

Have your Alg Nat book open to pages 21-23. Fill out a pink slip if you did not complete this assignment. In your notebook, copy down and work out the following problems. This is in review for your test next Tuesday.

Simplify completely:

$$(10x^4 - 16) + (12 - 6x^3 + 11x^4)$$

$$21x^4 - 4 - 6x^3$$

$$21x^4 - 6x^3 - 4$$

$$(9r + 6r^4) + (12r - 2r^4 - 17)$$

$$21r + 4r^4 - 17$$

$$4r^4 + 21r - 17$$

$$(20n + 11n^4) - (15n + 16n^2 - 17n^4)$$

$$20n + 11n^4 - 15n - 16n^2 + 17n^4$$

$$28n^4 + 5n - 16n^2$$

$$28n^4 - 16n^2 + 5n$$

$$(20v^2 - 9v^3) - (7v^3 - 10v^4 - 14v^2)$$

$$20v^2 - 9v^3 - 7v^3 + 10v^4 + 14v^2$$

$$10v^4 - 16v^3 + 34v^2$$

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Section 1 – Topic 8 pg. 21

More Operations with Radicals and Rational Exponents

Let's explore multiplying and dividing expressions with radicals and rational exponents.

$$\sqrt{10} \cdot \sqrt{2}$$

$$= \sqrt{10 \cdot 2}$$

$$= \sqrt{20}$$

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

$$= 2\sqrt{5}$$

$$10^{\frac{1}{2}} \cdot 2^{\frac{1}{2}}$$

$$= (2 \cdot 5)^{\frac{1}{2}} \cdot 2^{\frac{1}{2}}$$

$$= (2^{\frac{1}{2}} \cdot 5^{\frac{1}{2}}) \cdot 2^{\frac{1}{2}}$$

$$= (2^{\frac{1}{2}} \cdot 2^{\frac{1}{2}}) \cdot 5^{\frac{1}{2}}$$

$$= 2^{\left(\frac{1}{2} + \frac{1}{2}\right)} \cdot 5^{\frac{1}{2}}$$

$$= 2 \cdot 5^{\frac{1}{2}}$$

$$\sqrt{2} \cdot \sqrt[3]{2}$$

We cannot multiply the radicals since the roots are not the same.

$$2^{\frac{1}{2}} \cdot 2^{\frac{1}{3}}$$

$$= 2^{\left(\frac{1}{2} + \frac{1}{3}\right)}$$

$$= 2^{\frac{5}{6}}$$

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$$\frac{\sqrt{10}}{\sqrt{2}}$$

$$= \sqrt{\frac{10}{2}}$$

$$= \sqrt{5}$$

$$\frac{10^{\frac{1}{2}}}{2^{\frac{1}{2}}}$$

$$= \frac{(5 \cdot 2)^{\frac{1}{2}}}{2^{\frac{1}{2}}} = \frac{5^{\frac{1}{2}} \cdot 2^{\frac{1}{2}}}{2^{\frac{1}{2}}} = 5^{\frac{1}{2}}$$

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Let's Practice!

1. Use the properties of exponents to perform the following operations.

a. $(x^{\frac{1}{3}})^{\frac{1}{2}} = x^{(\frac{1}{2}) \cdot (\frac{1}{3})} = x^{\frac{1}{6}}$

b. $(\sqrt[2]{7})^3 = \sqrt{7^3} = \sqrt{7^2 \cdot 7} = 7\sqrt{7}$ ($7^{\frac{3}{2}}$ is also correct)

c. $(a^{\frac{1}{2}}b^{\frac{2}{5}}) \cdot (a^{\frac{2}{3}}b^{\frac{1}{2}}) = (a^{\frac{1}{2}} \cdot a^{\frac{2}{3}}) \cdot (b^{\frac{2}{5}} \cdot b^{\frac{1}{2}}) = a^{(\frac{1}{2})+(\frac{2}{3})} \cdot b^{(\frac{2}{5})+(\frac{1}{2})}$
 $= a^{\frac{7}{6}} \cdot b^{\frac{9}{10}} = a^{(1+\frac{1}{6})} \cdot b^{\frac{9}{10}} = a \cdot \sqrt[6]{a} \cdot \sqrt[10]{b^9}$

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$$d. \frac{\sqrt[4]{8}}{\sqrt{8}} = \frac{8^{\frac{1}{4}}}{8^{\frac{1}{2}}} = 8^{\left(\frac{1}{4}-\frac{1}{2}\right)} = 8^{-\frac{1}{4}} = \frac{1}{8^{\frac{1}{4}}} = \frac{1}{\sqrt[4]{8}}$$

Try It!

