EDUC501 OP13 G62 SM11 CTA Mathematics

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Lesson Plan 1– Expressions – Day 1

­TITLE: **Translating Verbal Expressions into Algebraic Expressions**

CONTEXT OF LESSON/PRE-REQUISITE KNOWLEDGE:

* The pacing of this lesson is geared toward the lesson being taught in a Full-Year Collaborative Algebra I class (in a 90 minutes class period) that includes students classified as ESL and/or Special Education.
* Students should be able read and comprehend basic math vocabulary, take notes, and listen attentively during direct instruction (20-30 minutes). Additionally, students should be able to work in small learning groups and remain on task with minimal redirection for up to 20 minutes.
* This lesson should be presented early in the course and concepts/vocabulary should be reviewed frequently throughout the school year.

LEARNING OBJECTIVES and ASSESSMENT:

* Students will be able to translate verbal phrases into algebraic expressions and algebraic expressions into verbal phrases.
* Students will be able to write, read, and evaluate algebraic expressions in which letters stand for numbers.

RELATED 2009 VIRGINIA STANDARDS OF LEARNING:

* **SOL A.1**: *The student will represent verbal quantitative situations algebraically and evaluate these expressions for given replacement values of the variables.*

MATERIALS NEEDED:

* Computer for Powerpoint slideshow & data projector
* Blank Unit Organizer *[Attached file: unitorganizer.pdf & unitorganizer1.pdf]*
* Sample Expression Unit Organizer *[Attached file: expressionunitorganizer.pdf & expressionunitorganizer1.pdf]*
* *“*Lesson 1-1 Transparency” *[Attached file: 1-1variablesandexpressions.pdf]*
* “Algebra I Recipe: Translating Verbal Phrases into Algebraic Expressions or Translating English into Math” *[Attached file: algebraIrecipe1.doc]*
* “Expression Worksheet 1-3” *[Attached file: expressions1-3.doc]*
* “Additional Practice Expressions 1-5” ” *[Attached file: expressions1-5practice.doc]*
* Blank Bingo Card *[Attached file: expressionbingo.doc]*
* *“*Plastic or candy markers
* Candy prizes (optional)
* “Algebraic Expressions Practice 6-1 ” Houghton Mifflin p. 61PA *[Attached file: 6.1practice.pdf]*
* “Translating Words into Mathematical Symbols 1.5 Exercises p. 33-34”  *[attached file: 1-5exercise.pdf & 1-5exercise-1.pdf]*
* Identifying Verbal Phrases and Operations of Algebraic Expressions” *[Attached file: verbalphrases.doc].*

Warm-up/Engagement Activity: (5 - 10 minutes):

* Play a couple rounds of the game “What is my Rule?” that starts students thinking about operations of numbers. Encourage students to use mathematic terms or words to express solutions and select a student to write the expression on the board. Seek out several possible answers/solutions.

*Samples:* 8 24: *(Rule is: x plus 16 or x+16; 2x+x or twice x plus x)*

6 57: *(Rule is: ten times x minus three or 10x – 3; x squared plus 27 or x^2 + 21)*

Implementation: (30-40 minutes)

