Mat 011 Agenda  Day 3:  1/27/03

- Attendance
- Questions
- Review Rules of Addition and Multiplication of Signed Numbers
- English to Algebra
- Jigsaw
- Team Rules
- Manipulatives
- Introduction to Variables
- PowerPoint Lecture 3

Homework:  Topics 3, 4, 5 pages S7-S11, S29
$+2 + 7 = 9$
$+2 - 7 = -5$
$-2 + 7 = 5$
$-2 - 7 = -9$

$(2)(7) = 14$
$(2)(-7) = -14$
$(-2)(7) = -14$
$(-2)(-7) = 14$
\[ 5 - (-2) \]
\[ 5 + (+2) = 7 \]
\[ 5 - (+2) \]
\[ 5 + (-2) = 3 \]
Homework: Topics 3, 4, 5; pages S7-S11, S29

Mat 011 Web page:
http://www.mc3.edu/crsprog/career/MATHSCI/mat011imat011.htm

BlackBoard: http://blackboard.mc3.edu
Your username is: <<first letter first name: full last name: last 4 digits of Datatel ID>>
Password is: <<Datatel ID>>
For Example:
Student Name: John Smith Datatel ID: 1234567
ID: jsmith4567
Password: 1234567
Explantion of Subtraction Vs. Opposite Of:

On the inexpensive calculators of yesteryear, there were 4 function keys: addition, subtraction, multiplication, division (+ - × ÷). These are BINARY keys because they need TWO numbers to operate on.

If you push 6 and + key, nothing will happen because the calculator is waiting for the 2nd number to subtract (binary operation).

There was also a Plus/Minus key (±). This is a unary key, it only needs one number to operate on.

If you push 6 then the ± key, the number will become negative -6, that is, -6.
Addition and Multiplication of Signed Numbers

Motivation: There are only two primary operations, Multiplication and Addition. Division is multiplying by the inverse of the divisor; subtraction is adding the opposite of subtrahend. Hence, we need to learn only the rules for Multiplication and Addition of signed numbers.

Addition of Signed Numbers tells us to look at the numbers and:

1. Decide whether the numbers have the same signs or unlike signs.
2. Like signs:
   a. Ignore the signs
   b. Add the two numbers together
   c. Take the common sign as the sign of the answer
   d. \(+2 + 5 = +7\)
   e. \(-2 - 5 = -7\)
3. Unlike signs:
   a. Ignore the signs
   b. Find the difference between the two numbers, how far apart are they?
   c. Determine which number without its sign is bigger
   d. Go back to the original problem determine what sign it originally had, make that the sign of the answer.
   e. +2 -5 = -3
   f. -2 +5 = +3
Multiplication of Signed Numbers:
1. Decide whether the numbers have the same signs or unlike signs.
   - Like signs: Positive \((-)(-)=\cdot\); \((+)(+)=\cdot\)
   - Unlike signs: Negative \((-)(+)=\cdot\); \((+)(-)=\cdot\)

Informal Reasoning for two negatives:
False = Not True
not False = not (not True) = True

Paying back a debt of 6 dollars means the person now has the 6 dollars.
\(-(-6)=\cdot\cdot\cdot6\)
English into Algebra

