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Writing and Interpreting Numerical Expressions

Unit 1 Lesson 1

Math 5

Students will be able to:

- Recognize numerical expressions.
- Familiarize the words used to represent operations such as addition, subtraction, multiplication and division.
- Write a numerical expression that records calculations with numbers given a verbal phrase.
- Translate numerical expressions into words.
- Interpret numerical expressions without evaluating them.
- Compare expressions using visual models.

Writing and Interpreting Numerical Expressions

Key Vocabulary:

Numerical expression

Parentheses

Operations

Addition

Subtraction

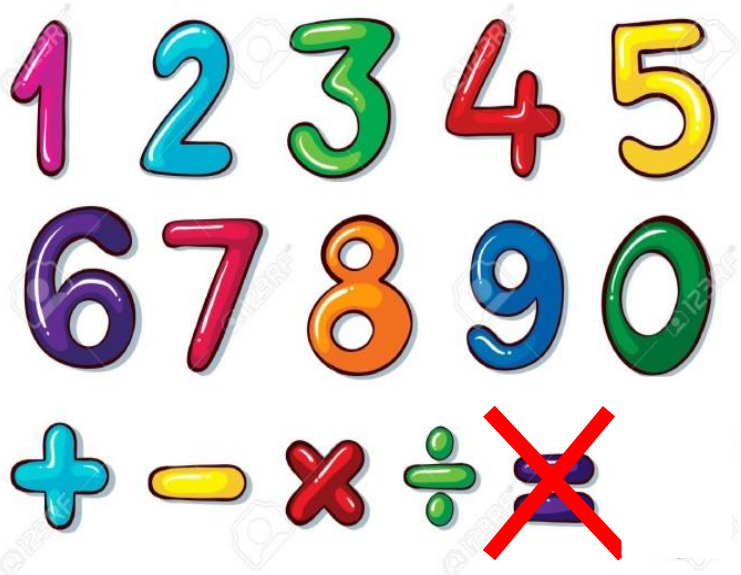
Multiplication

Division

Tape diagram

What are NUMERICAL EXPRESSIONS?

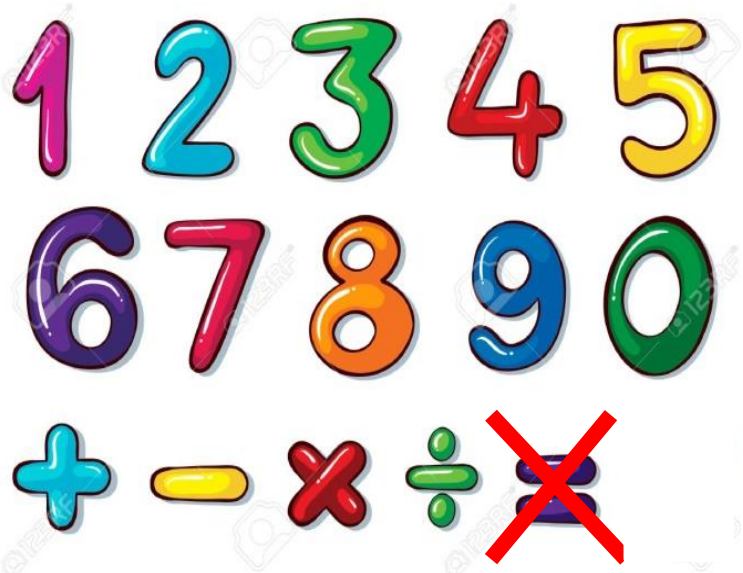
A numerical expression is a mathematical phrase representing a **single value** consisting of one or more **numbers** and operations. These operations involve **Addition**, **Subtraction**, **Multiplication,** and **Division**.



What are NUMERICAL EXPRESSIONS?

The picture shows the numbers and operations you can mix up to form a numerical expression.

Also, remember that there should be NO equal sign "=" in the expression because that would be a different story ☺!



Sample Problem 1:

Which among the following is a numerical expression?

a. $x + y + 3$

b. $1 + 3 = 2 + 2$

c. $(4 + 5) \div 3$

d. $24 \times (9 - 1)$

Solution:

The correct answers are C and D.

