]{5}$



$\frac{x^2 y^{-3}}{x^3} = \frac{x^2}{x^3 y^3}$

$\boxed{\frac{1}{x y^3}}$ = Answer

$x^2 \cdot x^{-6} = \frac{1}{x^4}$

Like Terms

$7x - 8y - 5x$

$7x - 5x - 8y$

$2x - 8y$

Like Terms

$7\sqrt{3} - 8\sqrt{5} - 5\sqrt{3}$

$7\sqrt{3} - 5\sqrt{3} - 8\sqrt{5}$

$2\sqrt{3} - 8\sqrt{5}$

Like Terms

$6(S + 2B) - 6B + 2S$

$6 \cdot S + 12B - 6B + 2S$

$6S + 2S + 12B - 6B$

$8S + 6B$

Like Terms

$$6(\sqrt{5}+2\sqrt{8})-6\sqrt{8}+2\sqrt{5}$$

$6\sqrt{5}+12\sqrt{8}-6\sqrt{8}+2\sqrt{5}$

$6\sqrt{5}+2\sqrt{5}+12\sqrt{8}-6\sqrt{8}$

$8\sqrt{5}+6\sqrt{8}$

Pop Quiz

$$1\sqrt{5}+2\sqrt{8}-6\sqrt{8}+2\sqrt{5}=$$

$3\sqrt{5}-4\sqrt{8}$

Is the answer Rational or Irrational?

$$\sqrt{4}+2\sqrt{7}+6-2\sqrt{7}=$$

zero

$\sqrt{4}+6$ = Irrational