Instructor's Name: Cassie Schroer
Subject : Math
Grade: 8
Title of Lesson: Multiply and divide monomials

Materials and Resources (including technology):

Lesson being taught online

Standard(s) the Lesson will Address: Type out the source, number, and the text of the standard (s) addressed in this lesson

8.2.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of algebra. Properties include the associative, commutative and distributive laws, and the order of operations, including grouping symbols

Objective: State the CONDITION, the BEHAVIOR, and the CRITERIA. Label in ( ) the predominant domain of **C** for Cognitive, **A** for Affective, or **P** for Psychomotor. DO NOT make every condition "at the conclusion of the lesson.."

At the completion of the lesson students will be able to distinguish the difference between the distributive property, associative property and commutative property.

During the lesson students will be able to recall their algebra knowledge to find the answer to the problems using the distributive property, associative property and commutative property.

Vocabulary:

Distributive Property: if you recall that "multiplication *distributes* over addition" or used to multiply a single term and two or more terms inside a set of parentheses

Associative Property: states that you can add or multiply regardless of how the numbers are grouped. By 'grouped' we mean 'how you use parenthesis'. In other words, if you

are adding or multiplying it does not matter where you put the parenthesis. Add some parentheses anywhere you like!

Commutative Property: comes from "commute" or "move around", so the Commutative Property is the one that refers to moving stuff around

Anticipatory Set: How will you get the students ready and/or excited to accept instruction?
Not sure what to do here because the students will be required to watch the video to learn the new terms and concepts.

Pre-Assessment Plan (if any): Pre-assessments help you to determine what students already know and bring to the lesson content.
This will probably be done before the unit is started for this age.

Input: (SCRIPTED)*Detailed planning: Write plans to a level of depth that would allow another teacher to use the plan to deliver the instruction. Script the learning target(s), transitions and key questions as well as timings.***)**

(This will all be done in the video for students to watch before class)

Distributive Property:
The Distributive Property is easy to remember, if you recall that "multiplication *distributes* over addition". Formally, they write this property as "$a(b + c) = ab + ac$". In numbers, this means, that $2(3 + 4) = 2\times3 + 2\times4$. Any time they refer in a problem to using the Distributive Property, they want you to take something through the parentheses *(or factor something out)*; any time a computation depends on multiplying through a parentheses *(or factoring something out)*, they want you to say that the computation used the Distributive Property.

- **Why is the following true? $2(x + y) = 2x + 2y$**
- Since they distributed through the parentheses, this is true **by the Distributive Property.**
- **Use the Distributive Property to rearrange: $4x - 8$**
- The Distributive Property either takes something through a parentheses or else factors something out. Since there aren't any parentheses to go into, you must need to factor out of. Then the answer is "By the Distributive Property, $4x - 8 = 4(x - 2)$"

"But wait!" you say. "The Distributive Property says multiplication distributes over *addition,* not *subtraction!* What gives?" You make a good point. This is one of those times when it's best to be flexible. You can either view the contents of the parentheses as the subtraction of a positive number ("$x - 2$") or else as the addition of a negative number ("$x + (-2)$"). In the latter case, it's easy to see that the Distributive Property applies, because you're still adding; you're just adding a negative.
The other two properties come in two versions each: one for addition and the other for multiplication. (Note that the Distributive Property refers to both addition and multiplication, too, but to both within just one rule.)

Associative Property:
The word "associative" comes from "associate" or "group";the Associative Property is the rule that refers to grouping. For addition, the rule is "$a + (b + c) = (a + b) + c$"; in numbers, this means $2 + (3 + 4) = (2 + 3) + 4$. For multiplication, the rule is "$a(bc) = (ab)c$"; in numbers, this means $2(3\times4) = (2\times3)4$. Any time they refer to the Associative Property, they want you to regroup things; any time a

computation depends on things being regrouped, they want you to say that the computation uses the Associative Property.

- Rearrange, using the Associative Property: $2(3x)$
- They want you to regroup things, not simplify things. In other words, they do not want you to say "$6x$". They want to see the following regrouping: $(2\times3)x$
- Simplify $2(3x)$, and justify your steps.
- In this case, they *do* want you to simplify, but you have to tell why it's okay to do... just exactly what you've *always* done. Here's how this works:

$2(3x)$	original (given) statement
$2\times3)x$	by the Associative Property
$6x$	simplification $(2\times3 = 6)$

- Why is it true that $2(3x) = (2\times3)x$?
- Since all they did was regroup things, this is true by the Associative Property.