Writing Numerical Expressions

How do I write numerical expressions?

In writing numerical expressions from verbal statements, you must familiarize yourself with the **CLUES**!!! These clues are words that are used to represent the four operations: addition, subtraction, multiplication, and division. These words/phrases are identified on the next slide.

Writing and Interpreting Numerical Expressions

Addition	Subtraction	Multiplication	Division
the sum of	the difference	multiplied	divided (by)
plus	less than	times	average
increased by	diminish	twice	ratio
more (than)	minus	tripled	quotient
and	decrease (by)	doubled	per
total of	go down	product	part
raised	subtract from		shared equally
combined	reduce		___ out of ___
added to	drop		split
together	fewer than		
add	left		
additional	lost		
in all	taken from		

Example 1:

Write a numerical expression given the verbal phrase below:

The sum of nine and five multiplied by three

Looking at the given example, you must understand that you need to get the sum of nine and five first and multiply whatever the answer is by three.

This should be done first ⟶ **the sum of nine and five**

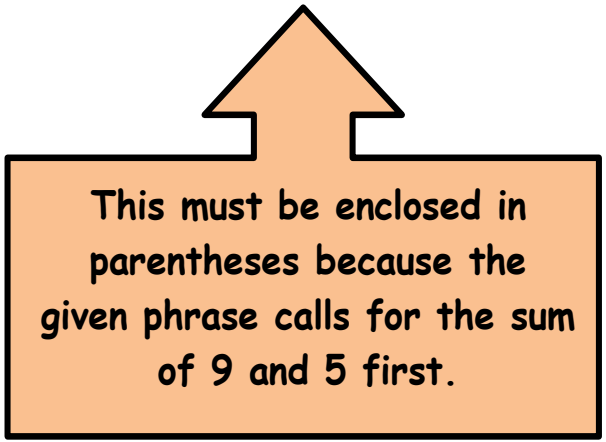
Then, whatever the answer is ⟶ **multiply it by three**

So how do we write it as a numerical expression?

We need to do some **grouping** to indicate that one operation must be done before doing another. We use open/close parentheses "( )" to group the numbers and operations.

The operation that must be done first must be enclosed in parentheses.

(The sum of nine and five) multiplied by three



So the numerical expression we can get is:

The sum of nine and five multiplied by three

$$(9 + 5) \times 3$$

Example 2:

Write a numerical expression given the verbal phrase below:

The sum of nine and the product of five and three

If you compare it to the first example, both involve the same numbers and the same operations.

Example 1: **The sum of nine and five multiplied by three**

Example 2: **The sum of nine and the product of five and three**

Both examples in the previous slide involve numbers nine, five and three, and operations addition and subtraction.

But do they really mean the same?

BIG NO!!!

In Example 2, "**The sum of nine and the product of five and three**", the operation that must be done first is to multiply five and three… then add nine to whatever the product is.

The grouping will then be:

The sum of nine and (the product of five and three)

$$9 + (5 \times 3)$$

Writing and Interpreting Numerical Expressions

Let's compare the two verbal phrases!

The sum of nine and five multiplied by three

$(9 + 5) \times 3$

The sum of nine and (the product of five and three)

$9 + (5 \times 3)$

Here, both verbal statements may have exactly the same numbers and involve the same operations; they mean differently. Pay close attention to the given phrase and group the numbers with operations that must be done first.

The examples in the previous slide will also give **DIFFERENT** answers when evaluated.

Sample Problem 2:

Tell whether the given phrases below have the same meaning by writing their corresponding numerical expression.

a. The difference between twenty and twelve divided by two

b. The difference between twenty and the quotient of twelve and two

Sample Problem 2:

Solution:

a. The difference between twenty and twelve divided by two

$$(20 - 12) \div 2$$

a. The difference between twenty and the quotient of twelve and two

$$20 - (12 \div 2)$$

The given phrases do not mean the same.

Now, let's do it the other way around!!!

