Unit 2: Algebra and Number:

In this unit we will solve problems involving:

- square roots and cube roots
- integral and rational exponents
- irrational numbers, including radicals
- multiplying polynomials
- factoring polynomials

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- solve square rootand cube roots
- integral and rational exponents
- irrational numbers, including radicals
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Chapter 4: Exponents and Radicals

In this chapter we will solve problems involving

- square roots and cube roots
- integral and rational exponents
- represent, identify, and simplify irrational numbers, including radicals

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4.1 Square Roots and Cube Roots

Perfect Squares and Square Roots....

Perfect Cubes and Cube Roots.....

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PRIME FACTORIZATION

(This is important even though our calculators can give us the answer super quick and easy and it feels really pointless so stay with me here)

Prime factorization involves writing a number as the product of its prime factors. We do this by creating a factor tree, or repeated division by prime factors...

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Write the prime factorization of the following numbers, are they perfect squares, cubes, or neither?

196 125

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Determine the square root of 1296.

Prime Factorization and grouping

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A floor mat is a square with an area of 196 m^2. What is its side length?

The volume of a cubic box is 27 000 in^3. Determine its dimensions.

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Hmwk: Pg 158 #5, 7, 9, 11

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4.2 Integral Exponents

The Exponent Laws:

Product of powers: $a^m \cdot a^n = a^{m+n}$

Quotient of powers: $a^m \div a^n = a^{m-n}, a \neq 0$

Power of a power: $(a^m)^n = a^{mn}$

Power of a product: $(ab)^m = a^m b^m$

Power of a quotient: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

Also very important:

$$a^{-n} = \frac{1}{a^n}, a \neq 0$$

$$\frac{1}{a^{-n}} = a^n, a \neq 0$$

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Write each product or quotient as a power with a single exponent.

$$(2^{-3})(2^5)$$

$$\frac{7^{-5}}{7^3}$$

$$\frac{(-3.5)^4}{(-3.5)^{-3}}$$

$$\frac{3y^2}{3y^{-6}}$$

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Write each expression as a power with a single, positive exponent. Then, evaluate where possible.

$[(0.6^3)(0.6^{-3})]^{-5}$

$[(t^{-4})(t^3)]^{-3}$

$(\frac{(y^2)^0}{(y)^3})^{-3}$

$(\frac{x^6}{x^4})^{-2}$

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HMWK: Pg 169 #2, 4, 5abc, 6abc, 7, 8, 10

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4.3 Rational Exponents

Same thing as before but the exponent is a fraction...

And remember - we are not afraid of fractions!

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Recall the product of powers law: $(a^m)(a^n) = a^{m+n}$

Then $(9^{\frac{1}{2}})(9^{\frac{1}{2}}) =$

So what is the value of $9^{\frac{1}{2}}$? Of $4^{\frac{1}{2}}$? $16^{\frac{1}{2}}$?

Taking $n^{\frac{1}{2}}$ is the same as taking the ________________

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$$n^{\frac{a}{b}} = \sqrt[b]{n^a} = \left(\sqrt[b]{n}\right)^a$$

Powers with fractional exponents can be written as radicals (as explored last day). When the index, b, is even, n cannot be negative, since the product of an even number of equal factors is always positive.

Convert the following from a power to a radical.

$10^{\frac{1}{4}}$ $(x^4)^{\frac{3}{8}}$

Convert the following from a radical to a power.

$\sqrt[5]{x}$ $\sqrt[3]{5^2}$

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Simplifying expressions with rational exponents

$(x^5)(x^{\frac{-1}{2}})$ $\dfrac{3^{-\frac{3}{4}}}{3^{0.25}}$

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Write each expression as a power with a single, positive exponent. Then, evaluate where possible.

$$[(t^{\frac{4}{3}})(t^{\frac{1}{3}})]^9$$

$$[\frac{x^3}{64}]^2$$

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Cody invests $5000 in a fund that increases in value at the rate of 12.6% per year. The bank provides a quarterly update on the value of the investment using the formula below. Where q represents the number of quarterly periods and A represents the final amount of the investment.

$$A = 5000(1.126)^{\frac{q}{4}}$$

a) What is the relationship between the interest rate of 12.6% and the value 1.126 in the formula?

b) What is the value of the investment after the 3rd quarter?

c) What is the value of the investment after 3 years?

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Homework: Pg 180 #1-3abc, 6, 8, 10, 13

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4.1- 4.3 Review Activity

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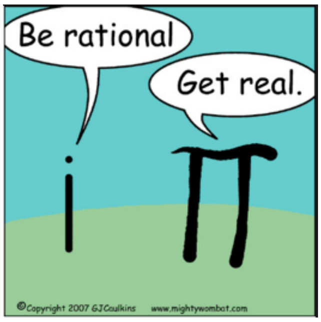
4.4 Irrational Numbers

An **irrational number** is a real number that cannot be expressed as a ratio of integers, i.e. as a fraction. Therefore, **irrational numbers**, when written as decimal numbers, **do not terminate, nor do they repeat.**



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4.4 Irrational Numbers

Converting between entire radicals and mixed radicals

Reduce

$\sqrt{27}$

Method 1:

Write as multiplication with a perfect square

$\sqrt{50}$

$$\sqrt[n]{ab} = \sqrt[n]{a} \bullet \sqrt[n]{b}$$

Method 2:

Use Prime Factorization and Grouping

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$\sqrt[4]{80}$

When dealing with large numbers or not a square root radical it is often best to use Method 2: Prime factorization.

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$\sqrt[3]{32} =$

$\sqrt{30} =$

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Converting mixed radicals to entire radicals REVERSE

$7\sqrt{3} =$

$2\sqrt[3]{18} =$

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Homework: Pg 192 #1abc, 2abc, 4-7

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4.4 Irrational Numbers - Ordering and Solving

Show your work!

Order these irrational numbers from least to greatest

Don't JUST use your calculator.

$$2\sqrt{54}, \sqrt{192}, 5\sqrt{10}$$

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The Seabee Mine is Located at Laonil Lake, SK. In 2007, the mine produced a daily average of gold great enough to fill a cube with a volume of 180 cm^3. If five days of gold production is cast into a cube, what is its edge length?

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Homework: Pg 193 #8, 10, 11, 12, 15, 19, 20

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