

General Information

Lesson Parts & Duration

Total Duration: 1 hour

- Parentheses, Brackets, Braces: Introduction to Symbols Used in Numerical Expressions

Subject(s)

- Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols (5.OA.A.1).

Objective

- Students will be able to distinguish between parentheses, brackets, and braces.
- Students will be able to apply previous knowledge about the order of operations (PEMDAS) to new situations.

Materials

- blank paper (2 per student)
- pencil & crayons/colored pencils
- document camera or whiteboard
- **Optional:** printable “Exit Slip” (page 5)
- **Optional:** printable “Break Up Your Day” brain/movement break ideas (page 6)

Instructional Setting

- Students should be seated with or near another student for partner work.

Throughout this lesson, you will find:

- ☀ **Scripted Text** indicates things that need to be said directly. Bullets starting with a “T” followed by *italicized type* indicate scripted text
- ☀ **Clarifiers** within scripted text are in orange
- ☀ **Teacher Directions** indicate things you should be doing
- ☀ **Side notes** provide helpful hints, ELL strategies, differentiation and information
- ☀ **Break Up Your Day** (Brain/Movement Breaks) are in green boxes (at the end)

Remember!

Quality over quantity. All components do not have to be accomplished; lessons may be ended at any time and resumed later.

Instructional Plan: 60 minutes

Pass out 2 pieces of paper per student. One will be for “Notes” and the other for practice.

Introduction

- T* Today we will talk about numerical expressions and how we can read them correctly.
- T* You know how when we learn to read, we learn that each punctuation mark gives our text different meaning.
- T* These punctuation marks tell someone what needs to be done, like when a reader sees a comma, they know they must pause or end punctuation like a period tells a reader to take a longer pause.
- T* Similarly, in math, we use symbols as well; for example, a plus sign and a minus sign.
- T* But you may already know that there are some other symbols as well.
- T* Can anyone think of an example of another mathematical symbol?
- T* Turn and tell a partner sitting next to you all of the mathematical symbols that you know.

Provide about 30 seconds for students to discuss. Monitor to ensure student conversations are on topic.

- T* Who would like to share their answers with the class? **Call on several students.**
- T* Addition sign, subtraction sign, multiplication sign, division sign, fraction line, percentage, decimal point, exponents.
- T* All these are symbols that mean that we need to calculate something.
- T* Now let us take some notes because we are about to learn even more symbols!

Setting up Paper

- T* Write your name and date in the top right hand corner of your paper. **See example & model so students can follow.**
- T* On the top center of your paper, title it “Notes.” **See example & model so students can follow.**
- T* Underneath your title write the statement, “I can identify the symbols used in numerical expressions, such as....”and write a few of the examples that we mentioned before. **See example & model so students can follow.**
- T* Then, continue with “I can identify parentheses, brackets, and braces and follow their order.”
- T* Below your “I can” statement, write the three words to that will be our focus today: parentheses, brackets, and braces. **See example & model so students can follow.**
- T* The first symbol is “parentheses.”
- T* Parentheses look like (), so draw them next to the word.
- T* They are the innermost set of symbols for grouping numbers and variables in a numerical expression. **See example & model so students can follow.**
- T* For example, the expression $2(a + b)$ has only one set of parentheses.
- T* But what is going to happen if I want to have another set of parentheses? **Call on several students.**
- T* I will have to use brackets that look like this [].
- T* Write down “brackets” on your next line and let’s define them as the middle symbols used outside of parentheses to group numbers and variables.
- T* In the numerical expression $2[a (a + b)]$, how would I know what to do?
- T* Talk to the person next to you; what do you think is the difference between a bracket and a parenthesis? How do we know what calculation to perform? **Call on several students. Answer: Parentheses are the innermost, brackets are outside of parentheses. We do multiplication.**
- T* What if we want to add one more level of grouping? We will use braces that look like curly brackets { }.