Commutative Property:

The word "commutative" comes from "commute" or "move around", so the Commutative Property is the one that refers to moving stuff around. For addition, the rule is "$a + b = b + a$"; in numbers, this means $2 + 3 = 3 + 2$. For multiplication, the rule is "$ab = ba$"; in numbers, this means $2\times3 = 3\times2$. Any time they refer to the Commutative Property, they want you to move stuff around; any time a computation depends on moving stuff around, they want you to say that the computation uses the Commutative Property.

- Use the Commutative Property to restate "$3\times4\times x$" in at least two ways.
- They want you to move stuff around, not simplify. In other words, the answer is not "$12x$"; the answer is any two of the following:
    - $4 \times 3 \times x$, $4 \times x \times 3$, $3 \times x \times 4$, $x \times 3 \times 4$, and $x \times 4 \times 3$
- Why is it true that $3(4x) = (4x)(3)$?
- Since all they did was move stuff around (they didn't regroup), this is true by the Commutative Property.

Guided Practice (Formative Assessment):

(This will all be done in the video for students to watch before class)

I will also have students practice this at the beginning of the class time before starting on the independent practice.

Simplify $3a - 5b + 7a$. Justify your steps.

- I'm going to do the exact same algebra I've always done, but now I have to give the name of the property that says it's okay for me to take each step. The answer looks like this:

$3a - 5b + 7a$	original (given) statement
$3a + 7a - 5b$	Commutative Property
$(3a + 7a) - 5b$	Associative Property

$a(3+7)-5b$	Distributive Property
$a(10)-5b$	simplification $(3+7=10)$
$10a-5b$	Commutative Property

Simplify $23+5x+7y-x-y-27$. Justify your steps.

$23+5x+7y-x-y-27$	original (given) statement
$23-27+5x-x+7y-y$	Commutative Property
$(23-27)+(5x-x)+(7y-y)$	Associative Property
$(-4)+(5x-x)+(7y-y)$	simplification $(23-27=-4)$
$(-4)+x(5-1)+y(7-1)$	Distributive Property
$-4+x(4)+y(6)$	simplification
$-4+4x+6y$	Commutative Property

Simplify $3(x+2)-4x$. Justify your steps.

$3(x+2)-4x$	original (given) statement
$3x+3\times2-4x$	Distributive Property
$3x+6-4x$	simplification $(3\times2=6)$
$3x-4x+6$	Commutative Property
$(3x-4x)+6$	Associative Property
$x(3-4)+6$	Distributive Property
$x(-1)+6$	simplification $(3-4=-1)$
$-x+6$	Commutative Property

Why is it true that $3(4+x)=3(x+4)$?
All they did was move stuff around: Commutative Property

Why is $3(4x)=(3\times4)x$?
All they did was regroup: Associative Property

Why is $12-3x=3(4-x)$?

They factored: Distributive Property

Independent Practice/Summative Assessment: (How will students extend or apply their learning OR demonstrate mastery? If demonstrating mastery, include criteria for evaluation (checklist, rubric, sample, etc).

IXL Practice: Multiply and divide monomials (8-BB.8)
Answer any questions
Worksheet:
Commutative and Associative Practice

Accommodations & differentiation for learners: (For all practice lesson assume that you have at least one student in each category: attention/focus issue, language processing issue, sensory issues)

How do I incorporate this in for the video part of the lesson?

Multiple Intelligences Addressed: Address at least ONE of these intelligences: verbal linguistic, musical/rhythmic, visual/spatial, intrapersonal, logical/mathematical, interpersonal, bodily/kinesthetic, naturalistic

---

AFTER TEACHING THE LESSON:

Respond with *professional insights that go beyond superficial considerations.*

- As I reflect on the lesson, to what extent were students productively engaged?
- To what extent did the students learn what I intended? Were instructional objectives met?
- To what extent did I alter my objectives or instructional plan as I taught the lesson? Why?
- To what extent did I practice effective classroom management strategies? What issues do I need to address when I teach again?
- To what extent did I provide closure to the lesson?
- If I had the opportunity to teach this lesson again to the same group of students, what would I do differently? Why? How would this affect the outcome of this and future instruction?