General Information

Lesson Parts & Duration

Total Duration: 2 to 2 ½ hours

- Segment 1: Parentheses, Brackets, Braces: Introduction to Symbols Used in Numerical Expressions *(45-60 Minutes)*
- Segment 2: Playing with Parentheses, Brackets and Braces: (Minimum and Maximum Values) *(45-60 Minutes)*
- Segment 3: Activity: Backwards Numerical Evaluation *(40-60 Minutes)*

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.
- Students will be able to evaluate numerical expressions with parentheses, brackets, and braces.
- Students will be able to come up with their own examples of numerical expressions using these symbols.

Materials

- pencil & crayons/colored pencils
- blank paper (a few per student)
- document camera/projector or whiteboard
- **Optional:** printable "Exit Slips" (page 13)
- **Optional:** printable "Break Up Your Day" brain/movement break ideas (page 14)

Instructional Setting

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

Throughout these lessons, 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: Segment 1: 45-60 minutes

Subject

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

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 13)

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

Introduction

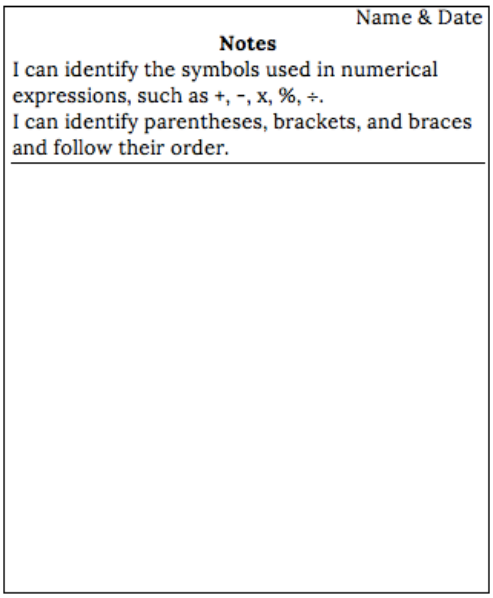
T *Today we will talk about numerical expressions and how we can read them correctly.*
T *You know how when we learn to read, we learn that each punctuation mark gives our text different meaning.*
T *These punctuation marks tell someone what needs to be done, like when a reader sees a comma, they know 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."*


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.

- ***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 { }.*
- ***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?*

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)]}

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 x 5 + 2 x 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.

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*** *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 [(2x2) + 4]} = .* **Call on a few students after 1-2 minutes. Answer: 120.**
- ***T*** *Now we need to start in the parentheses, 2 x 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 x 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.*
- ***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 x 12 – 3 x 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 x 12) -3] x 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 x 12a – 3 x 7
-or- 6 x 4 x ___

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 14)

You may use the exit slip at the end of this lesson (page 13) 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: Segment 1

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 x 12 – 3 x 7=

   V V
   72 21
   4 + 72 -21 =
   V
   76 – 21 = 55

2. Add symbols to the expression and solve. 4 + 6 x 12 – 3 x 7=

   ANSWERS WILL VARY BASED ON PLACEMENT OF SYMBOLS

3. Add different symbols to the expression and solve. 4 + 6 x 12 – 3 x 7=

Instructional Plan: Segment 2: 45-60 minutes

Subject

- Playing with Parentheses, Brackets and Braces: (Minimum and Maximum Values)

Objective

- Students will be able to apply previous knowledge about the order of operations (PEMDAS).
- Students will be able to evaluate numerical expressions with parentheses, brackets, and braces.

Materials

- blank paper (1 per student)
- rulers (1 per two students)
- pencil & crayons/colored pencils
- document camera/projector or whiteboard

Introduction

T *Today we will be building upon what we learned about the order of operations PEMDAS.*

T *Let's quickly remind ourselves, what the acronym PEMDAS stands for?* **Call on students to share. Answer: Parentheses, Exponent, Multiplication, Division, Addition, Subtraction.**

T *What are the three different sets of symbols we talked about?* **Call on students to share. Answer: parentheses, brackets, braces.**

T *Since we already practiced how to evaluate numerical expressions with different placements of parentheses, brackets, and braces; today we will go a step further.*

Hand out one piece of blank paper per student.

