

NTTI MEDIA RICH LESSON

PART 1

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NAME

“Xpresso”

TITLE

55 minutes with an extended-plan for a 90-minute block

TIME ALLOTMENT:

OVERVIEW:

Understanding and using symbols and expressions are vital to a student’s mathematical development. It provides the foundation for language that continues to grow as a student explores mathematics and its related subjects. Mathematics as communication and representation is fundamental to the development of a conceptual understanding. This is why it is important to emphasize these aspects from the very beginning. Student’s involvement through individual participation and cooperative learning is woven throughout the lesson to accomplish this.

This lesson is designed as a part of a series to teach conceptual algebra in either 7th or 8th grade Pre-Algebra class. It can also be used as an introduction to an Algebra I class for accelerated students in the middle school or a regular class for high school students. The lesson introduces simple expressions and their representations. It shows how expressions can be added and subtracted. It also touches on algebraic properties, such as the commutative property. The use of the Algebra Tiles is strongly recommended throughout the series as part of



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hands-on activities. Also, the lesson is modular. The extensions at the end can be incorporated into the lesson or not depending on the amount of time for class.

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SUBJECT MATTER:

Mathematics

GRADE LEVEL:

7th or 8th Grade Pre-Algebra/Algebra I

LEARNING OBJECTIVES:

The students will be able to:

- Construct and interpret algebraic expressions
- Collect like terms
- Add and subtract like terms
- Use algebraic expressions in real-life applications

STANDARDS:**National Council of Teachers of Mathematics (NCTM):**

Represent and analyze mathematical situations and structures using algebraic symbols.

- Develop an initial conceptual understanding of different uses of variables;
- Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope;
- Use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships;
- Recognize and generate equivalent forms for simple algebraic expressions and solve linear equations.

Georgia Quality Core Curriculum (QCCs) 1, 3, and 4:

1. Solves problems that involve selecting appropriate approaches and tools, estimating, and judging the reasonableness of results throughout elementary algebra.
3. Reviews the following algebraic topics:



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- Simplifies numerical expressions.
 - Evaluates simple algebraic expressions and formulas.
 - Translates words into algebraic expressions and equations.
 - Represents problem situations by algebraic expressions and equations.
 - Identifies subsets of the real numbers, such as whole numbers, integers, rational and irrational numbers.
 - Graphs real numbers on a number line.
 - Adds, subtracts, multiplies, and divides integers and other rational numbers, and finds their absolute value.
4. Identifies and applies properties of the real number system, including simplifying numerical and algebraic expressions, and determining equivalent expressions.

MEDIA COMPONENTS:

Video: Math Vantage # 122: “Algebraic Expressions” [produced by Nebraska Mathematics and Science Coalition and distributed by GPN]
Mathematics Grades 6-8

This series integrates practical application and enrichment activities into the curriculum, and promotes student problem-solving strategies and reasoning skills. The series helps students make the connection between what they’ve learned in class and what lies outside the classrooms.

<http://www.gpn.unl.edu/mav/mavindex>

Supplementary Materials:

Algebra Action #101: “What is a Variable?” and Algebra Action #102: “What Does It Mean to Evaluate An Expression?” [Produced by ITS and distributed by Center for Education]
Mathematics Grades 9-12

A series of short, single concept programs designed to introduce, reinforce and review basic algebra concepts.

<http://www.its.itmonline.com/>

Riverdeep, Destination Math: Mastering Algebra I, Course 1

The Destination Math Series is a carefully sequenced, comprehensive curriculum that demonstrates how Mathematical issues arise out of real-life situations.



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www.riverdeep.net/math/destination_math/dm_tools/coursev/msc5_1.12.jhtml

Edteach, Understanding Algebra: An online algebra text by James W. Brennan

Chapter 2: Introduction to Algebra- Algebraic Expressions- the complete contents of this algebra textbook are available here online. This text is suitable for high-school Algebra I, preparing for the GED, a refresher for college students who need help preparing for college-level mathematics, or for anyone, including homeschoolers, who wants to learn introductory algebra.
www.edteach.com/algebra/intro%20to%20algebra/algebraic_expressions.htm

Interactive Exploration: ExploreLearning- Algebra Learning Modules for MCS

Using algebraic expressions: ExploreLearning's algebra learning resource modules allow students and educators to experiment with equations, variables, and graphs in a hands-on, visual manner. They are fully integrated with the curriculum management resources of Microsoft Class Server (MCS). Each module includes an ExploreLearning Gizmo, an Exploration Guide, and Progress Check Questions.
http://mcs.explorelearning.com/Content/Alg36/Preview/HTML/1_UsingAlgebraicExpressions/P