* Introduction:
  + Discuss the purpose of learning how to translate words into mathematical symbols. *(Answer: is to assist you in solving words problems and real world problems.)*
* Provide examples of phrases that are translated into variable expressions:
  + Ten more than the number: 10 + x or x + 10
  + Five times last year’s income: 5x
  + The number of books decreased by 20: x – 20
* Review key vocabulary words and show examples of the use of these words in word problems:
  + Example: *Seventeen students more than last year’s number*
  + Example: *Twenty miles less than the old route*
  + Example: *Five hundred dollars divided by the number of men working*
  + Example: *Twenty minus the number of days*
  + Example: *Four more than twice the number of machines available*
* Demonstrate how to translate verbal expressions to algebraic expressions. Discuss the linkage between some of the vocabulary words and their definition: quotient: quantity. Quotient comes from a word meaning “how many times.” When you divide you are finding how many times one quantity goes into another. Have students find correlations between other words. *example:*  triple:triangle (three sides); twice:twin (two people); decrease:deflate (go down)
  + Addition Phrases: (+)
    - Key Words: **sum, plus, increased by, more than, added to and total**
    - *Example*: sum: The sum of 3 and a number: (3 + x)
    - *Example*: more than: 15 more than a number (15 + x)
  + Subtraction Phrases: (-)
    - Key Words: **difference, decreased by, less than, minus**
    - *Example*: difference: The difference between a number and 4. (x – 4)
    - *Example*: decreased by: A number decreased b y 7. (x – 7)
    - *Example*: less than: 4 less than a number. (x – 4)
  + Multiplication and Division Phrases:
    - Key Words: **product, times, multiplied by, of a number, quotient, divided by**
    - *Example*: The product of 9 and a number. (9n)
    - *Example*: The quotient of a number and 6. (n / 6)
    - *Example*: 10 times a number. (10n)
    - *Example*: 7 divided by a number ( 7 / n)
  + Exponential Phrases:
    - Key Words: **squared, cubed, to the \_\_ power**
    - *Example*: A number squared (y^2)
    - *Example*: A number to the third power (x^3)

Review/Assessment Activities

* Review Activity 1: Use the attached handouts as a group review activity: “Lesson 1-1 Transparency” or “Algebra I Recipe: Translating Verbal Phrases into Algebraic Expressions or Translating English into Math”. *[Attached file: 1-1 variablesandexpressions.pdf], algebraIrecipe1.doc]*
* Review Activity 2: Create together an Unit Organizer & Expanded Map, to review vocabulary and to connect or show correlation of this lesson to the unit *[Attached file: unitorganizer.pdf, unitorganizer1.pdf, expressionunitorganizer.pdf & expressionunitorganizer1.pdf]*
* Practice Activity 3: “Expression Worksheet 1-3” - (15-20 minutes) *[Attached file: expressions1.3.doc]*
* Using a deck of cards or trial grouping, form collaborative teams (4-5) and partners with 4 students per team (“Think/Pair/Square/Share” – J. Strebe’s strategy). Take in consideration students with special needs. Random selection may not be the best arrangement with multi-level learners.
* Partners are to Complete “Expression Worksheet 1-3” and then collaborate with other team members to compare answers. Differentiate instruction having a more challenging worksheet available to substitute, depending on your grouping and your students’ needs. ” *[Attached file: expressions1-5practice.doc]*
  + After the team members have compared answers, the team leader will hand in one completed worksheet to the teacher and teacher will record the completion time.
  + When all teams have completed the task, teams will exchange papers and check answers.
  + Scoring will be assigned as follows: extra 4 points for being the first team completed and one point for all the correct answers; extra 3 points for being the second team completed; extra 2 points for being the third team completed; and 1 point for being the fourth team completed.
  + Team points are posted and recognition is given to highest scorer.

Reinforcement/Wrap-up/Assessment Activities: (20-30 minutes)

* Activity 4: “Translating Verbal to Algebraic Expressions Bingo” *[Attached file: expressionbingo.doc]*
  + Distribute blank bingo worksheet.
  + Display bingo card answers on overhead or projector. Tell students to randomly place their answers on the blank bingo worksheet. It may be helpful to show each answer one by one, possibly by creating a Powerpoint presentation to avoid students putting the answers in similar order.
  + Provide clear plastic chip or candy markers.
  + Display and read aloud written expressions, one at a time, on the overhead or via a data projector (suggestion: make a PowerPoint slide show).
  + Play a couple rounds to allow a couple winners. Winners can choose candy or points for their team.