T *Sometimes our numerical expressions are more complex than just using parentheses, brackets, and braces.*

T *Now we will have the challenge of trying to solve expressions that contain: exponents, fractions, and decimals.*

T *Raise your hand if you feel ready for the challenge!*

Directions for the Activity

Pass out 1 piece of blank paper to each student. You will be modeling each step for students to copy using either the document camera or a whiteboard.

T *Write your name and date in the top right hand corner of your paper.* See example & model so students can follow.

T *Write the title: "Evaluating Expressions with Parentheses, Brackets and Braces."*

T *Remember that PEMDAS helps us to remember the order in which to solve our expression.*

Name & Date

Evaluating Expressions with Parentheses, Brackets, and Braces

Expression: $4^2 + 6 \times 1/3 + 2^3 \times 10 =$

T *Please write the word "Expression:" and after it write the expression: "* $4^2 + 6 \times \frac{1}{3} + 2^3 \times 10 =$"

T *First, we will solve this expression just using PEMDAS, we will not be adding any extra symbols.*

T *I am going to give you a few minutes to attempt to solve it on your own first and then we will discuss how you solved it and what answers you all got.*

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

T *Now that everyone has had a chance to solve this expression, who would like to come up and share the steps you took and what your answer was?* **Call on a student to share.**

- ***T*** *Did anyone arrive at a different answer?* If any students raise their hands, ask them to share how they solved the problem as well.
- ***T*** *Now I would like us all to quickly solve the problem together and we will see whose answer was correct!*
- ***T*** *The "P" in PEMDAS tells me to look for parentheses, since there are none in this expression I will move onto the "E."*
- ***T*** *The "E" stands for exponents, I see two sets of exponents in this expression:* 4^2 *&* 2^3.
- ***T*** *Remember that when solving for exponents it does not indicate to multiply by that number, instead it tells us how many time the whole number should be multiplied by itself.*
- ***T*** *Therefore,* 4^2 *is 4 x 4, which equals 16.*
- ***T*** *When I am solving expressions with many steps, I like to indicate the answers to the portions I am solving below.*
- ***T*** *So, below* 4^2 *I will write 16, and below* 2^3 *I will write 8 because 2 x 2 x 2= 8.*
- ***T*** *Since there are no more exponents we are ready to move on to the next letters which are M & D.*

Name & Date

Evaluating Expressions with Parentheses, Brackets, and Braces

Expression: $4^2 + 6 \times 1/3 + 2^3 \times 10 =$

No extra symbols: $4^2 + 6 \times 1/3 + 2^3 \times 10 = 16 + 2 + 80 = 98$

$$4^2 + 6 \times \frac{1}{3} + 2^3 \times 10 =$$

$$\mathbf{16} + 6 \times \frac{1}{3} + \mathbf{8} \times 10 =$$

$$16 + \mathbf{2} + 80 =$$

$$\mathbf{18} + 80 = \mathbf{98}$$

- ***T*** *Multiplication and Division will happen at the same time, start at the left and solve any multiplication or division problems you encounter.*
- ***T*** *After solving for our exponents our expression now reads: "*$16 + 6 \times \frac{1}{3} + 8 \times 10 =$*".*
- ***T*** *I see 2 multiplication problems that need to be solved:* $6 \times \frac{1}{3}$ *and* 8×10.
- ***T*** *Just like in the last step I will indicate my answers below.*
- ***T*** *I can solve* $6 \times \frac{1}{3}$ *or I can first divide 1 by 3 to convert it from a fraction into a decimal.*
- ***T*** $\frac{1}{3}$ *is .3333¯, so 6 x .3333 = 2, I will record a 2 below* $6 \times \frac{1}{3}$.
- ***T*** *Next, I will solve 8 x 10, which I know is 80.*
- ***T*** *So now my expression reads: "*$16 + 2 + 80 =$*".*
- ***T*** *The final step in order of operations is adding or subtracting.*
- ***T*** *I say "or" because just like multiplication and division, you will decide what to solve first by working left to right.*
- ***T*** *First, we will solve 16 + 2, which is 18 and then add 80, which is 98.*

Using Symbols to Create Minimum & Maximum Values

- ***T*** *As you know, adding symbols like parentheses, brackets, and braces into an expression will change the meaning or the value of an expression, just as adding different punctuation marks into a sentence can change the way a sentence is read or even its meaning.*
- ***T*** *Now you will put parentheses, brackets, and braces into an expression to try to find the minimum value it.*
- ***T*** *Then, by placing the symbols in different places you will try to achieve the maximum value of the expression.* See example & model so students can follow.
- ***T*** *This can be very challenging because you will need to try a variety of placements.*
- ***T*** *It is okay if your first attempt gets you the maximum value, when you were trying to find the minimum instead.*
- ***T*** *Your goal is to find both the minimum and the maximum.*

