Basic Math: Fractions and Exponents

Tutorial Math Session for
Students in “Basic Electricity”
A Fairfield University E-Course
Powered by LearnLinc

Basic Math

- Text: "Basic Mathematics," Marvin Bittinger, Addison Wesley, 1999, Edition 8, ISBN 0-201-95958-5
- References:
  - "MathMax," Multimedia CD-ROM for the text

Chapter 2

Fractional Notation: Multiplication and Division

- 0BJECTIVES: This Session reviews fractions.
  - 2.1 Factors
  - 2.2 Divisibility
  - 2.3 Fractions
  - 2.4 Multiplication
  - 2.5 Simplifying
  - 2.6 Multiplication and Simplifying
  - 2.7 Division

Section 1 Schedule:

Session a – 03/04	Atoms, Charge and Current	Text 1.1 – 1.39
	Conductivity (G), Electric Fields and Electromotive Force (EMF)	Text 1.40 – 1.68
Math a – 3/06	**Fractions**	**Bittinger ch. 2**
Session b – 03/11	Resistance (R), Conductance (G), Ohms Law (Ω) & Power (Watts)	***Text 2.1 – 2.52***
Session c – 03/13	Working with Equations	Text 2.53 – 2.98
Session d – 03/18 (lab - 03/16, sat.)	Resistors in Series and Parallel	2.99 – 2.115
	Kirchoff, Thevenin, Norton	2.116 – 2.133
Session e – 03/20	Review: The Water Model	1.42, 1.63, 2.5, 2.129 Sokos

Factors

- Whole numbers can be written as the product of several “Prime” numbers
  - 21 = 3*7
  - 54 = 9*6 = 3*3*3*2 = $(3)^3$*2
- A prime number is only divisible by itself and one.
  - 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 31, 37, …

Divisibility

- Numbers are only“Divisible” by their factors
  - The answer must be an “Integer” or “Whole Number”
  - Prime numbers are not divisible

$$\frac{33}{3} = 11$$

Fractions

- Fractions break up Integers into smaller Pieces
- A fraction has two parts
  - Numerator: the number of pieces you have
  - Denominator: the size of each piece

$$\frac{3}{7}$$

  - 3 is the numerator (there are 3 pieces)
  - 7 is the denominator (each piece is 1/7 of the whole)

Multiplication

- Multiplying a fraction by a whole number
  - The new numerator is the product of the old numerator and the multiplicand
  - The denominator is unchanged

$$3 * \frac{2}{7} = \frac{3*2}{7} = \frac{6}{7}$$

- Multiplying two fractions
  - The new numerator is the product of the two numerators
  - The new denominator is the product of the two denominators

$$\frac{2}{5} * \frac{3}{7} = \frac{2*3}{5*7} = \frac{6}{35}$$

Simplifying Fractions

- First Factor the numerator and the denominator
- Find common factors
- Separate the common factors into their own fractions – they "cancel" becoming a multiplication by one

$$\frac{6}{21} = \frac{2*3}{3*7}$$

$$\frac{2*3}{3*7} = \frac{2}{7} * \frac{3}{3}$$

$$\frac{2}{7} * \frac{3}{3} = \frac{2}{7} * 1 = \frac{2}{7}$$

Reciprocals

- Just flip the fraction (interchange the numerator and denominator)
- A fraction times its reciprocal equals one

$$\frac{2}{7} = \frac{7}{2} = \frac{6}{2} + \frac{1}{2} = 3\frac{1}{2}$$

$$\frac{2}{7} * \frac{7}{2} = \frac{2}{2} * \frac{7}{7} = 1 * 1 = 1$$

Division

- Dividing two fractions is the same as multiplying the "Dividend" by the reciprocal of the "Divisor" (simplify common factors)

$$\frac{\left(\frac{2}{7}\right)}{\left(\frac{4}{5}\right)} = \frac{2}{7} * \frac{5}{4} = \frac{2*5}{7*4} = \frac{5}{7*2} = \frac{5}{14}$$

Solving Equations

- Test tube example (pp. 123-124)
  - How many test tubes can be filled to 0.6 milliliters (ml) from a container which contains 60 ml.

$$n * 0.6 = 60$$

$$n * \frac{3}{5} = 60$$

$$n * \frac{3}{5} * \frac{5}{3} = 60 * \frac{5}{3}$$

$$n = \frac{60*5}{3} = 20 * 5 = 100$$