Other Resources:

* Video Game: “Verbal and Algebraic Expressions”: Translate verbal expressions into algebraic expressions and vice versa. <http://www.quia.com/cb/25018.html>

## Video Game: “Algebraic Expressions Millionaire” : http://www.math-play.com/Algebraic-Expressions-Millionaire/algebraic-expressions-millionaire.html

ASSESSMENT:

* Activity 5 – Assessment:
  + Each student will write a verbal expression (using key vocabulary words) and it’s algebraic expression on an index card that can be used for the next day’s warm-up.
* Activity 6 – Assessment: “Graphic Organizer “Identifying Verbral Phrases & Operations”
  + Students should be able to complete the worksheet/graphic organizer: “Identifying Verbal Phrases and Operations of Algebraic Expressions” *[Attached file: verbalphrases.doc],* independently or by using notes.
* Activity 7 – Alternative Assessment: “Algebraic Expressions Practice 6-1 ” Houghton Mifflin p. 61PA *[Attached file: 6.1practice.pdf]*

MEETING THE NEEDS OF ALL STUDENTS:

* The pacing of each activity should be considered based on your learners. Students with limited English language proficiency and those with learning disabilities will require additional instruction that incorporate multi-sensory approaches, including additional verbal and written modeling. Partner and group activities will provide re-teaching opportunities for students who need remediation.

WHAT COULD GO WRONG WITH THIS LESSON **AND** WHAT WILL YOU DO ABOUT IT?

* This lesson is long and covers a lot of different concepts. This lesson may require more than one day to complete, especially if several students are absent or if students’ behaviors interfere with the pacing of the lesson. Informal assessment strategies such as varied level questioning will need to be used to keep the advanced students engaged, while meeting the needs of the struggling learners. This concept (Algebraic Expressions) may seem easy to some because they mastered the concept in previous grade levels, while this may be new material to others. I would teach this lesson in a full-year collaborative Algebra I class over at least two days. I would differentiate my instruction by dividing the class into teacher-designed groups and providing leveled worksheets, I would attempt to incorporate interactive instruction, such as additional technology led activities (as suggested in the lesson plan) to get students actively involved in the learning process. I would plan to include additional practice (possibly in warm-up activities) throughout the semester to keep students prepared for the end of the semester (SOL) test. I would increase the complexity and length of the word problem as we advanced through the curriculum.

CONNECTION TO CTA:

* In this lesson I have incorporated many of John Strebe’s approaches to engage students in cooperative learning activities. I also took in consideration J. Patrick Lintner’s Open-Ended Mathematical Tasks discussion to develop open-ended questions to nurture critical thinking skills.

*Resource:* G Redden, [AlgebraLAB](http://www.algebralab.org/) [Project Manager](mailto:chcolwel@volusia.k12.fl.us?subject=AlgebraLAB%20question), Copyright © 2003-2011, [Mainland High School](http://www.mainlandhighschool.org/)  
<http://www.algebralab.org/studyaids/studyaid.aspx?file=Algebra1_1-6.xml>

**Algebra I Recipe: Translating Verbal Phrases into Algebraic Expressions or Translating English into Math**

**A. Words that indicate multiplication:**

1. [product](javascript:def('/Glossary/glossaryterm.aspx?word=Product',%20500,%20500);)  
2. times  
3. multiplied by  
4. of  
5. Twice

*Examples:*

* The [product](javascript:def('/Glossary/glossaryterm.aspx?word=Product',%20500,%20500);) of 9 and a number
* 10 times a number
* A number multiplied by 3
* One fourth of a number
* Twice a number

**B. Words that indicate division:**

1. quotient  
2. divided by

*Examples:*

* The quotient of a number and 6
* 7 divided by a number

**C. Words that indicate addition:**

1. sum  
2. more than  
3. plus  
4. increased by

*Examples:*

* The sum of 6 and a number
* 8 more than a number
* A number plus 5
* A number increased by 7

**D. Words that indicate subtraction:**

1. difference  
2. less than  
3. minus  
4. decreased by

*Example*

* The difference between 5 and a number
* 4 less than a number
* 7 minus a number
* A number decreased by 9

**E. Translating sentences into an** [**equation**](javascript:def('/Glossary/glossaryterm.aspx?word=Equation',%20500,%20500);) **or inequality.**

*Example:*

* The sum of a number and 12 is 16.
* The quotient of 15 and a number x is less than 3.
* The [product](javascript:def('/Glossary/glossaryterm.aspx?word=Product',%20500,%20500);) of 5 and a number x is 25.
* 10 times a number x is greater than or equal to 50.