- ***T*** *You are going to work with a partner who is wearing the same color as you.*
- ***T*** *When I say, "Go", you will stand up and find someone to work with who is wearing the same color as you are today.*
- ***T*** *Ok, Go!*

Give time for students to find partners. Monitor students and ensure they are being respectful when choosing a partner and that everyone is paired up. If there is an odd number of students you will need to create a group of 3.

- ***T*** *Don't forget to show your work.*
- ***T*** *If you have any questions, do not hesitate to ask me!*
- ***T*** *Here is the expression:* $4^2 + 6 \times \frac{1}{3} + 2^3 \times 10 =$
  See example & model for answers.

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

- ***T*** *Now that you have had some time to work on the numerical expression with your partner, let's take some time to share your solutions.*
- ***T*** *Who would like to begin? If you have the same solution on your paper, show me a thumb instead of interrupting your friends.* Call on a student for each part of the problem. Write their ideas on the board. Answers shown on the right. Students' answers may vary depending on how they chose to input the symbols. The maximum value is 1, 832.6 and the minimum is 87.3.

Name & Date

Evaluating Expressions with Parentheses, Brackets, and Braces

Expression: $4^2 + 6 \times 1/3 + 2^3 \times 10 =$

No extra symbols: $4^2 + 6 \times 1/3 + 2^3 \times 10 = 16 + 2 + 80 = 98$

Minimum: $[(4^2 + 6) \times 1/3] + 2^3 \times 10 = 22/3 + 80 = 87.3$

Maximum: $[(4^2 + 6) \times (1/3 + 2^3)] \times 10 = 22 \times 8.33 \times 10 = 1{,}832.6$

- ***T*** *Even though some of you were unable to find the exact minimum answer and the exact maximum, you should be proud if you were able to find multiple answers by moving around the different symbols in your expression.*
- ***T*** *Ok, so now that we know how to play around with parentheses, brackets, and braces, we will move on to the next problem.*
- ***T*** *We have solved an expression to find a minimum and a maximum, now I will give you a numerical expression with an answer.*
- ***T*** *Your task is to place the parentheses in necessary spots to make the equation true.*
- ***T*** *For example:* $2 + 3 \times 4 = 20$*; I need to rewrite it with parentheses as,* $(2 + 3) \times 4 = 20$. Write example on the board.
- ***T*** *However, your problems will be a bit more difficult.*
- ***T*** *Let's see if you can solve these problems by adding parentheses to make the expression true.*
- ***T*** *Remember to show your work step by step.*
- ***T*** *Please copy this equation on your paper and then you may begin.*
  - $6^2 + 15 - 4 \times 0.25 \times 7 + 1 = 58$

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

- ***T*** *Now that you have had a chance to work through this problem, who would like to share their answer with the class?*
- ***T*** *If you came up with the same solution, show me a thumbs up instead of calling out.* Call on a student to answer. Write their ideas on the board.

T *Make sure you also tell the class what steps you took to arrive at your answer. Indicate what parentheses you added and the steps you took.* Record steps on the board. Repeat with more volunteers. Answers are on the model sheet.

T *Great! Now we will move on to the next one.*

T *We will use the same problem solving skills for the next problem.*

T *Are you ready? This one will be tougher, so take your time.*

T *On your paper please copy this equation:* $14 + 68 \times 2 \times 4 \times 3 = 480$.

T *Just like the last problem, you will need to add parentheses to make the equation true.*

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

T *Who would like to volunteer and explain where the symbols should go? If you agree with the person speaking, don't forget to put your thumb up.* Call on a student to answer. Write their ideas on the board.

T *Ok, can you tell me why you decided to place these symbols there?* Record steps on the board. Repeat with more volunteers. Answers are on the model sheet.

Place the missing parentheses to make the equation true:

$6^2 + 15 - 4 \times 0.25 \times 7 + 1 = 58$

$6^2 + (15 - 4) \times 0.25 \times (7 + 1) = 58$

$14 + 68 \times 2 - 4 \times 3 = 480$

$[(14 + 68) \times 2 - 4] \times 3 = 480$

T *Great job everyone! The final problem that we will work on before the break is comparing the same numerical expression, but with different placement of the symbols.*

T *For example,* $(2 + 3) \times 4 > 2 + (3 \times 4)$.

