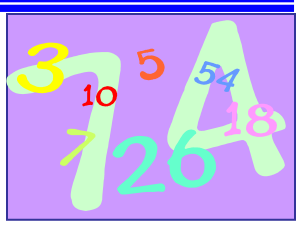
Algebra Connections

Mr. Breitsprecher's Edition May 26, 2005 FREE!

Let's Get Started: The Basics



Factor. Write as a product (multiplication). Some common factors of 12 are: 1, 2, 3, 4, 6, and 12. These numbers, in different combinations, can be multiplied to equal 12.

Prime Factorization. When a number is written as a factor of prime numbers. For example, 60 can be factored as: 60 = 6*10. Neither 6 or 10 are prime numbers – but we can factor them into prime numbers. The prime factorization of 60 = 2*3*2*5.

Least Common Multiple. The LCM of a list of numbers is the smallest number that is a multiple of all numbers in the list. To find the LCM of a list of numbers:

1. Write the prime factorization of each number.
2. Write the product containing each different prime factor (from Step 1) the greatest number of times that it appears in any one factorization. This product is the LCM.

Example: Find the LCM of 12 and 40.

1. 12 = 2*2*3 and 40 = 2*2*2*5
2. LCM = 2*2*2*3*5

Fractions

Equivalent Fractions. Fractions that represent the same quantity.

Fundamental Principle of Fractions. If a, b, and c are real numbers, then: a/b = (a*c)/(b*c) or (a*c)/(b*c) = a/b. (note: as long as b and c are not 0)

Simplifying Fractions. A fraction is simplified when the numerator and the denominator have no factors in common other than 1. For example, 26/34 is not simplified as the numerator and denominator have a common factor of 2. We can rewrite, or simplify, 26/34 as 13/17. To simplify a fraction, factor the numerator and the denominator; then apply the fundamental principle of fractions. For example 6/14 = (2*3)/(2*7) = 3/7.

Reciprocal. Two fractions are reciprocals if their product is 1. The reciprocal of a/b is b/a, as long as a and b are not 0. The reciprocal of 6/25 is 25/6.

Multiplying Fractions. The numerator times the numerator equals the numerator of the product. The denominator times the denominator equals the denominator of the product. For example, (2/5)*(3/7) = 6/35

Dividing Fractions. Multiply the first fraction by the reciprocal of the second fraction. For example, (5/9) ÷ (2/7) = (5/9)*(7/2) = 35/18.

Add Fractions With The Same Denominator. Add the numerators and place the sum over the common denominator. For example, (5/11)+(3/11) = 8/11.

Subtract Fractions With The Same Denominator. Subtract the numerators and place the difference over the common denominator. For example, (13/15)-(3/15) = 10/15 = 2/3.

Add Or Subtract Fractions With Different Denominators. First write each fraction as an equivalent fraction with the LCD as denominator. For example, (2/9)+(3/6) = [(2*2)/(9*2)]+[(3*3)/(6*3)] = (4+9)/18 = 13/18.

Decimals and Percents

Decimals as Fractions. Use place values. For example, 0.12 = 12/100.

Add Or Subtract Decimals:

1. Write the decimals so that the decimal points line up vertically.
2. Add or subtract as for whole numbers.
3. Place the decimal point in the sum or difference so that it lines up vertically with the decimal points in the problem.

Adopted From Introductory Algebra, K. Elayn Martin-Gay

Examples: 2.8-1.04 and 25+0.02

2.8	25
-1.04	+0.02
1.76	25.02

Multiply Decimals:

1. Multiply the decimals as though they are whole numbers.
2. The decimal point in the product is placed so that the number of decimal places in the product is equal to the sum of the number of decimal places in the factors.

Example: 1.48*5.9

1.48	(2 decimal places)
5.9	(1 decimal place)
1332	
740	
8.732	(3 decimal places)

Divide Decimals:

1. Move the decimal point in the divisor to the right until the divisor is a whole number.
2. Move the decimal point in the dividend to the right the same number of places as the decimal point was moved in Step 1.
3. Divide. The decimal point in the quotient is directly over the moved decimal point in the dividend.

Example: 1.118 ÷ 2.6

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   0.43
26)11.18
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Write Fractions Ad Decimals. Divide the numerator by the denominator.

Example: Write 3/8 as a decimal.

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  0.375
8) 3.000
  -2.4
    60
   -56
    40
   -40
     0
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Write A Percent As A Decimal. Drop the % symbol and move the decimal point two places to the left. For example, 25% = 0.25

Write A Decimal As A Percent. Move the decimal point two places to the right and attach the % symbol. For example, 0.7 = 0.70 = 70%

Sets of Numbers. A set is a collection of objects, called elements, enclosed in braces. For example, [a, b, c}

Natural Numbers. {1, 2, 3, 4…}

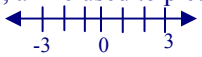
Whole Numbers. {0, 1, 2, 3, 4…}

Integers {…-3, -2, -1, 0, 1, 2, 3…}

Rational Numbers. Real numbers that can be expressed as a quotient of integers. For example, -3.4, 0, 2/3, 5, -4)

Irrational Numbers. Real numbers that cannot be expressed as a quotient of integers. For example, the square root of 3 or *Π*

Real Numbers. All numbers that correspond to a point number line, a line used to picture numbers.