Some say that Algebra is a language because one must translate from words into symbols.
The following Table shows some common English phrases and the corresponding algebraic or arithmetic expressions.
<table>
<thead>
<tr>
<th>Phrase</th>
<th>Example</th>
<th>Algebraic Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sum of</td>
<td>The sum of 3 and 2</td>
<td>$3 + 2$</td>
</tr>
<tr>
<td>Added to</td>
<td>3 added to 2</td>
<td>$2 + 3$</td>
</tr>
<tr>
<td>More than</td>
<td>3 more than 2</td>
<td>$2 + 3$</td>
</tr>
<tr>
<td>Phrase</td>
<td>Example</td>
<td>Algebraic Expression</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Difference of</td>
<td>Difference of 3 and 7</td>
<td>$3 - 7$</td>
</tr>
<tr>
<td>Subtracted from</td>
<td>7 subtracted from 3</td>
<td>$3 - 7$</td>
</tr>
<tr>
<td>Less than</td>
<td>7 less than 3</td>
<td>$3 - 7$</td>
</tr>
<tr>
<td>Phrase</td>
<td>Example</td>
<td>Algebraic Expression</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>Product of</td>
<td>Product of 3 and 2</td>
<td>((3)(2)) 3 \cdot 2</td>
</tr>
<tr>
<td>Multiplied by</td>
<td>3 multiplied by 2</td>
<td>((3)(2))</td>
</tr>
<tr>
<td>Times the quantity</td>
<td>3 times the quantity of 7 plus 2</td>
<td>(3(7+2))</td>
</tr>
</tbody>
</table>
Jigsaw - Find your match

1. Learn the Name of partner
2. Something you have in common
3. Something you do not have in common
<table>
<thead>
<tr>
<th>Equation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5 + 3 =</td>
<td>-2</td>
</tr>
<tr>
<td>-5 - 3 =</td>
<td>-8</td>
</tr>
<tr>
<td>+5 - 3 =</td>
<td>2</td>
</tr>
<tr>
<td>5 + 3 =</td>
<td>8</td>
</tr>
<tr>
<td>-12 + 2 =</td>
<td>-10</td>
</tr>
</tbody>
</table>
\[-12 - 2 = -14\]

\[12 - 2 = 10\]

\[12 + 2 = 14\]

\[(-3) \times (2) = -6\]

\[(-2) \times (-3) = 6\]
-6 + 4 = -2
-6 - 2 = -8
6 - 4 = 2
6 + 2 = 8
-6 - 4 = -10
<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-16 + 2$</td>
<td>$-14$</td>
</tr>
<tr>
<td>$6 + 4$</td>
<td>$10$</td>
</tr>
<tr>
<td>$16 - 2$</td>
<td>$14$</td>
</tr>
<tr>
<td>$(-12) / (+2)$</td>
<td>$-6$</td>
</tr>
<tr>
<td>$(-12) / (-2)$</td>
<td>$6$</td>
</tr>
</tbody>
</table>
Ground Rules for Teams

1. Stay focused on the team task.

2. Work cooperatively with other team members.

3. Reach a team decision for each problem.
4. Make sure each person on the team understands the solution before the team moves on.

5. Listen carefully to others and try to build upon their ideas.

6. Share the leadership of the team.
7. Make sure everyone participates and no one dominates.

8. Take turns recording team results.
Vocabulary

Variable:
Variable:

A letter that is used to represent a quantity or a number

Examples: x, y, z, a, b, c
The manager of an Ice Cream Shop pays $800 per month for fixed expenses such as rent, light, and wages. Ice cream cones are sold for $1.85 each, of which $1.40 goes for ice cream, cone and napkin.

Let $P =$ profit

$\chi =$ # cones

$P = 1.85 - 1.40 = \frac{.45}{.45}$

$P = .45 \chi - 800$
Calculate the monthly profits, when they have sold the following number of ice cream cones per month?

<table>
<thead>
<tr>
<th>Cones</th>
<th>Calculations</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>.45(10000)-800</td>
<td>$3,700</td>
</tr>
<tr>
<td>15,000</td>
<td>.45(15000)-800</td>
<td>$5,950</td>
</tr>
<tr>
<td>20,000</td>
<td>.45(20000)-800</td>
<td>$8,200</td>
</tr>
<tr>
<td>c</td>
<td>.45c - 800</td>
<td></td>
</tr>
</tbody>
</table>

\[ P = .45c - 800 \]
Let $p =$ amount of profit
Let $c =$ number of cones
X added to X visually is 2X
Manipulatives

X added to X visually is 2X
X added to X visually is 2X
X added to Y is X + Y

X + Y can not be combined

\[ X + Y \]
$X$ times $X$ is $X^2$

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$X$</td>
<td>$X$</td>
<td>$X$</td>
<td>$X$</td>
</tr>
</tbody>
</table>

$X + X$

$X \cdot X$
\[2x + 3x + 3y + ax^2 + y^2 \]

\[5x + 3y + ax^2 + y^2 \]
X times X is $X^2$
$X \times X$ is $X^2$.

