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

- **OBJECTIVES**: This Session reviews fractions.
 - 2.1 Factors
 - 2.2 Divisibility
 - 2.3 Fractions
 - 2.4 Multiplication
 - 2.5 Simplifying
 - 2.6 Multiplication and Simplifying2.7 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

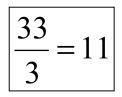
$$-54 = 9*6 = 3*3*3*2 = (3)^{3*2}$$

• 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

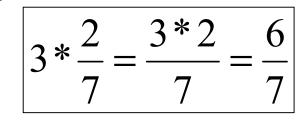
Fractions

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

3

Multiplication

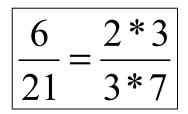
- Multiplying a fraction by a whole number
 - The new numerator is the product of the old numerator and the multiplicand
 - The denominator is unchanged
- Multiplying two fractions
 - The new numerator is the product of the two numerators
 - The new denominator is the product of the two denominators

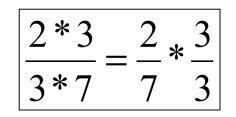


5*7 35

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





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

Reciprocals

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

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

$$\left|\frac{2}{7} * \frac{7}{2} = \frac{2}{2} * \frac{7}{7} = 1 * 1 = 1\right|$$

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

$$\begin{bmatrix}
 n * 0.6 = 60 \\
 n * \frac{3}{5} = 60
 \end{bmatrix}$$

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