T *What do you notice about this statement?* Call on a student to answer.

T *We will solve both sides, show our work and then compare the answers.*

T *Then, we will put a less than, greater than or equal sign to make the expression true.*

T *Here is your problem!* $(3^2 - 4) \times 6 - \frac{1}{2} \quad ? \quad 3^2 - 4 \times (6 - \frac{1}{2})$

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

T *Ok, who would like to tell me how you compared these expressions?* Record steps on the board. Repeat with more volunteers. Answers found on the right.

$$(3^2 - 4) \times 6 - \tfrac{1}{2} > 3^2 - 4 \times (6 - \tfrac{1}{2})$$
$$5 \times 6 - \tfrac{1}{2} > 9 - 4 \times 5.5$$
$$29.5 > -13$$

T *As you can see, moving the parentheses around can have a big impact on the answer.*

T *Thank you to those of you who volunteered to share.*

T *Now I would like to collect your papers so that your teacher can see your progress.*

T *Make sure you have written your name on your paper before you hand it in.* Collect papers and use them as exit slips for this segment. Give them to the teacher to review later.

T *Great! Now that we have worked so hard, we can finish this lesson with a bit of movement!*

T *So, let's get up and stretch!*

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 14)

Instructional Plan: Segment 3: 40-60 minutes

Subject

- Activity: Backwards Numerical Evaluation

Objective

- Students will be able to apply previous knowledge about the order of operations (PEMDAS).
- Students will be able to evaluate numerical expressions with parentheses, brackets, and braces.
- Students will be able to come up with their own examples of numerical expressions using these symbols.

Materials

- blank paper (as much as needed per student)
- pencil & crayons/colored pencils
- whiteboard & markers
- Optional: printable "Exit Slip" (page 13)

Backwards Activity

T *So far, we have practiced* PEMDAS, *we have evaluated different numerical expressions, and we have seen how answers may change depending on the position of parentheses, brackets, and braces.* **Write PEMDAS and then parentheses, brackets, and braces on the whiteboard.**

T *Now it is time to see how we can apply that knowledge and solve a backwards problem.*

T *It will be something like Jeopardy – I will give you an answer and then you will have to come up with the numerical expression that needs to be solved to get that answer.*

T *However, there are some rules for this game.*

T *First, there is no one single correct numerical expression that will yield the answer.*

T *Does this mean we will have multiple ways to solve the problem?* **Wait for a whole class answer. Answer: Yes**

T *Second, you need to have at least 5 numbers in the numerical expression, otherwise it would be too easy.*

T *So, if I gave you the answer of 18 an example of a correct answer might be* 5 + 4 x 6 – 5 x 2. **Write example on board for students to model their answers after.**

5 + 4 x 6 – 5 x 2.
24 10
5 + 24 – 10 = 18

T *So, how many numbers do you need in your expression?* **Wait for a whole class answer. Answer: 5**

T *Another rule is you need to show two different numerical expressions that yield the same answer, but have different numbers and different placement of the symbols, if you choose to add symbols.*

[5 + (4 x 6)] – 5 x 2.
24
5 + 24 = 29
29 – 5 x 2
29 – 10 =

T *You will earn 5 points per correct numerical expression.*

T *So, if both of your numerical expressions are correct, you can earn a total of 10 points.*

T *Then, you can also earn 2 bonus points if you are able to create an expression that includes two out of the three symbols – parentheses, brackets, and braces. How many symbols do you need in your numerical expression to earn 2 extra points?* **Wait for a whole class answer. Answer: 2**

T *To sum it up, you need two different expressions and at least 5 numbers in each numerical expression.*

T *To earn additional bonus points you need to use at least 2 out of the 3 types of symbols (parentheses, brackets, and braces in each).*

Rules:

1.) Must have 5 numbers
2.) Must write 2 different expressions per answer.

