INSTITUTE FOR THE PROFESSIONAL DEVELOPMENT OF ADULT EDUCATORS

Module: Mathematics

Lesson Title: Can You Translate This for Me?

Standards for the Lesson

Florida Adult Basic Education Mathematics Standards
Apply and extend previous understandings of arithmetic to algebraic expressions. (CCR.MA.ABE.6.3.1) Write and evaluate numerical expressions (mathematical phrase using numbers, letters and operations) involving whole-number exponents (power). (CCR.MAE.ABE.6.3.1.a) Write, read, and evaluate expressions in which letters stand for numbers. (CCR.MA.ABE.6.3.1.b)

Interpreting the Standard

1 Standards	2 Skills Included in the Standard	3 Concepts Included in the Standard	4 Through a Particular Context	5 Cognitive Demand/Levels of Thinking	6 Sample Activity
Apply and extend previous understandings of arithmetic to algebraic expressions. (CCR.MA.ABE.6.3.1)	Apply and extend	understandings of arithmetic to algebraic expressions	Games and real-world situations	DOK 1 DOK 1	Have students translate words to expressions and expressions to words
Write and evaluate numerical expressions (mathematical phrase using numbers, letters and operations) involving whole-number exponents (power). (CCR.MA.ABE.6.3.1.a)	write and evaluate	numerical expressions		DOK 1	Have students practice translating algebraic expressions by playing games Use real-world situations to translate
Write, read, and evaluate expressions in which letters stand for numbers. (CCR.MA.ABE.6.3.1.b)	write, read, evaluate	expressions		DOK 1	

Objectives of the Lesson

Students will:

- Translate verbal expressions and word problems to algebraic expressions
- Write a phrase from an algebraic expression
- Identify phrases that align with different operations

Materials

- **Handout A: Translating Words into Algebraic Expressions**

- **Handout B: Words for Operations**

- **Handout C: What's My Operation?**

- **Handout D: Language of Algebra Game**

Instructional Plan

Overview

Learning algebra is a little like learning another language. The first step in learning to "speak algebra" is learning the definitions of commonly used words and then being able to translate from plain English to the "language" of algebra. This lesson is designed to provide students with practice in translating words into algebraic expressions.

Process

Introduce the lesson by writing the following words on the board:

like, dogs, walks

Ask students if they can write a sentence in which the word dogs is used first. How about walks? Asks the students whether both sentences make sense? Why or why not?

Share with students that math also uses sentences. Discuss that when you take information from a sentence or word problem and turn it into a mathematical expression, it is called "translating." You may need to clarify that an algebraic expression is a number sentence that does not have an equal sign, such as x +2 or 3 + 7.

Show students how to translate words into expressions by writing the following on the board:

Alex found that he had some money in his pocket. He already had $25 in his wallet?

Ask students what is *known* and what is *unknown*. They should respond that what they *know* is that Alex has $25. What they *do not know* is how much money is in Alex's pocket. Show students that they can translate this information into an algebraic expression. What is *known* is $25; what is *not known* becomes n. So, 25 + n is the translation of words into an expression.

Model for students additional word problems and/or sentences where you have students help you in determining what is *known* and what is *unknown*. Then translate the words into an algebraic expression.

Ask students how they know whether to add, subtract, multiply, or divide. Students should share that they translate the words into the operation.

If students are having difficulty with the translation of words to operations, you may wish to have them brainstorm words for each of the operations on **Handout B: Words for Operations** or play the game **What's My Operation?** in **Handout C**. To play the game, make a copy of the activity for each team. The purpose is for students to take the headers and place the appropriate expression or definition under the correct header. Debrief by having student share why they placed each expression or definition under a specific header.

Continue to model for students different phrases and word problems. Have students assist you in the translations until they are able to translate basic phrases independently.

Sample phrases and word problems are provided for your use in **Handout A: Translating Words into Algebraic Expressions.** You may also wish to use problems that are available through math resources in your classroom.

As an ending activity, divide the classroom into groups of four students. Share with students that they are going to compete in an algebra card game. Provide each group with a deck of cards that you have created prior to class.

Share with students the rules of the game. The rules and the template for the cards are in **Handout D: Language of Algebra Game.** You may wish to have a "prize" for the winner of the game.

Sample Debriefing Questions

- What are the terms associated with the four operations?
- What strategies can you use to organize the clue words to help you remember when to add, subtract, multiply, or divide?
- What do the words known and unknown mean to you when working with algebraic expressions?
- Why is it important to be able to translate written situations into expressions?
- What is one situation where you have used algebraic reasoning in your daily life? (e.g., determining what is the latest time you can get up and still get to work on time)

Modifications for Different Levels

For students who grasp the concept of expressions and phrases, challenge them to turn their expressions into equations and then solve the problems. Provide students with higher levels of word phrases and problems to translate. Students at higher achievement levels should be able to translate word phrases and problems that incorporate all operations with the addition of order of operations, parentheses, and powers.