Notes	Name & Date
I can identify the symbols used in numerical expressions, such as +, -, x, %, ÷.	
I can identify parentheses, brackets, and braces and follow their order.	
Parentheses: () used to group numbers and/or variables in a numerical expression; innermost	
Brackets: [] used outside of parentheses to group numbers and/or variables; middle	

- T** Next to “braces” we will write, outermost symbols used outside of brackets and parentheses to group variables and numbers.
- T** Now let’s review the order: $a \{ b + [c (d + e)] \}$. Add that to your notes. **See example & model so students can follow.**
- T** Does the order of these symbols remind you of something?

Order of Operations (PEMDAS) and Order of Parentheses, Brackets and Braces

- T** Who would like to tell me what PEMDAS stands for? **Call on a student.** **Answer:** Parentheses, Exponent, Multiplication, Division, Addition, Subtraction.
- T** Let’s write that down under the order of the three bracket symbols we talked about and see how we can connect the two.
- T** We cannot really write a new acronym where we include brackets and braces because they might be including other calculations. However, we will keep in mind the order we go in, Parentheses, Brackets, Braces – from the inner to the outermost type.
- T** Now that we have reviewed PEMDAS, we know the different types of brackets, and we know how to evaluate numerical expressions, I would like us to consider this example. **Write example on the board.**
- T** You can write the numerical expressions on the back of your paper.
- T** $3 \times 5 + 2 \times 2 + 4 =$. Let’s solve it without any brackets, braces or parentheses and see what answer you will get. **Call on a few students after 1-2 minutes.** **Answer:** 23.
- T** We know that we start with the multiplication and then we add the values with a plus in front of them to get 23.
- T** Now let’s see what’s going to happen if I put a pair of parentheses like this: $3 (5 + 2) 2 + 4 =$ **Call on a few students after 1-2 minutes.** **Answer:** 46.
- T** We start with $5 + 2$ in the parentheses which gives us 7. Then, we multiply this by 3 and by 2. Finally, we add four to get the answer 46.
- T** Now let’s put a pair of brackets as well and evaluate the expression. $3 [5 + 2 (2 + 4)] =$ **Call on a few students after 1-2 minutes.** **Answer:** 51.
- T** In this case, we start with $2 + 4$ which is 6, then multiply by the 2 in front of the parentheses to get 12, add 5 from the brackets to get 17 and finally multiply by the 3 in front of the brackets. The final answer is 51.
- T** Finally, we can put some braces to make the picture complete. $3 \{ 5 [(2 \times 2) + 4] \} =$ **Call on a few students after 1-2 minutes.** **Answer:** 120.
- T** Now we need to start in the parentheses, 2×2 which is 4, then we look at the brackets and will add $4 + 4$ which is 8. Then I look at the braces and will multiply 5×8 which is 40, last I will multiply 40 by 3 to get 120.
- T** So, after using the exact same numbers, but placing parentheses, brackets and braces, what can we conclude? Talk to your shoulder buddy about what you noticed.
- T** We can play around with the numerical expression and get different answers when we place the parentheses, brackets and braces in different places.
- T** It is important to remember that after all of these symbols are used, we need to keep the order of the other operations as in PEMDAS.

Name & Date	
Notes	
I can identify the symbols used in numerical expressions, such as +, -, x, %, ÷.	
I can identify parentheses, brackets, and braces and follow their order.	
Parentheses: () used to group numbers and/or variables in a numerical expression; innermost	
Brackets: [] used outside of parentheses to group numbers and/or variables; middle	
Braces: { } used outside of parentheses to group numbers and/or variables; outermost	
Order: $a \{ b + [c (d + e)] \}$	
PEMDAS	
Parentheses	
Exponents	
Multiplication	
Division	
Addition	
Subtraction	

T Now that we have practiced, I will ask you to take a half piece of paper and evaluate the expression in three different ways by placing parentheses, brackets, and braces anywhere in the expression. Show your work!

Give time to complete this task. Monitor students and provide assistance as needed.

T The expression is: $4 + 6 \times 12 - 3 \times 7$. Solve it first without any additional symbols and then in two more ways with parentheses, brackets and braces. **Answer: 55 with no parentheses. When parentheses and brackets are included, some possibilities are:** $4 + 6 (12-3) 7 = 382$; or $4 + [(6 \times 12) - 3] \times 7 = 487$.

T If we have time at the end, we will go over some of the answers as a whole class, otherwise I will collect your papers and leave them for your teacher to see your work!