MATERIALS:

- Algebra Tiles (classroom set and transparent tiles for the overhead projector)
- Overhead Projector
- Transparencies
- Paper
- Pencils
- Notebooks
- Lamp/Classroom Lights
- Sound Effect of Thunder
- TV/VCR
- Video Tape



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PREPARATION FOR TEACHERS:

When introducing the algebra tiles, make sure that students have a worksheet that provides clear instructions so that they can work independently. The questions for the worksheet are built into the lesson provided here. Also, provide a worksheet that repeats a series of questions that will be discussed during the viewing of the video segment in order to differentiate and reinforce the concepts of adding and subtracting algebraic expressions. The worksheets can be constructed from the questions that are embedded in this lesson plan. This lesson is meant to fit into a fifty-five minute class period. A good rule of thumb when working with seventh graders is to not spend too much time on one activity and try not to saturate them with too much information. This lesson is the first lesson of a series of lessons that will use the entire video on algebraic expressions. If you find that the class period ends before you have finished, pick up the next day where you left off in order to provide continuity.

INTRODUCTORY ACTIVITY:

Setting the Stage/Engage (Maximum of 20 minutes)

Step 1:

The students will already have a basic understanding of the algebra tiles, or at least, will know how to use them for integer addition. Let us assume for this activity that they only know how to use the tiles for integer addition. Introduce to them what is known as the “ x ” tile for both a positive “ x ” and a negative “ x ” and demonstrate to them how they make a “zero pair” when put together. In another word, they add to “0.” Model the creation of basic expressions using the basic tiles and ask them to represent the following basic expressions using the tiles:

- $X + 1$
- $-2X + 1$
- $X + 2$
- $3X - 2$
- $-3X - 4$

Step 2:

Have students work in groups of two for about three minutes and ask several groups to come up to the overhead projector to demonstrate the modeling of the given expressions using transparent tiles.



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Step 3:

After students finish, ask the class, “What would happen if we were to add two of the expressions together?” “What would be the result?” If they have trouble understanding, model one expression for them and then ask them to model the addition of any two of the expressions.

Step 4:

Give them three minutes and then ask two groups to come up to the overhead projector and model the addition of two of the expressions. Keep the following question in mind, “What happens when you have a “zero pair?” *The answer must be: They cancel each other out and must be removed. Repeat this question several times during the process to reinforce the concept.*

LEARNING ACTIVITY:

Using the video on “Algebraic Expressions” (Maximum of 20 minutes)

Step 1:

Insert video of Math Vantage: Algebraic Expressions #122, in the VCR. **START** the tape from the beginning to the 24-second mark: Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking them to define the word “symbol” and allow for many answers in order to connect to other subject areas (You may prepare some samples of symbols on transparencies to show to your class.).

- What is a symbol?
- How are symbols used in every day life?

After the discussion, **PLAY** the tape until it shows several mathematical expressions and replaces the variables with animal symbols. **STOP** the tape. **CHECK** for comprehension. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking students the following questions:

- How is a symbol used in mathematics?
- How did they use the symbols in the video segment?

As students answer, guide them towards the use of symbols to represent numbers, operations, variables, and combinations.

Step 2:



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After the discussion, **RESUME PLAY** of the tape and continue to play through the segment on how to figure out the distance a lightning flash is away from a person by counting from the time the lightning starts and when you hear the sound of the thunder. **PAUSE** the tape right before the narrator begins to discuss the meaning of the word “Algebra.” **REWIND** the tape for this segment if needed for reinforcement after discussion. **STOP** the tape. Provide your students with a **FUCUS FOR MEDIA INTERACTION**, asking your class:

- What is the rule for finding out how far away lightning is?
- Give them two minutes to write this down on a sheet of paper or in their notebook to ensure that all students are involved.
- *The answer is, “To start counting when you see the lightning and stop when you hear the thunder. For every five seconds you count, the lightning is one mile away.”*
- Try to focus and lead class discussion on words and construct a list of the vocabulary they can learn from the video such as symbol, generalization, pattern, expression, variable, and algebraic expression.

CULMINATING AND INTERACTIVE ACTIVITY:

Recreate Thunder and Lightning

Step 1:

Use the classroom lights and some sound effect to recreate the lightning and thunder. Tell the class that when you flicker the lights, they have to close their eyes and start counting.