For students at lower achievement levels, provide students with phrases that incorporate basic addition and subtraction. Students at lower achievement levels should be able to translate word phrases and problems that incorporate basic whole number operations. To differentiate the card activity, select appropriate cards that incorporate the skills that these students should have. Then, have students match the appropriate phrase to the expression, rather than using as a card game.

Handout A: Translating Words into Algebraic Expressions

Word Phrase	Translation
four plus a number	$n + 4$
twice a number	$2n$
a number divided by 3	$n \div 3$
fifteen less than a number	$n - 15$
three times a number, increased by 12	$3n + 12$
the product of nine and a number	$9n$
seven times a number	$7n$
twice a number, decreased by four	$2n - 4$
a number increased by 12	$n + 12$
thirty divided by three times a number	$30 \div 3n$

Sample Word Problems to Translate and Answers

1. Devon earns $25 a day working after school at the supermarket. How much money will he earn in *d* days?

   $25d$

2. It costs $15 to get into the county fair. It costs $1 for a packet of ride tickets. How much will you spend to go to the fair and purchase *t* packets of tickets?

   $15 + t$

3. You have just won $1,000 on a scratch-off lottery ticket. You want to split it between you and your friends. How much will each of you receive if there are *f friends?*

   $1000 \div f$

4. A pizza delivery driver earns $8 an hour and works *h* hours per day. He also spends $20 a day on gas. How much will the driver earn in one day?

   $8h - 20$

Handout B: Words for Operations

+	-	x (∗)	÷	parenthesis

Handout C: What's My Operation?

add	sum
increased by	more than
greater than	more
all together	plus
difference	minus
decreased by	less than

fewer than	less
times	product
twice	multiplied by
of	quotient
per	divided by
ratio	the quantity of

times the sum of	times the difference of
3(4)	plus the difference of
$\dfrac{2}{8}$	4d

Addition +
Subtraction -
Multiplication •
Division ÷
Parenthesis ( )

Handout D: Language of Algebra Game

Preparation: Print enough decks of cards so that one deck per group of 4 students can be distributed. You may wish to use colored card stock so that the cards can be reused.

Purpose of the Game: Students collect cards with either equivalent mathematical expressions or equivalent verbal expressions on them. When a player has at least 3 matching cards, he/she may lay down the book of cards. The object of the game is to be the first to get rid of all the cards in your hand.

Directions: Shuffle the cards and deal out 7 cards to each player. Place the remaining cards in a draw pile in the center of the table. Turn one card over to create the discard pile.

On his/her turn, each player will:

1. Either draw a card from the draw pile **OR** pick up the top card of the discard pile. (A player may only pick up the top card of the discard pile if by doing so it creates a book that the player can lay down immediately or it is a card that can be added to an existing book on the table.)
2. The player then examines his/her hand to see if there are any sets of three or four that can be laid down. If so, the cards are laid down on the table face up.
3. If the player does not have any groups to lay down, he/she may lay down a single card if that card can be added to another player's book that has been laid on the table previously.
4. If the player cannot put down a book or a single card to add to an existing book, then the player's turn is over.
5. At the end of each turn the player must place a card on the discard pile. If this is the last card in his/her hand, then he/she is the winner!
6. Play moves to the left in a similar fashion until all the cars have been played or no other cards remain to be drawn and no player can go out. At that point, the player with the least number of cards in his/her hand is the winner.

A number decreased by 8	n – 8
A number minus 8	8 less than a number
A number squared	n^2
The square of a number	n × n

A number divided by 6	$n \div 6$
$\dfrac{n}{6}$	The quotient of a number and 6
The sum of 9 and a number	$9 + n$
Nine increased by a number	$n + 9$

Twice the sum of 15 and a number	2(15 + n)
(15 + n) · 2	Two times the sum of 15 and a number
7 more than the product of 6 and a number	6n + 7
7 + 6n	The product of 6 and a number increased by 7

30 increased by 3 times the square of a number	$30 + 3n^2$
$3n^2 + 30$	30 more than 3 times the square of a number
Five squared	5^2

$5 \cdot 5$	Five raised to the second power
Four times a number	$4n$
The product of a number and 4	$4 \cdot n$
3 less than 5 times a number	$5n - 3$

The product of 5 and a number less 3	3 less than the product of 5 and a number
One-half the square of b	$\frac{1}{2} b^2$
$\frac{b^2}{2}$	The quotient of b squared and 2
Six times n squared plus 3	$6n^2 + 3$

Three more than the product of six and the square of a number	$3 + 6n^2$
$\dfrac{2}{3}n^2$	Two-thirds the square of a number
The quotient of twice a number squared and 3	$\dfrac{2n^2}{3}$
The difference of a number and 1	$n - 1$

One less than a number	A number minus 1
The product of a number cubed and the square of another number	n^3m^2
A number cubed times another number squared	$n \cdot n \cdot n \cdot m \cdot m$