Note that the shape is a square – the name fits the object.
$X \times X \text{ is } X^2$

Note that the shape is a square – the name fits the object.
Algebraic Expression: Collection of numbers, variables, operation symbols and grouping symbols.

Algebraic Equation: Mathematical statement that 2 expressions have equal value. An equation is easy to spot because it has an equal symbol.

\[ 2x + 3y = 7y + 3 \]
Algebraic Expression: \( axy + bz \)

Algebraic Equation: \( axy + bz = 24 \)
Variable:

Terms:
Vocabulary

Variable: A letter that is used to represent a quantity or a number

Terms: Parts of an algebraic expression connected by + or - signs

\[2 \times y - 3 \times 2 + 4\]

factor 2
Like Terms: Terms where the variables and their exponents are the same

Factors: Parts of an algebraic expression that are multiplied
Terms

The terms in the equation $2xy + 3z = w$ are:

$2xy$  $3z$  $w$
Factors

Factors in the term $2xy$ are:

$2 \quad x \quad y$

Factors in the term $3z$ are:

$3 \quad z$
Combine Like Terms:

\[ 3x + 7 + 2x + 5 \]

\[ 5x + 12 \]
Distributive Property:

\[ 2(3x + 5) \]

\[ 6x + 10 \]
Distributive Property

2 \((3 + 4)\) = 2 \cdot 3 + 2 \cdot 4

2 \((7)\) = 6 + 8

14 = 14
\[ \alpha(3\chi + 4) \]

\[ 6\chi + 8 \]
Equation for Profit for Ice Cream Cones

Let \( c = \# \) of cones

Let \( P = \) amount of profit
Equation for Profit for Ice Cream Cones

Suppose the expenses increase to $875 a month and they charge $2.10 a cone ($1.40 still goes for ice cream, cone and napkin). What will be the new equation for their monthly profits?

\[ P = 0.70c - 875 \]
Wrecker charges $21.95 per day plus .41 a mile.

Complete the table.

<table>
<thead>
<tr>
<th>MILES</th>
<th>CALCULATION</th>
<th>COST ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Equation for Rental Car

A rental car company charges $21.95 per day plus 41 cents a mile.
Another rental company, Limo, charges a flat rate of $39.95 a day with unlimited miles. How many miles would you have to drive to make Limo cost the same as Wrecker?
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<table>
<thead>
<tr>
<th>MILES</th>
<th>CALCULATION</th>
<th>Wrecker COST ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>.41 ( 10 ) + 21.95</td>
<td>26.05</td>
</tr>
<tr>
<td>20</td>
<td>.41 ( 20 ) + 21.95</td>
<td>30.15</td>
</tr>
<tr>
<td>30</td>
<td>.41 ( 30 ) + 21.95</td>
<td>34.25</td>
</tr>
<tr>
<td>40</td>
<td>.41 ( 40 ) + 21.95</td>
<td>38.35</td>
</tr>
<tr>
<td>44</td>
<td>.41 ( 44 ) + 21.95</td>
<td>39.99</td>
</tr>
<tr>
<td>m</td>
<td>.41 ( m ) + 21.95</td>
<td>C</td>
</tr>
</tbody>
</table>
Equation for Rental Car

A third company, Ertz, charges $18.95 a day and .50 a mile. What is the formula that calculates the cost of renting a car from Ertz for a day?
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To solve this problem algebraically, set the cost of Ertz equal to the cost of Wrecker.