Math 10 Chp 4.1

Square Roots and Cube Roots - these are inverse (opposite) functions to squaring and cubing. So, if we are given the area of a square or the volume of a cube, then we can work backwards and find the side length.

eg) Find the side length of a square if the area is 49 cm^2.

Notice that we take the square root of the units.

eg) Find the side length of a cube if the volume is 125 in^3.

If the root is an integer, then the radicand is a perfect square, cube, etc. Otherwise we call it a radical - we will address this later.

How can we find the root without a calculator?

First, a refresher on divisibility.

2 - if even (ends in 0, 2, 4, 6, 8)
3 - if sum of digits is divisible by 3
4 - if last 2 digits is divisible by 4
5 - if it ends in 0 or 5.
6 - divisible by 2 & 3.
7 - it's complicated
8 - if last 3 digits are divisible by 8
9 - if sum of digits is divisible by 9
10 - if it ends in 0.

Factorize and determine if perfect square or cube

eg) 1296

For perfect cube, you must find triplets.

eg) 3375

eg) 105

If you are asked to do the root using factorization, do not use the root function on your calculator; you can only use the calculator to divide.

Assigned Work: pp. 158-161: 1, 3-8, 11, 12

Challenge: 13 a, 14, 15 a, 16, 18

Math 10 Chp 4.2

Note Title 2016-07-18

Integral Exponents - rather than expanding powers and counting, it's better to develop rules to multiply and divide powers. There are no general rules to add or subtract powers.

eg) $(5^3)^4 =$

eg) $5^3 \cdot 5^4 =$

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

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

If you forget the rules on a test, you can always derive them as we just did above. Here is a summary of all the rules.

$(a^m)^n = a^{m \cdot n}$

$a^m a^n = a^{m+n}$

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

$(ab)^n = a^n b^n$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0$

$a^0 = 1, a \neq 0$

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

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

eg) $(3 \cdot a)^2 =$

eg) $\left(\frac{4}{b}\right)^3 =$

eg) $(10000\, a^5 b^6)^0 =$

eg) $15^{-2} =$

eg) $\frac{1}{7^{-2}} =$

eg) $\left(\frac{5^{-2}}{3^{-2}}\right)^{-3} =$

eg) $\left(\frac{2^3}{4}\right)^3 =$

Word Problems: You will be supplied with a formula. Such as $P = 8172(2)^n$. If the base is >1, then it is a growth problem. If the base is >0 & <1, then it is a decay problem. 'n' is normally in terms of a fixed amount of time such as hours, days, years.

eg) A \$2000 investement makes 4% per year and is compounded yearly. The total investment is found with $P = 2000(1.04)^n$ where n is the number of years. How much is it worth after 8 years?

A harder problem would be asking how long to get \$2500.
You will have to do guess and test or use logarithms.

Using logarithms:

Assigned Work: pp. 169-173 : 2, 4, 5, 7, 8, 11, 12

Challenge: 14, 16, 19, 20

Math 10 Chp 4.3

Note Title 2016-07-18

Rational Exponents - Radicals can be expressed as powers. Sometimes rational exponents are easier to work with and other times radicals are easier. It is BEST to get used to both methods.

$x^5 \cdot x^5 =$

$x^4 \cdot x^4 =$

$x^3 \cdot x^3 =$

$x^2 \cdot x^2 =$

$x^1 \cdot x^1 =$

ALL exponent laws work for rational exponents! This is good because we don't have to learn different rules! You need to recall adding and subtracting fractions. Also reduce rational exponents.

eg) $x^{3/4} \cdot x^{1/3} =$

Sometimes, it is necessary to change the base before using the exponent laws.

eg) $\dfrac{27^{3/2}}{9^{2/5}} =$

eg) $\dfrac{4^{3/4}}{8^{5/3}} =$

eg) $(-8)^{2/6}$

There are 2 special bases: 2 & 1/2. '2' represents a doubling problem and '1/2' represents a half-life problem. Because these problems work on multiples of time units, it will have a slightly different form.

eg) What is the percentage of carbon-14 compared to a living sample of a fossil that is 8000 years old? Use the formula: $P = 100\left(\frac{1}{2}\right)^{n/5730}$.
The 5730 is the number of years it takes to half the number of C-14 isotopes, ie, the half-life.

Again the harder problem is to ask how old is the fossil if there is 20% of C-14.

Using logarithms

Assigned Work: pp. 180-183: 2, 4, 5, 8, 9, 13

Challenge: 12, 16, 17

Math 10 Chp 4.4

Note Title 2016-07-18

Irrational Numbers - first recall that a rational is a number is a fraction with integer numerators and denominators. So an irrational is when a number cannot be expressed as a fraction. Recall that fractions have repeating decimals.

eg) $\frac{1}{3} = .3333\ldots$

$\frac{1}{7} = .142857142857\ldots$

$\frac{1}{2} = .5000000\ldots$

$\sqrt{2} =$ 1.4142135623730950488016887242096980785696718753769480731766797379907 32. .

If $\sqrt{2}$ were rational, then we have $\sqrt{2} = \frac{p}{q}$

such that p, q are reduced.

So,

$$\left(\sqrt{2}\right)^2 = \left(\frac{p}{q}\right)^2$$

$$2 = \frac{p^2}{q^2}$$

$$2q^2 = p^2$$

p must be even because of $2q^2$

If p is even, then $p = 2r$

$$2q^2 = (2r)^2$$

$$2q^2 = 4r^2$$

$$q^2 = 2r^2$$

q must be even because of $2r^2$

But this contradicts our assertion that p, q are reduced, there $\sqrt{2}$ is not rational.

So anytime we have have a radicand that is not a perfect square, cube ... then it is irrational.

Is $\sqrt{.64}$ an irrational?

$\sqrt{.64} =$

$\sqrt[n]{x^m} = x^{m/n}$ Use this to convert between radical and rational exponent.

eg) Convert to power: $\sqrt[3]{4^5} =$

eg) Convert to a radical: $9^{2/3} =$

Mixed radicals - we factor out all perfect squares, cubes, ...
Entire radicals - we bring in all coefficient inside the radicand.

eg) Convert to mixed radical:

$\sqrt{45} =$

$\sqrt[3]{54} =$

$\sqrt{28} =$

eg) Convert to entire radical:

$4\sqrt{3} =$

$2\sqrt[3]{5} =$

$7\sqrt{3} =$

To order radicals, you will need to convert them all to entire radicals of the same index or decimals.

eg) $2\sqrt{4}$, $3\sqrt{2}$, $2\sqrt{7}$, $4\sqrt{3}$, $\sqrt{10}$

Assigned Work: pp. 192-195: 1-3, 6, 7, 9

Challenge: 12, 14, 15, 17