Basic Math: Algebra

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
  - http://library.thinkquest.org/10030/algecon.htm

Basic Math	Thinkquest
1 & 2 & more	1
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11	3
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Chapter 11: Algebra

- 0BJECTIVES: This session is Algebra simplified

  11.1 Introduction

  11.2 Solving Equations: addition

  11.3 Solving Equations: multiplication

  11.4 addition and multiplication together

  11.5 Applied Problems

  *** Some Circuit Equations

  *** Polynomials (FOIL)

Algebraic Order Remember

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

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

Introduction to Algebra

- We use variables (named "place holders") in equations so that our work can be applied to several problems. We just replace the variables with numbers later to get a numerical answer.
- Example $X_L = 2*\pi*f*L$

  π is 3.14159, f is the frequency and
  L is the inductance
- We can solve for any of the placeholders and get a new equation: $f = X_L / 2*\pi* L$
  (I used the multiplication rule)

More Introduction

- Distributive Law
  a*(b + c) = ab + bc 5*(3+4) = 35 = 5*3+5*4
- Associative Law
  a*(b*c) = (a*b)*c 5*(3*4) = 60 = (5*3)*4
- Commutative Law
  a*b = b*a
- Factoring
  ab + ac = a*(b + c) opposite of distribution

Simplifying Expressions

- "Collect" similar terms factor and reduce
  These are all equivalent expressions
  $23 + 5*t + 7*y - t - y - 27$
  $(23 - 27) + (5 - 1)*t + (7 - 1)*y$
  $-4 + 4*t + 6*y$
  $4*(t - 1) + 6*y$

FOIL

- Polynomial
  $a*x + b$ first order
  $a*x^2 + b*x + c$ second order (quadratic)
- $(a + b)*(c + d)$
  $a*(c + d) + b*(c + d)$
  $a*c + a*d + b*c + b*d$
- Foil (a shortcut)
  First – a*c; outer – a*d; inner – b*c; last – b*d

The Addition Principle

- You can add (or subtract) the same number (expression) to both sides of an equation and it is still true.
  a = b adding c to both sides
  a + c = b + c is still true
- Example
  r + 1/3 = 8/3 subtract 1/3 from both sides
  r + 1/3 – 1/3 = 8/3 – 1/3 or
  r = 7/3 = 2.33333

The Multiplication Principle

- You can multiply (or divide, but not by zero) both sides of an equation by the same number (expression) and the equation is still true.
  a = b multiplying both sides by c
  a * c = b * c is still true
- Example
  -15x = 105 divide both sides by (–15)
  x = -105/15
  x = -7

Combinations

$-7x - 24 = -129$ add 24 to both sides

$-7x = -129 + 24$

$-7x = -105$ divide both sides by (-7)

$x = -105/(-7)$

$x = 15$

Word Problems

Add	**Subtract**	**Multiply**	**Divide**
add	subtract	multiply	divide
sum	difference	product	quotient
plus	minus	times	divided by
more than	Less than	of	ratio
Increased by	Decreased by		
	Take from		

Steps

1. Get to know the problem (think)
2. Translate the words to an equation
3. Solve the equation
4. Check your answer – is it reasonable?
5. State the answer clearly – include units

An MT2 Example

- Find the resonant frequency: the resonant frequency is that frequency for which the inductive reactance equals the capacitive reactance and they cancel.

$X_L = 2*\pi*f*L = X_C = 1/(2*\pi*f*C)$

Multiply both sides by f and

divide both sides by $(2*\pi*L)$

$f^2 = 1/(2*\pi)^2*L*C)$ now take the square root and

$f = 1/ [\ 2*\pi*(L*C)^{½}\ ]$

Interim Schedule:

MT2 QA	– 08/26	MT2 Review continues	
Math Review	**– 08/28**	**Algebra**	**Math Chapter 11**
No Class	– 09/02	Vacation	
	– 09/04	MT2 AM & PM	
	– 09/06	MT2 PM	
	– 09/09	MT2 results session	
	– 09/11	Section 5 Begins "Electronics"	Start reading Electronics text

Web Tutorials

http://library.thinkquest.org/10030/algecon.htm	Algebra
http://www.play-hookey.com/semiconductors/	Electronics