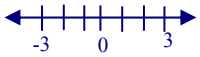


Absolute Value. Denoted as | a |, is the distance between a and 0 on the number line. It is always a positive value.

Symbols

=	is equal to
≠	is not equal to
>	is greater than
<	is less than
≥	is less than or equal to
≤	is greater than or equal to

Order Property for Real Numbers. For any 2 real numbers a and b, a is less than b if a is to the left of b on the number line.



-3<0, 0>-3, 0<3, 3>0

Exponential Expressions. The expression a^n is an exponential expression. The number a is called the base. It is the repeated factor. The number n is called the exponent. It is the number of times that the base is a factor. For example, 4^3 = 4*4*4 = 64

Order of Operations. Simplify expressions in the following order. If group symbols are present, simplify expressions within those first, starting with the innermost set. Also, simplify the numerator and the denominator of a fraction separately.

1. Simplify exponential expressions.
2. Multiply or divide in order from left to right
3. Add or subtract in order from left to right.

Variable. A symbol used to represent a number.

Evaluate an Algebraic Expression. Substitute a given number for the variable and then simplify.

Equation. A mathematical statement that two expressions are equal.

Solution of an Equation. The value of the variable that makes the equation a true statement.

Add 2 Numbers with the Same Sign:

1. Add their absolute values
2. Use their common sign as the sign of the sum

Examples: 10+7=17 and -3+(-11)

Add 2 Numbers with Different Signs:

1. Subtract their absolute values
2. Use the sign of the number whose absolute value is larger as the sign of the sum

Examples: -25 + 5 = -20 and 14 + (-9) = 5

Opposites or Additive Inverses. Two numbers that are the same distance from 0 but lie on opposite sides of 0. The opposite of a is -a. For example, the opposite of -7 is

Subtract Two Numbers. Add the first number to the opposite of the second number. For example, a-b = a+(-b)

Multiplying Real Numbers. The product of two numbers with the same sign is a positive number. The product of two numbers with different signs is a negative number.

Products Involving Zero. The product of 0 and any number is 0

Quotient of Two Real Numbers. a/b = a*(1/b)

Dividing Real Numbers. The quotient of two numbers with the same sign is a positive number. The quotient of two numbers with different signs is a negative number

Commutative Properties:

Addition: a+b=b+a

Multiplication: (a*b)*c=a*(b*c)

Associative Properties:

Addition: (a+b)+c=a+(b+c)

Multiplication: (a*b)*c=a*(b*c)

Multiplicative Inverses or Reciprocals. Two numbers whose product is 1. The reciprocal of a nonzero number a is 1/a because a* 1/a=1

Distributive Property. a(b+c)=a*b+a*c

Identities

a+0=a

0+a=a

a*1=a

1*a=a

Inverses:

Additive or opposite: a+(-a)=0

Multiplicative or reciprocal: b*(1/b)=1

Reading Graphs. To find the value on the vertical axis representing a location on a graph, move horizontally from the location on the graph until the vertical axis is reached. To find the value on the horizontal axis representing a location on a graph, move vertically from the location on the graph until the horizontal axis is reached.

Studying Math is Different from Studying Other Subjects

Math is learned by doing problems. Do the homework. The problems help you learn the formulas and techniques you do need to know, as well as improve your problem-solving prowess.

A word of warning: Each class builds on the previous ones, all semester long. You must keep up with the Instructor: attend class, read the text and do homework every day. Falling a day behind puts you at a disadvantage. Falling a week behind puts you in deep trouble.

A word of encouragement: Each class builds on the previous ones, all semester long. You're always reviewing previous material as you do new material. Many of the ideas hang together. Identifying and learning the key concepts means you don't have to memorize as much.

Math is a skill. To develop that skill you must practice. Do your homework in a quiet place, similar to the classroom if possible. Do not spend "hours" on one problem. If you cannot solve a problem, look for a similar problem in your notes or your text. If you still cannot solve the problem, skip it and work on other problems. Try the problem later. Many times you will come up with an idea after you have done something else for a while. If you still cannot solve the problem, get some help.

Math Study Skills
Active Study vs. Passive Study

Be actively involved in managing the learning process, the mathematics and your study time:

- Take responsibility for studying, recognizing what you do and don't know, and knowing how to get your Instructor to help you with what you don't know.
- Attend class every day and take complete notes. Instructors formulate test questions based on material and examples covered in class as well as on those in the text.
- Be an active participant in the classroom. Get ahead in the book; try to work some of the problems before they are covered in class. Anticipate what the Instructor's next step will be.
- Ask questions in class! There are usually other students wanting to know the answers to the same questions you have.
- Go to office hours and ask questions. The Instructor will be pleased to see that you are interested, and you will be actively helping yourself.
- Keep a glossary of math terms as they are presented in class. Math is a language, getting involved by maintaining a list of terms will keep you involved and learning.
- Show ALL work, do not skip steps, even on homework.

Good study habits throughout the semester make it easier to study for tests.