Scoring Points

- 5 Points for each correct numerical expression containing 5 numbers
- 2 Bonus Points if correctly used 2 symbols (parentheses, brackets, & braces)

- ***T*** *After you work on these problems, you and your partner will exchange your paper with another group and check their work.*
- ***T*** *The other group will be awarding you with points for each correct expression and bonus points if 2 symbols are included in your numerical expression.*
- ***T*** *If the partners you have switched with made a mistake, discuss it with them and identify the issue.*
- ***T*** *We will also look at a few examples together on the board to make sure that we all understand the procedure.*
- ***T*** *After we are done with the activity, we will continue by thinking about how numerical expressions with parentheses, brackets, and braces can be used in real life. Any questions before we start?*

Give each student a piece of paper.

- ***T*** *I will write the answers on the board. Remember, you have to go backwards and make up your numerical expressions from there.*
- ***T*** *The first answer is 72.*
- ***T*** *The second one is 44.*
- ***T*** *The third one is -28.*
- ***T*** *The fourth one is 177.*
- ***T*** *And the fifth one is 99.5.*
- ***T*** *Get your pencils ready and go!*

Differentiation:
Pair struggling students with a partner. If the whole class appears to be solid on the concept, you may want them to complete this task independently.

Note:
If some students are finished earlier than others, give them a couple more answers to work on: 243 and 13.

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

- ***T*** *Now exchange your papers with another group and look thoroughly through their solutions.*
- ***T*** *If something is unclear, do not hesitate to ask them.*

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

- ***T*** *Now I would like us to take the opportunity to share our many solutions for each answer.*
- ***T*** *This will help you to clearly see that there is always more than one way to solve a problem!*
- ***T*** *Who would like to share?* Call on a few students and write down their numerical expressions. Ideally, have the students walk the whole class through their solutions on the whiteboard. This will take some time for all 5 answers and their numerical expressions.

Real Life Application

- ***T*** *We practiced using a lot of numbers that we cannot connect with our real-life experiences.*
- ***T*** *But let's stop for a moment and think, what are some occasions where we have to add, subtract, multiply and divide several numbers at once?*
- ***T*** *I may need to group these numbers in my numerical expression using imaginary parentheses, brackets, and braces.*
- ***T*** *Let me give you an example of what I mean.*
- ***T*** *I am going to the grocery store and I need to buy the following items: 4 bananas and each one weighs 120 grams; 2 apples and each one weighs 80 grams, and 3 boxes of strawberries with 500 grams in each. I want to buy all these things twice and separate them – one time for me and one time for my brother.*
- ***T*** *How many* ***kilograms*** *will that be in total?* Write example on the whiteboard.
- ***T*** *How can I write this using a numerical expression with grouping symbols?* Call on a few students to give their guesses. Write their ideas on the board. The correct answer: 2[(4 x 120) + (2 x 80) + (3 x 500)]/ 1,000 = 2[480 + 160 + 1500]/1,000 = 2x2,140/1,000 = 4,280/1,000 = 4.28 KG

- ***T*** *I would like you to come up with a similar scenario and support it with a numerical expression with parentheses, brackets, and braces.*
- ***T*** *I will leave my example on the board to help you as you create a similar scenario and support it with a numerical expression using parentheses, brackets, and braces.*

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

- ***T*** *After you are done with your scenario and the corresponding numerical expression, I will collect your papers.* Collect papers and use them as exit slips for this segment. Give them to the teacher to review.
- ***T*** *Eyes on me in 5...4...3...2...1...0. Thank you!*
- ***T*** *We are done with this lesson, so let us get up and move around a little bit!*

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 14)

Name: _____Date: _____

Exit Slip: Segment 1
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 x 12 – 3 x 7=

2. Add symbols to the expression and solve. 4 + 6 x 12 – 3 x 7=

3. Add different symbols to the expression and solve. 4 + 6 x 12 – 3 x 7=

Name: _____Date: _____

Exit Slip: Segment 3
Order of Operations: Real Life Application
PEMDAS

Directions: Create a scenario that involves use of at least 2 of the 3 symbols, parentheses, brackets, and braces. Then show the corresponding numerical expression.

Example: *I am going to the grocery store and I need to buy the following items: 4 bananas and each one weighs 120 grams; 2 apples and each one weighs 80 grams, and 3 boxes of strawberries with 500 grams in each. I want to buy all these things twice and separate them – one time for me and one time for my brother. How many* ***kilograms*** *will that be in total?*

Numerical Expression: 2[(4 x 120) + (2 x 80) + (3 x 500)]/ 1,000 = 2[480 + 160 + 1500]/1,000 = 2x2,140/1,000 = 4,280/1,000 = 4.28 KG

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.