5th Grade Math

ELG 5.OA.A Write and interpret numerical expressions

Vertical Progression:

3rd Grade	**3.OA.A Represent and solve problems involving multiplication and division.** ○ **3.OA.A.1** Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.* ○ **3.OA.A.2** Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*
4th Grade	**4.OA.A Use the four operations with whole numbers to solve problems.** ○ **4.OA.A.1** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. ○ **4.OA.A.2** Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
5th Grade	**5.OA.A Write and interpret numerical expressions**. ○ **5.OA.A.1** Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. ○ **5.OA.A.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*
6th Grade	**6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions.** ○ **6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers. ○ **6.EE.A.3** Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* ○ **6.EE.A.4** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for*.

Students will demonstrate command of the ELG by:

- Using parentheses, brackets, or braces in numerical expressions and evaluations with these symbols.
- Writing simple expressions that record calculations with numbers.
- Interpreting numerical expressions without evaluating them.

Vocabulary:

- braces
- brackets
- numerical expression
- order of operations
- parentheses

Sample Instructional/Assessment Tasks:

1) **Standard(s): 5.OA.A**

Source: Illustrative Math
https://www.illustrativemathematics.org/content-standards/5/OA/A/tasks/1606

Item Prompt: Why Do We Need An Order Of Operations?

a. State the meaning of each of the following expressions and draw a picture that represents it.
(3×5)+4
3×(5+4)

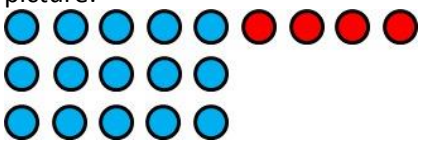
b. State the meaning of this expression:
3×5+4
How do you know?

c. State the meaning of each of the following expressions and draw a picture that represents it.
(3+5)×4
3+(5×4)

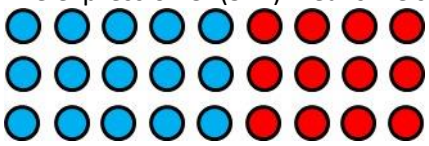
d. State the meaning of this expression:
3+5×4
How do you know?

Correct Answer:

a. The expression (3×5)+4 means we should multiply 3 and 5 and then add 4 to the result. Here is a picture:

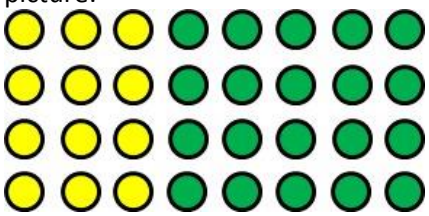


The expression 3×(5+4) means we should multiply 3 by the sum of 5 and 4. Here is a picture:

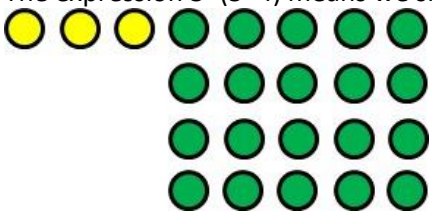


b. The expression 3×5+4 means the same thing as the expression (3×5)+4. If we haven't already learned about the order of operations, then it is possible for 3×5+4 to mean either (3×5)+4 or 3×(5+4). The only way to know what 3×5+4 means is to understand that we have all agreed that when we don't have grouping symbols, we should multiply before we add.

c. The expression (3+5)×4 means we should add 3 and 5 and then multiply the result by 4. Here is a picture:



The expression 3+(5×4) means we should add 3 to the product of 5 and 4. Here is a picture:



d. The expression 3+5×4 means the same thing as the expression3+(5×4). If we haven't already learned about the order of operations, then it is possible for 3+5×4 to mean either (3+5)×4 or 3+(5×4). The only way to know what 3+5×4 means is to understand that we have all agreed that when we don't have grouping symbols, we should multiply before we add.

2) Standard(s): 5.OA.A.1

Source: Illustrative Math
https://www.illustrativemathematics.org/content-standards/5/OA/A/1/tasks/1596

Item Prompt: Using Operations and Parentheses

What numbers can you make with 1, 2, 3, and 4? Using the operations of addition, subtraction, and multiplication, we can make many different numbers. For example, we can write 13 as 13 = (3 x 4) + 1. You can use parentheses as many times as you like and each of the numbers 1, 2, 3, and 4 can be used *at most* once.

- **a.** Find two different ways to make 9.
- **b.** Find two different ways to make 7.
- **c.** Find two different ways to make 11.
- **d.** Can you make 26?

Correct Answer:

- **a.** Using the fact that 9=3×3 we have 9=3×(4−1). Also, using the fact that 9=8+1, we have 9=(4×2)+1.
- **b.** Using the fact that 7=6+1 we have 7=(3×2)+1. Also, using the fact that 7=8−1, we have 7=(4×2)−1. Or, avoiding multiplication, we have 7=4+2+1.
- **c.** Using the fact that 11=8+3 we have 11=(4×2)+3. Also, using the fact that 11=12−1 we have 11=(4×3)−1.
- **d.** We have 26=2×13 so if we can write 13 using 1, 3, and 4 we can get 26 by doubling. We have 3×4=12 and 12+1=13. Putting all of this together gives 26=2×((3×4)+1). Note that double parentheses are used here because there are three operations. The first operation is inside the innermost parentheses, 3×4. The next operation is in single parentheses, adding 1. The final operation is not in parentheses, multiplying by 2.

3) **Standard(s): 5.OA.A.2**

Source: Illustrative Math
https://www.illustrativemathematics.org/content-standards/5/OA/A/2/tasks/139

Item Prompt: Comparing Products

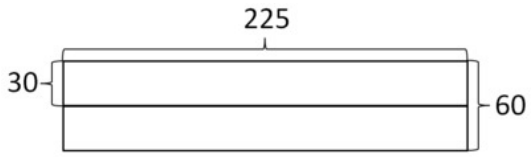
Leo and Silvia are looking at the following problem:

How does the product of 60 x 225 compare to the product of 30 x 225?

Silvia says she can compare these products without multiplying the numbers out. Explain how she might do this. Draw pictures to illustrate your explanation.

Correct Answer:

Since 60 is twice 30, the product 60×225 is twice the product 30×225. We can write this as an equation: 60×225=(2×30)×225=2×(30×225). The above explanation corresponds to the following picture.



The area of a 225 by 60 rectangle (60×225) is double that of a 225 by 30 rectangle (30×225). If we scale the width of the rectangle by a factor of 2, then the area of the resulting rectangle doubles. In other words, if one of the factors of the product 30×225 is scaled by a factor of 2 then the product is scaled by a factor of 2.