Basic Math: Fractional Notation

Tutorial Math Session for
Students in “Basic Electricity”
A Fairfield University E-Course
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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 3
Fractional Notation: Mixed Numerals

- 0BJECTIVES: This session continues fractions.
  - 3.1 Least Common Multiples
  - 3.2 Addition
  - 3.3 Subtraction
  - 3.4 Mixed Numerals
  - 3.5 Addition and Subtraction with Mixed Numerals
  - 3.6 Multiplication and Division with Mixed Numerals
  - 3.7 Algebraic Order of Operations

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
(again)

- 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, …

Least Common Multiples

- LCM is the smallest number that has both numbers as a factor
  - Find the LCM of 9 and 12
    - 9 = 3*3, 12 = 3*4
    - 36 = 3*3*4 is the LCM
  - Find the LCM of 5, 6 and 14
    - 5=5, 6 = 2*3, 14 = 2*7
    - 210 = 5*2*3*7 is the LCM

Addition of Fractions

- You can only add “like” fractions
  - They MUST have the same denominator
- The “Least Common denominator” is the lowest LCM of the denominators of the fractions to be added

$$\frac{2}{7}+\frac{3}{5}=\frac{2*5}{35}+\frac{3*7}{35}=\frac{31}{35}$$

Subtraction of Fractions

- You can only subtract “like” fractions
  - They MUST have the same denominator
- Again the “Least Common denominator” is the lowest LCM of the denominators of the fractions to be subtracted

$$\frac{2}{3}-\frac{3}{7}=\frac{2*7}{21}-\frac{3*3}{21}=\frac{14-9}{21}=\frac{5}{21}$$

Mixed Numerals: Addition and Subtraction

- Mixed Numerals are the sum of an integer and a fraction

$$2\frac{3}{5} = 2 + \frac{3}{5} = \frac{10}{5} + \frac{3}{5} = \frac{13}{5}$$

- Add (subtract) the Integers, add the fractions then simplify

$$2\frac{3}{5} + 3\frac{1}{2} = 2 + 3 + \frac{3}{5} + \frac{1}{2} = 5 + \frac{6+5}{10} = 6\frac{1}{10}$$

Mixed Numerals: Multiplication

- First convert to LCD fractions, multiply then simplify

$$2\frac{1}{4} * 3\frac{2}{5} = \frac{9}{4} * \frac{17}{5} = \frac{153}{20} = 7\frac{13}{20}$$

Division

- Convert to LCD fractions, divide then simplify

$$\frac{\left(2\frac{1}{3}\right)}{\left(1\frac{3}{4}\right)} = \frac{\left(\frac{7}{3}\right)}{\left(\frac{7}{4}\right)} = \frac{7}{3} * \frac{4}{7} = \frac{4}{3} = 1\frac{1}{3}$$

Algebraic Order

- In mixed operations follow the algebraic order:
  - Multiply/divide
  - Add/subtract
- Alternately, use parenthesis to make things clear

$$\frac{2}{3} * 24 - 11\frac{1}{2} = 16 - 11\frac{1}{2} = 15\frac{2}{2} - 11\frac{1}{2} = 4\frac{1}{2}$$