2. Use the properties of exponents to perform the following operations.

$$a. (m^0 n^2)^{\frac{1}{5}} = m^{0 \cdot \left(\frac{1}{5}\right)} \cdot n^{2 \cdot \left(\frac{1}{5}\right)} = m^0 \cdot n^{\frac{2}{5}} = 1 \cdot n^{\frac{2}{5}} = n^{\frac{2}{5}}$$

$$b. (\sqrt{8} \cdot \sqrt[3]{3})^{\frac{2}{3}} = \left(8^{\frac{1}{2}} \cdot 3^{\frac{1}{3}}\right)^{\frac{2}{3}} = 8^{\left(\frac{1}{2}\right) \cdot \left(\frac{2}{3}\right)} \cdot 3^{\left(\frac{1}{3}\right) \cdot \left(\frac{2}{3}\right)} = 8^{\frac{1}{3}} \cdot 3^{\frac{2}{9}} \\ = 2 \cdot 3^{\frac{2}{9}} = 2 \cdot \sqrt[9]{3^2} = 2 \cdot \sqrt[9]{9}$$

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$$c. \sqrt[4]{4} \cdot \sqrt[3]{4} = 4^{\frac{1}{4}} \cdot 4^{\frac{1}{3}} = 4^{\left(\frac{1}{4}\right) + \left(\frac{1}{3}\right)} = 4^{\frac{7}{12}} = \sqrt[12]{4^7}$$

$$d. (3 \cdot \sqrt[6]{27})^{\frac{1}{2}} = \left(3 \cdot (3^3)^{\frac{1}{6}}\right)^{\frac{1}{2}} = \left(3 \cdot 3^{\frac{1}{2}}\right)^{\frac{1}{2}} = 3^{\frac{1}{2}} \cdot 3^{\frac{1}{4}} = 3^{\frac{3}{4}} = \sqrt[4]{3^3}$$

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BEAT THE TEST! pg. 23

1. Which of the following expressions are equivalent to $2^{\frac{1}{2}}$?
Select all that apply.

- $\sqrt[3]{4}$
- $\sqrt[3]{8}$
- $\sqrt[4]{4}$
- $\sqrt[6]{8}$
- $\sqrt[6]{16}$

$$(\sqrt{2})^1 = \sqrt[2]{2}$$

$$\begin{aligned} \sqrt[3]{4} &= 4^{\frac{1}{3}} = (2^2)^{\frac{1}{3}} = 2^{\frac{2}{3}} \\ \sqrt[3]{8} &= 8^{\frac{1}{3}} = (2^3)^{\frac{1}{3}} = 2 \\ \sqrt[4]{4} &= 4^{\frac{1}{4}} = (2^2)^{\frac{1}{4}} = 2^{\frac{1}{2}} \\ \sqrt[6]{8} &= 8^{\frac{1}{6}} = (2^3)^{\frac{1}{6}} = 2^{\frac{1}{2}} \\ \sqrt[6]{16} &= 16^{\frac{1}{6}} = (2^4)^{\frac{1}{6}} = 2^{\frac{2}{3}} \end{aligned}$$

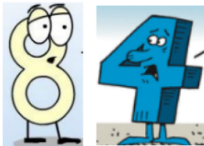
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Section 1 – Topic 9 pg.23
Operations with Rational and Irrational Numbers

- Numbers that can be represented as $\frac{a}{b}$, where a and b are integers and $b \neq 0$, are called rational numbers.
- Numbers that cannot be represented in this form are called irrational numbers.
 - Radicals that cannot be rewritten as integers are examples of such numbers.

$$\frac{4}{2} = 2 \quad \frac{4}{0} \quad \sqrt{4}$$

Rational




-Can be written in the form

a
b $b \neq 0$

-Terminating decimals
0.35

-Repeating decimals
0.333333...

Irrational



-Cannot be written in the form

~~**a**~~
~~**b**~~

-Non-Terminating decimals
3.14159...

-Non-Repeating decimals
0.387130923...

$$\frac{35}{100} = \frac{a}{b}$$

$$\frac{1}{3}$$

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Real Numbers:
All numbers you've ever experienced, so far...

Rational Numbers:
Examples: $\frac{1}{2}$, 3, -14, 7.184, $2\frac{1}{4}$, $5.\overline{333}$

Integers:
..., -3, -2, -1, 0, 1, 2, 3, ...

Whole Numbers:
0, 1, 2, 3, ...

Natural Numbers:
1, 2, 3, ...

Handwritten notes:
 $7.184 = \frac{7184}{1000}$
 $5.\overline{3} = 5\frac{1}{3} = \frac{16}{3}$
 $2\frac{3}{4} = \frac{11}{4}$


Irrational Numbers:
 π , and all other non-terminating, non-repeating decimals...
 $\sqrt{2}$, $\sqrt{3}$, $\sqrt[3]{5}$

Sep 9-9:44 AM

Determine whether the following numbers are rational or irrational.

