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LEARNING OBJECTIVE: We will define a linear expression, distinguish between linear and non-linear expressions, and discuss properties of linear equations. (G8M4L2)

CONCEPT DEVELOPMENT:

Linear Expression: A linear expression is an expression where each term is a constant, a variable (like x), or a product of a constant and a variable.

Examples:	*Non-Examples:*
$3x$ (monomial, Expression, term) $12x - 13$ (binomial, Expression, term, term) $\frac{x}{4} + 3$ $21 - 4x$ (x raised to the 1st power)	$x^2 - 3x - 4^2$ (Non linear) $x^4 - 1$ $2 - x^5$ $\left(\frac{x}{2}\right)^2$

Term: Any product of an integer power of x and a constant or just a constant.
Example: $4x,\ 2,\ y$

Constant: A fixed number.
Example: $2x + 12$ (12 is the constant term).

Coefficient: A number used to multiply a variable.
Example: $2x + 12$ (2 is the coefficient)

$3x - 24$
- Terms: $3x, -24$
- Coefficient: 3
- Constant: -24

Linear Equations: When two linear expressions are equal, they can be written as a linear equation.
Examples: $6 + 3 = 9$
$4 + 15x = 49$

When we write linear equations in x, such as $4 + 15x = 49$, we are making a statement about equality. What value(s) of x will make the equation true?

When $x = -4$?
$4 + 15(-4) \stackrel{?}{=} 49$
$4 + (-60) \stackrel{?}{=} 49$
$-56 \neq 49$
NO!!

When $x = 3$?
$4 + 15(3) \stackrel{?}{=} 49$
$4 + 45 \stackrel{?}{=} 49$
$49 \checkmark 49$
YES!!

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Guided Practice:

Steps for Examining Expressions

1. Read the written description carefully and define a variable.
2. Write your expression using symbols and simplify if possible.
3. Determine if the expression is linear or non-linear by the power of *x*, and identify the important parts of the expression (coefficient, constant, term)

The sum of a number and 4 times the number. Let x = a number Expression: $x+4x$ / $5x$ Linear? [Yes] or No Coefficient(s): 1, 4 5?	The product of a number and 5. Expression: $5x$ Linear? (Yes) or No Coefficient(s): 5
The sum of a number and three, and then times the original number. Expression: $(x+3)\ x = x^2+3x$ Linear? Yes or (No) Coefficient(s): 1, 3	The product of 19 and a number, subtracted from the reciprocal of the number cubed. $\frac{1}{x^3} - 19x$ Expression: Linear? Yes or (No) Coefficient(s): $-19, 1$
The square of the sum of six and a number. Expression: Linear? Yes or No Coefficient(s): Constant:	Four subtracted from the reciprocal of a number. Expression: Linear? Yes or No Coefficient(s): Constant:

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Steps for Determining Solutions to Linear Equations

1. Combine like terms on each side of your equation to make your expressions simpler (if applicable).
2. Substitute the number into the equation for the variable and check to see if both sides are equal.

In each of the following, determine if the values provided for x are solutions to the equations.

Does $x = 6$ make the equation true?

$$-2x + 11 - 5x = 5 - 6x$$

$-7x+11 = 5-6x$

$-7(6)+11 \stackrel{?}{=} 5-6(6)$

$-42+11 = 5-36$

$-31 = -31$

YES!

Does $x = -3$ make the equation true?

$$6x + 5 = 5x + 8 + 2x$$

$6x+5 = 7x+8$

$6(-3)+5 \stackrel{?}{=} 7(-3)+8$

$-18+5 \stackrel{?}{=} -21+8$

$-13 = -13$ YES!

Does $x = 4$ make the equation true?

$$6x + 4 - x = 2(x + 1)$$

$5x+4 = 2(x+1)$

$5(4)+4 = 2(4+1)$

$20+4 = 2 \cdot 5$

$24 \neq 10$

NO!

Does $x = -\frac{2}{3}$ make the equation true?

$$6x + 4 - x = 2(x + 1)$$

$5x+4 = 2(x+1)$

$5\left(-\frac{2}{3}\right)+4 \stackrel{?}{=} 2\left(-\frac{2}{3}+1\right)$

$-\frac{10}{3}+\frac{12}{3} \stackrel{?}{=} 2\left(\frac{1}{3}\right)$

$\frac{2}{3} = \frac{2}{3}$ YES

Does $x = 2$ make the equation true?

$$24x + 4 + 2x = 3(10x - 1)$$

Does $x = -8$ make the equation true?

$$\frac{1}{2}x + 9 = 13$$

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Independent Practice:

Are each of the following expressions linear or non-linear? Write the expressions symbolically.

A number decreased by three squared.	Two divided by a number, subtracted from seventeen. Non linear
The sum of 13 and twice a number.	The sum of a number and negative three, multiplied by the number. .
Three-fourths of a number multiplied by seven.	A number increased by 5, divided by two.

Determine if the following are solutions for the linear equation:

Does $x = 144$ make the equation true? $\frac{1}{2}x - 40 = -\frac{1}{4}x + 54$ NO!	Does $x = 3$ make the equation true? $5x + 29 - 8x = 5(x + 1)$ YES!

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Activating Prior Knowledge:

We know how to write mathematical statements using symbolic language

Subtract seven more than twice a number from the square of one-third of the number to get zero.	Three more than four times a number is the same as the square of half the number.

Closure:

Give out exit ticket lesson 3 as closure…

Teacher Notes:

Module 4, lessons 2 and 3.

Homework—give out problem set for lesson 3…page S.8 due Wednesday.