Translating Verbal Phrases into Numerical Expressions

Instead of writing numeral expressions given the verbal phrases, you'll do it the other way around. You are going to translate numerical expressions into words.

Remember that the **ORDER OF OPERATIONS** is very **IMPORTANT**!!! Always pay attention to the following:

"What should be done first?"

How do I write numerical expressions into verbal phrases?

Example 3: Translate $24 \div (8 - 4)$ into words.

As mentioned, take note of the order of operations and **"What should be done first?"**

In this example, which verbal phrase do you think is correct?

a. Twenty-four divided by eight minus four
b. Twenty-four divided by the difference of eight and four

The correct answer is B.

Take note that there are numbers to be grouped in the given example, and should be done first.

$$24 \div (8 - 4)$$

Twenty four divided by the difference of eight and four

A on the other hand is incorrect.

"Twenty-four divided by eight minus four"

Looking at the order of operations, the numerical expression for this verbal phrase is $(24 \div 8) - 4$.

Sample Problem 3:

Translate each numerical expression into words and write them in each cloud.

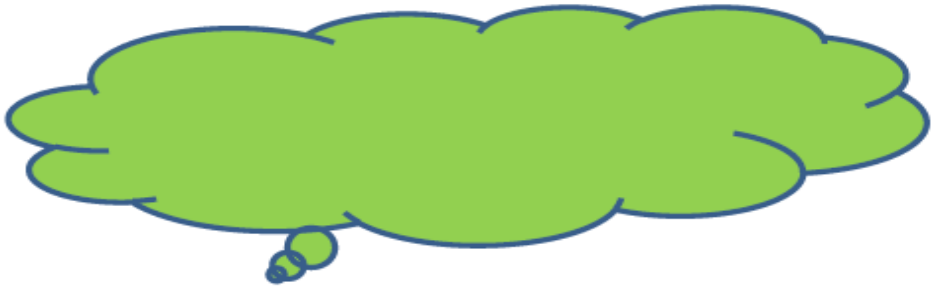
1. $(4 \times 5) + 10$

2. $4 \times (5 + 10)$

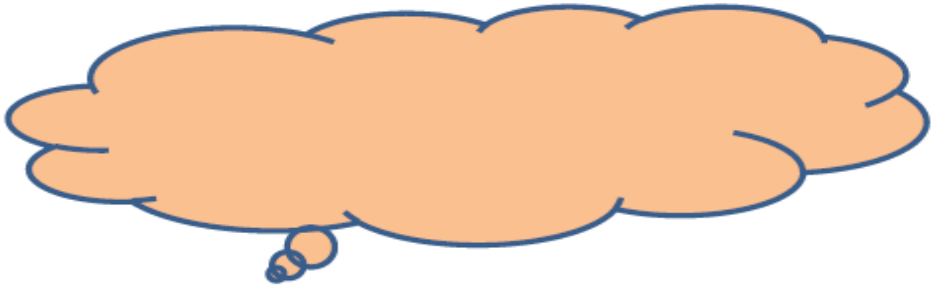
Sample Problem 3:

Translate each numerical expression into words and write them in each cloud.

3. $30 \div (5 + 1) \times (7 - 3)$



4. $(30 \div 5) + (1 \times 7) - 3$



Sample Problem 3:

Translate each numerical expression into words and write them in each cloud.

Solution: (Answers may vary)

1. Four times five plus ten.
2. Four times the sum of five and ten
3. Thirty divided by the sum of five and one times the difference of seven and three
4. Thirty divided by five plus the product of one and seven, minus three

Interpreting Numerical Expressions

How are numerical expressions interpreted without evaluating them? "**Evaluate**" means getting the value of a given numerical word with any given operation, following a correct order. But how is it done without evaluation?

Without evaluating, compare the value of:

$$(20 + 4) \text{ and } 5 \times (20 + 4)$$

To compare the values of the given numerical expressions without evaluating them, a visual model such as a TAPE DIAGRAM is used.