	Rational	Irrational
$\sqrt{9}$ <i>-3</i>	<input checked="" type="radio"/>	<input type="radio"/>
$\sqrt{8}$	<input type="radio"/>	<input checked="" type="radio"/>
π	<input type="radio"/>	<input checked="" type="radio"/>
<i>5/7</i> $\frac{22}{7}$	<input checked="" type="radio"/>	<input type="radio"/>
$9.\overline{48}$	<input checked="" type="radio"/>	<input type="radio"/>
$\frac{33}{2}$	<input checked="" type="radio"/>	<input type="radio"/>
$2.23606...$ <i>not tern. not rep.</i>	<input type="radio"/>	<input checked="" type="radio"/>
<i>-25</i> -25	<input checked="" type="radio"/>	<input type="radio"/>

Rational




-Can be written in the form $\frac{a}{b}$

-Terminating decimals
0.35

-Repeating decimals
0.333333...

Irrational



-Cannot be written in the form $\frac{a}{b}$

-Non-Terminating decimals
3.14159...

-Non-Repeating decimals
0.387130923...

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Given two rational numbers, a and b , prove that the sum of a and b is rational. pg. 24

The sum is always rational.

Examples: $3 + 5 = 8$, $\frac{1}{3} + \frac{1}{2} = \frac{5}{6}$

Given two rational numbers, a and b , what can be said about the product of a and b ?

The product is always rational.

Examples: $3 \cdot -5 = 15$, $0.3 \cdot 1.7 = 0.51$

$$\frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$$

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Given a rational number, a , and an irrational number, b , prove that the sum of a and b is irrational.

The sum is always irrational.

Examples: $4 + \sqrt{12} = 4 + 2\sqrt{3}$ / $2 + 3\pi = 2 + 3\pi$

Given a non-zero rational number, a , and an irrational number, b , what can be said about the product of a and b ?

The product is always irrational.

Examples: $2 \cdot \sqrt{5}$, 4π

$$4 \cdot \sqrt{12} = 4\sqrt{12}$$

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Let's Practice! pg.25

1. Consider the following expression.

$$\begin{matrix} P+I_r=I_r \\ 2+\sqrt{3} \end{matrix}$$

The above expression represents the sum
 product

of a(n) rational number
 irrational number and a(n)

rational number
 irrational number and is equivalent to a(n)

rational number
 irrational number

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Try It!

2. María and her 6 best friends are applying to colleges. They find that Bard College accepts $\frac{1}{3}$ of its applicants. María and her friends write the expression below to represent how many of them would likely be accepted.

$$7 \cdot \frac{1}{3}$$

The above expression represents the sum
 product

of a(n) rational number
 irrational number and a(n)

rational number
 irrational number and is equivalent to a(n)

rational number.
 irrational number.

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BEAT THE TEST! pg.26

1. Let a and b be non-zero rational numbers and c be an irrational number. Consider the operations below and determine whether the result will be rational or irrational.

	Rational <input type="checkbox"/>	Irrational
$3+5=8$ $a + b$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
$a - c$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
$a \cdot b$	<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>
$\frac{a}{b}$	<input type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>
$a \cdot b \cdot c$	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2. Consider $x \cdot y = z$. If z is an irrational number, what can be said about x and y ?

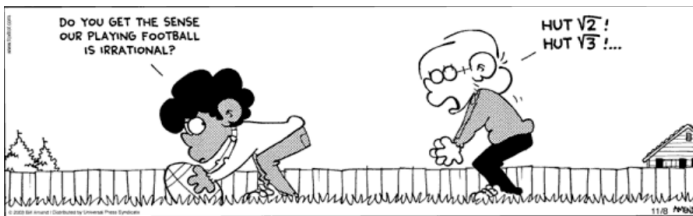
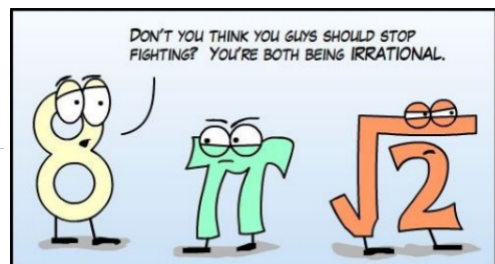
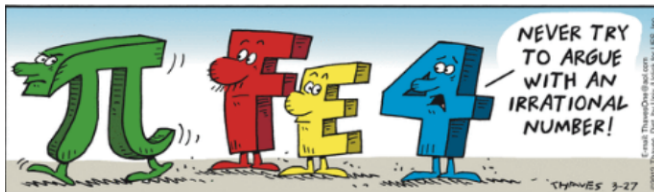
At least one of the variables MUST BE irrational.

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Homework

Finish S1T9 and work on mangahigh assignment(s)

STAR testing tomorrow for Algebra Readiness



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