Step 2:

When they hear the sound effect that you have chosen for thunder, they must stop counting and estimate the distance the “lightning” is away from the class.

Step 3:

Repeat the same process several times and ask your students to write down the time counted. Make sure to ask your students to divide each time by five for each of the trials. Explain or briefly describe segment of video referenced.

Step 4:

Ask your class if they can see a pattern and can make a generalization to mirror what was last shown in the video segment.



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Step 5:

Ask your students the following questions:

- How does the expression make it easier to determine how far away the lightning is?
- Ask the students how far away the lightning is if you count to 20, 25, 30, and 40?

CROSS-CURRICULAR EXTENSIONS:

Language Arts:

Before you resume the video segment on the tape, ask the students:

- Do you know the origins of the word “Algebra?”
- What language does it come from? [*Persian: a branch of Arabic*]
- *Tell them that the Persians contributed much to the development of mathematics in the 9th century and preserved translations of many Ancient Greek Texts that had perished when the Library of Alexandria in Egypt was burned.*

<http://www.aug.edu/dvskel/MichSP93.htm>

<http://www.und.edu/instruct/lgeller/algebra.html>

http://vmoc.museophile.com/algebra/section3_1.html

RESUME PLAY the video segment until the narrator is walking out of the house. **STOP** the tape. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking the class:

- What did the narrator say about the origins of the word “Algebra?”
- Did it relate to the discussion prior to the segment of the video?

COMMUNITY AND REAL LIFE CONNECTIONS:

Before you restart the video, let the students know that you will turn off the sound and that they have to figure out what the video is trying to explain. This video segment will make a real life connection using a taxicab as a vehicle and it will show various expressions involving the charge to use the taxicab. There is an initial charge and there is so much added on per minute and so much added on per mile. **MUTE** the sound, **RESUME PLAY** of the tape and **STOP** it when the taxicab segment is over. Provide your students with a **FOCUS FOR MEDIA INTERACTION**, asking the class:



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- What was the video segment about?
- How did the video use an expression to explain the charge?
- What part of the expression shows an initial charge for getting into the cab?
- How else is the cab driver making more money?
- How is time a factor?
- How is distance a factor?
- Ask them if they can reconstruct the expression from memory.

EXTENDED LEARNING ACTIVITY 1:

To provide the challenge for gifted class or to differentiate instruction for accelerated students.

If necessary, **REWIND** the segment(s) and show it again. If there is time or an extended time, you can have students create their own narrative(s) to the segment(s). They can do this as a cooperative learning activity. This would work well in a regular ninety-minute class for block scheduling.

CLOSURE ACTIVITY:

(Maximum of 15 minutes)

Step 1:

Assign the students into groups of four and ask them to combine their pencils, notebooks, and textbooks.

Step 2:

Ask your students in each group to put their items together in the same pile. This helps to reinforce the collecting of like terms.

Step 3:

Ask each group to write an expression that tells them how much they have of each. A possible expression could be:

$$4 \text{ pencils} + 2 \text{ notebooks} + 3 \text{ textbooks}$$

Step 4:



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Ask the class how much they would have to take away from the original pile in each group so that there will be the same amount of each item. Ask your students to write an expression that shows the result after they take away the required amount. Given the above expression, the resulting expression would be:

$$2 \text{ pencils} + 2 \text{ notebooks} + 2 \text{ textbooks}$$

Step 5:

Ask the class how much they would have to add to the original pile in order to have the same amount of each item. Also ask them to write an expression that shows the result after they add to the required amount. Given the same above expression, the resulting expression would be:

$$4 \text{ pencils} + 4 \text{ notebooks} + 4 \text{ textbooks}$$

Step 6:

Have your students write the expressions from each constraint in the form of algebraic expressions. Given the above expressions, the resulting algebraic expressions would be:

$$\begin{aligned} 4p + 2n + 3t \\ 2p + 2n + 2t \\ 4p + 4n + 4t \end{aligned}$$

Make sure to have each group show its written results.

EXTENDED LEARNING ACTIVITY 2:

To provide the challenge for gifted class or to differentiate instruction for accelerated students.

If there is extra time or an extended period, you can ask several groups of students to get up in front of the class and demonstrate the three different scenarios. And/or have them put all of the items in the same piles and write the expressions and algebraic expressions on the board. Make sure that they explain the process. This would work as well in addition to a regular ninety-minute class for block scheduling.

STUDENT MATERIALS:



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- Textbooks
- Notebooks
- Pencils



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