Bingo: *Translating Verbal to Algebraic Expressions*

Answers to Bingo Cards:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2y2** | **y / 3** | **6y** | **3 + y** | **-6y** |
| **y2 + 4** | **2y + 5** | **y / 4** | **3y** | **y + 2** |
| **y – 3** | **y – 5** | **2y + 2** | **y / -3** | **2y -4** |
| **2y + 4** | **y3** | **4y – 3** | **FREE** | **-y - 3** |
| **y2** | **2y** | **2y + 3** | **3y + 2** | **6 - y** |

Expressions:

|  |  |
| --- | --- |
| 2 times y squared | the difference of –y and 3 |
| twice y | the product of 6 and y |
| y cubed | 3 more than 2 times y |
| 3 less than 4 times y | the sum of 3 and y |
| y squared plus 4 | 3 less than y |
| 2 times y increased by 5 | 4 more than twice y |
| the quotient of y and 3 | -6 times y |
| the difference of 6 and y | y divided by 4 |
| y divided by -3 | y decreased by 5 |
| the sum of y and 2 | the product of 3 and y |
| 3 times y plus 2 | the sum of 2y and -4 |
| the product of 2 and y plus 2 | y squared |

B I N G O

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*Expressions Worksheet Page 1- 3*

**Team Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Time: \_\_\_\_ Score/Points: \_\_\_\_**

**DIRECTIONS:** *Translate the English phrases into algebraic phrases.*

1. 3 less than *n* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. *x* divided by 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Sum of 16 and *x* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. 20 minus *p* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Product of 5 and *m* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. x increased by 7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. *x* decreased by 20 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

8. 9 divided by *m* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. *m* increased by 12 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. Sum of 8 and twice *m* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. Product of 10 and *b* decreased by 7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. 5 times the sum of 10 and *x* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. *x* less 6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. 15 divided by *y* less than 4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

15. 6 minus the sum of *x* and 3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Additional Practice) *Adapted from Houghton Mifflin copyright 1987 page 61 PA*

Mathematical Expressions 1-5

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Write as a mathematical expression.*

1. Fifteen increased by a number b \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Five times the sum of a number x and three \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Half the sum of the numbers s, t, and u \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. A number y decreased by four times a number p \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Twelve divided by the sum of a number w and six \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. The sum of a number w and six, divided by twelve \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Nine less than twice a number g \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Match the word expression with the mathematical expression.*

8. \_\_\_\_\_\_\_ 14 + 3n A. The product of a number *x* and the sum of three and a number *n*

9. \_\_\_\_\_\_\_ 14 – 3/n B. Fourteen decreased by the difference, a number *n* less three

10. \_\_\_\_\_\_\_ x(3 +n) C. Three increased by the product of fourteen and a number *x*

11. \_\_\_\_\_\_\_ 3(n +x) D. Three times a number *n*, increased by a number *x*

12. \_\_\_\_\_\_\_ 3 + 14x E. Fourteen increased by the product of three and a number *n*

13. \_\_\_\_\_\_\_ 14 – (n + 3x) F. Fourteen decreased by the sum of a number *n* and three times a number *x*

14. \_\_\_\_\_\_\_ 3n + x G. Three times the sum of a number *n* and a number *x*

15. \_\_\_\_\_\_\_ 14 – (n – 3) H. Fourteen decreased by the quotient, three divided by a number *n*.

<http://sw-georgia.resa.k12.ga.us/Math.html#High%20School%20Graphic%20Organizers>

What verbal phrases should you look for to translate

**these operations into algebraic expressions?**

Addition

Subtraction

Division

Multiplication

Graphic Organizer by Dale Graham and Linda Meyer

Thomas County Central High School; Thomasville GA