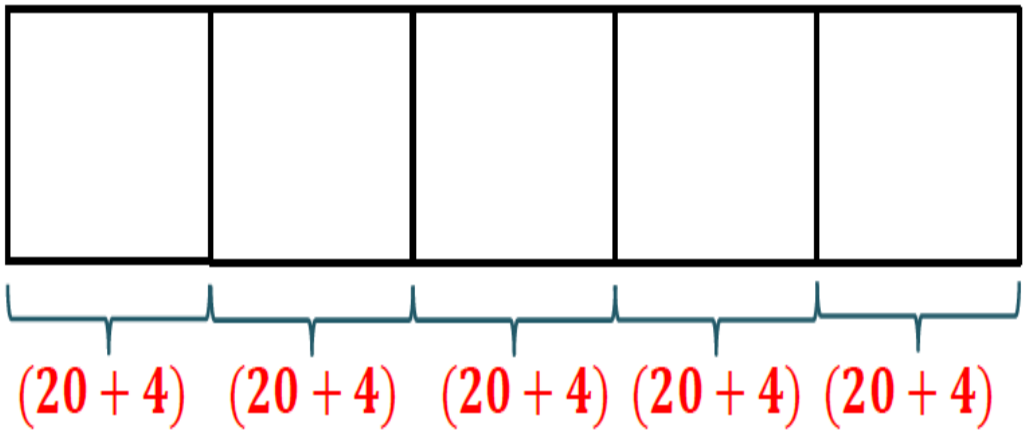
Writing and Interpreting Numerical Expressions

Using a tape diagram, we can draw the model of

$$(20 + 4)$$

and the model of

$$5 \times (20 + 4)$$



Without evaluating and by only drawing a model of the given numerical expressions, we can say that:

$$5 \times (20 + 4)$$

is 5 times as large as

$$(20 + 4)$$

Sample Problem 4:

Without evaluating, which do you think has a bigger value? Draw the model to compare.

The sum of 12 and 8 tripled

or

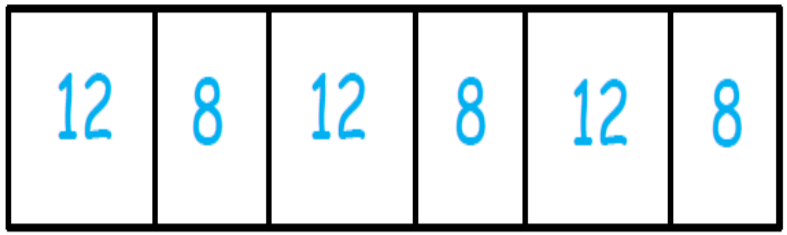
$$(3 \times 12) + (3 \times 8)$$

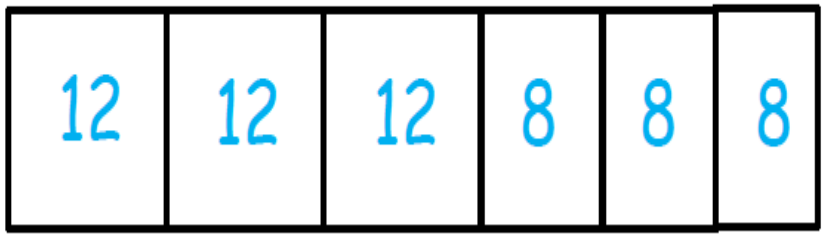
Sample Problem 4:

Solution:

The sum of 12 and 8 tripled

$(3 \times 12) + (3 \times 8)$





Without calculating, the visual models clearly show that the sum of 12 and 8 tripled and $(3 \times 12) + (3 \times 8)$ have exactly the same value.

Sample Problem 5:

Compare the given numerical expressions using >, < or =, without calculating. Draw tape diagrams to help you decide.