T When you are finished, please make sure you wrote your name on your paper and hand it in. Then we can all have a bit of a stretch.

Differentiation:

For more advanced students, you can try to give them exponents and x-variables and see if they can evaluate the expression correctly

For example:

$$4a + 6 \times 12a - 3 \times 7$$

-or- $6 \times 4 \times \underline{\hspace{1cm}}$

You may use the exit slip at the end of this lesson (page 5) as a quick assessment of student understanding -or- have students copy the problem on a half sheet of paper.

Name: **ANSWER KEY** Date: _____

Exit Slip:

Order of Operations: Parentheses, Braces, and Brackets

PEMDAS

Directions: You will solve the same expression 3 times. Each time you should arrive at a different answer based on the symbols you choose to add.

1. Solve the following expression without adding any symbols.

$$4 + 6 \times 12 - 3 \times 7 =$$

$$\begin{array}{cc} \vee & \vee \\ 72 & 21 \end{array}$$

$$4 + 72 - 21 =$$

$$\vee$$

$$76 - 21 = 55$$

$$4 + 6 \times 12 - 3 \times 7 =$$

2. Add symbols to the expression and solve.

ANSWERS WILL VARY BASED ON PLACEMENT OF SYMBOLS

3. Add different symbols to the expression and solve.

$$4 + 6 \times 12 - 3 \times 7 =$$



Make sure to "Break Up Your Day!"



Now is a great time to take a break and get students re-energized. See our list of engaging movement and brain break ideas to get your students moving and ready to refocus! (see page 6)

Name: _____ Date: _____

Exit Slip:

Order of Operations: Parentheses, Braces, and Brackets
PEMDAS

Directions: You will solve the same expression 3 times. Each time you should arrive at a different answer based on the symbols you choose to add.

4. Solve the following expression without adding any symbols. $4 + 6 \times 12 - 3 \times 7 =$

5. Add symbols to the expression and solve. $4 + 6 \times 12 - 3 \times 7 =$

6. Add different symbols to the expression and solve. $4 + 6 \times 12 - 3 \times 7 =$

Name: _____ Date: _____

Exit Slip:

Order of Operations: Parentheses, Braces, and Brackets
PEMDAS

Directions: You will solve the same expression 3 times. Each time you should arrive at a different answer based on the symbols you choose to add.

1. Solve the following expression without adding any symbols. $4 + 6 \times 12 - 3 \times 7 =$

2. Add symbols to the expression and solve. $4 + 6 \times 12 - 3 \times 7 =$

3. Add different symbols to the expression and solve. $4 + 6 \times 12 - 3 \times 7 =$

Make sure to “Break Up Your Day!”

These can be used in the middle of a lesson or at the end of your lesson.

Here are a few engaging movement and brain break ideas to get your students moving and ready to refocus!



Break Up Your Day: Math Outside!



- Students take scratch paper/pencil and find multiplication problems outside.
- Students write multiplication problems they see on the playground. (examples: 3 basketball courts times 6 students equals 18 basketball players, four hopscotches times 5 students equals 20 students playing hopscotch.)



Break Up Your Day: Thumbs Up!



- Student is called on (use name cards or equity cards if available) to state a rounding observation from within the classroom using numbers from 1 to 500.
- Other students signify whether they understand and agree with the observation. (Example: “There are approximately 100 pencils in the classroom because each student has 3 pencils and there are 32 students. 3 times 32 is 96 and 96 rounds to 100.)
- Tally how many students agree with the rounding statements.
- The statement with the most votes or Thumbs Up is the “Round Up Captain”!



Break Up Your Day: Body Stretches!



10 minutes

FORMATION: Standing at desks

- Have students begin the day with a series of simple activities lasting 30 seconds or more: jumping jacks, knee lifts, flap arms like a bird, hopping, scissors (feet apart then cross in front, feet apart then cross in back)...
- Follow each activity with a basic stretching movement:
- Reach for the sky runner’s stretch
- Butterfly stretch (sit with bottom of feet together)
- Knee to chest, rotate ankles, scratch your back

Hold stretches for 10 - 30 seconds. Repeat a different simple activity followed by a new basic stretch as many times as desired.