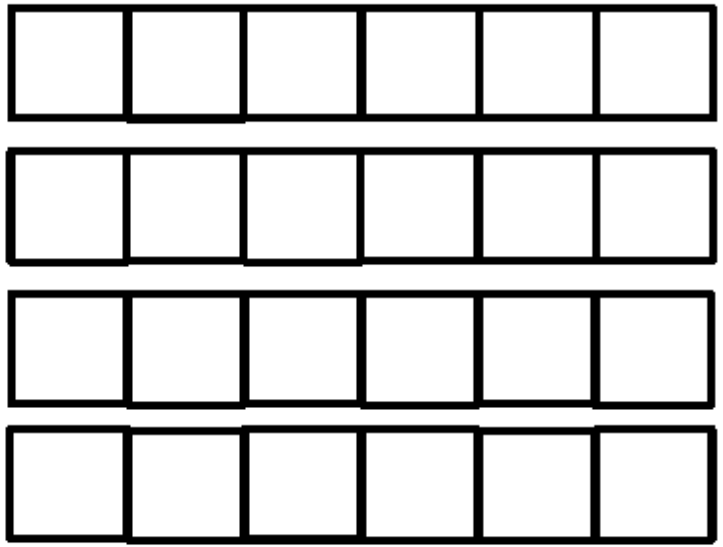
$$24 \times (20 + 5) \quad \square \quad (20 + 5) \times 12$$

Writing and Interpreting Numerical Expressions

Sample Problem 5- Solution:

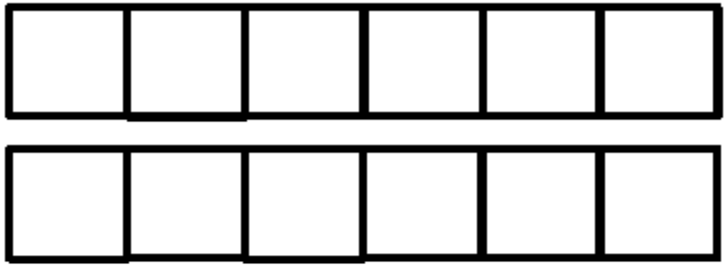
$24 \times (20 + 5)$

one ☐ represents $(20 + 5)$



$(20 + 5) \times 12$

one ☐ represents $(20 + 5)$



Sample Problem 5- Solution:

Therefore,

$$24 \times (20 + 5) \quad > \quad (20 + 5) \times 12$$

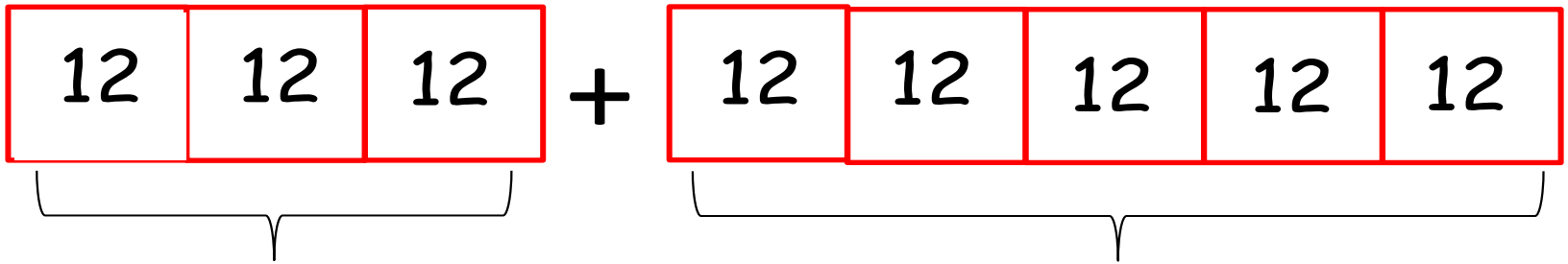
Sample Problem 6:

A pastry box contains 12 pcs of assorted cookies. Paul bought 3 boxes to be given to his parents and 5 boxes for his friends. Draw a tape diagram and write the numerical expression that shows the total number of cookies bought.

Sample Problem 6:

Solution:

Tape diagram:



The 3 boxes, with 12 cookies each, are for his parents.

The 5 boxes, with 12 cookies each, are for his parents.

Sample Problem 6:

Solution:

Numerical Expression:

$$(3 \times 12) + (5 \times 12)$$