

LESSON PLAN 1

Teacher: Mike Mills **Subject/Lesson Title:** Prime Time 4.1: Reasoning with even and odd numbers **Grade:** 6th

Curriculum Context/Rationale: In this lesson students build on their previous knowledge of even and odd numbers by representing them with rectangular arrays of square tiles. They think about even and odd numbers in different ways as they examine their multiplicative and additive characteristics. This lesson has the students making statements that require them to reason about the sum or product of combinations of even and odd numbers. By making those statements and defending them with evidence (in the form of rectangular arrays and written explanations) students will continue to use their ability to find greatest common factors developed earlier this unit and they will begin to informally use the distributive property (common core standard 6.NS.B.4). The next two lessons build on this informal use of the distributive property by formalizing it, providing practice using it and facilitating a deeper understanding through the use of rectangular arrays and interesting problems. The end goal of this lesson segment is for students to conceptually understand the distributive property and be able to fluently use it to solve problems.

Curriculum citation: Lappan, G., & Phillips, E. (2014). Prime time: Factors and multiples. Boston, MA: Pearson Prentice Hall.

Common Core Standards: 6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Short Term Learning Targets/Objective(s) for This Lesson:

Focus question: *How do you decide whether a number is even or odd?*

Learning target: *I can decide whether a number is even or odd and defend my answer with reasoning/evidence.*

The goal is for students to be making statements about sums and products of even and odd numbers and providing justifications for their choices using tiles or other methods. In doing this they will be informally using the distributive property. The students must also be able to defend their answers with evidence, and so must be able to explain their reasoning to peers.

Academic Language Objectives: Students are asked to *defend their statements/arguments with evidence and/or reasoning*, both orally and written. The new academic language vocabulary words that they will need for this investigation are *expression* and *equivalent expressions*. The week before this lesson the students will be introduced to these words and given supports. Other vocabulary that they have learned in previous lessons that will be used in this lesson are *even*, *odd*, *factor*, *multiple*, *sum*, and *product*. The syntax they will be working on throughout this investigation involves organizing an expression by using operations, using rectangular arrays to represent multiplicative and additive relationships, and using sentence frames such as: "I believe _____, because _____," to defend their statements with reasoning and evidence.

Language Supports: New academic language (expression and equivalent expression) will be introduced the week earlier with a math vocabulary worksheet that the students are used to using. The sheet includes a definition, examples, "what it's not," and a picture. Additionally, the function of the language, to *defend with evidence and reasoning*, is one that the students are familiar with and during the parts of the lesson when they are expected to do this function, there will be several sentence stems provided to give them support.

Assessment Plan & Rationale for Assessments (Why these types?):

Pre-Assessment: Students will be given a short, written pre-assessment that will ask them to use the distributive property and explain their reasoning. The assessment will focus on their ability to procedurally solve the problem, as well as their conceptual understanding by demonstrating correct use of a rectangular array model to explain the distributive property. It will allow the teacher to see what the students can do and know before starting the learning segment.

Formative Assessment: During the explore the teacher will be circulating around and listening to student ideas and asking probing, guiding, or extension questions. Often the students will be working at whiteboards which are on all of the walls of the classroom. This environment allows the teacher to quickly see what all of the students are working on and what they are understanding or struggling to understand. This allows the teacher to immediately provide interventions for struggling students by going over and giving them small group instruction. The information gathered during the explore will guide the summarize so that concepts that still need to be developed are highlighted. Students will be doing quick 1-4 self-assessments at the beginning, end and once throughout each lesson about their ability to answer the focus question.

Summative Assessment: At the end of the learning segment, there will be a post-assessment that is similar to the pre-assessment which will be used as a summative measure of the students' growth.

Student Voice: During the launch, students get to discuss with their groups what they believe the terms even and odd mean (which is the learning target/focus question) both as vocabulary words and as tile model representations. During the explore and summarize students will be given the opportunity to express their own reasoning both written and verbal. On the white board and in their composition books they will record their reasoning. Students will often be asked by the teacher to try to answer the focus question during the explore. During the summarize the students will have to defend their statements to a pair of peers, after they have done that, they will be randomly called on to explain to the class what their peers said. The students will also be completing a self-assessment at the end of the segment that asks them to reflect on what they have learned in the time from the pre-assessment to the post-assessment regarding the learning targets, what they still need to work on and what they feel they can do to learn the missing pieces.

INSTRUCTIONAL SEQUENCE

Activating Prior Knowledge: To activate the students' prior knowledge during the launch the teacher will have students talk to a shoulder partner and then raise hands to share out their responses to the question: *What makes a number even and what makes a number odd?* While modeling the numbers with tiles students are prompted to think about factors as well. Also, during the math review, students will revisit how to draw numbers as rectangular arrays.

Communicating Learning Targets: The focus question will be displayed at the beginning of class on the projector. The teacher will point it out, reinforce it during the explore, and highlight it again during the summarize. The quick self-assessments that students do regarding their progress towards the focus question remind them of the learning target.

Learning Experiences:

Time	Teacher Tasks	Student Tasks
0-10 min Math review	Display math review slide and start timer for 10 minutes, then help students who are stuck or facilitate students helping each other. Give students a "thumbs-up" when they have completed the first math review,	Students know the everyday routine of coming in, writing in their planner and then going to their spots on the

	<p>this indicates to them to help one other student if they wish and then move on to the challenge review problem.</p> <p>Review: representing numbers as rectangles</p>	<p>whiteboard to complete the math review. When a student is done with the first math review problem they raise their hand and the teacher gives them a thumbs up if they are right, and tells them to check their work if they are wrong. If they get the first problem right they can move on to the challenge problem.</p>
<p>10-20 min Launch</p>	<p>Point out the focus question for the day (on the same slide as the math review) as a segue to the question: "What does it mean for a number to be even? Odd?" Let them talk to their shoulder partner for 30 seconds, then call on volunteers to share, using cards.</p> <p>Explain that today we will be exploring some different ways to represent even and odd numbers and making some statements about sums and products of even and odd numbers. Remind them that they will be responsible for <i>explaining and defending</i> their statements with reasoning and evidence.</p> <p>Show them how to represent even and odd numbers with tiles on the document camera. Be sure to show both the multiple definition and the factor definition, as it does in the textbook.</p> <p>Ask them: "How are the models for even numbers different from the models of odd numbers?"</p> <p>Read question A1 from investigation 4.1 out loud and explain that students should spend 5 minutes independently working on the problems and then join their partner working on the whiteboard. Remind them that both people in the pair will be responsible for being able to defend their answer with evidence and/or reasoning. Pass out tiles to groups that want them.</p>	<p>Students talk to shoulder partner for 30 seconds, then raise hands and offer up their ideas in their own words.</p> <p>Students talk to shoulder partner for 30 seconds, then raise hands and offer up their ideas in their own words.</p>
<p>20-48 min Explore</p>	<p>During the explore, circulate around to all of the groups identifying different strategies that students could share during the summarize. Also ask probing questions and randomly pick students to defend their statements.</p> <p>To get students who are stuck started ask them to think of some examples to try out for each question. For an extension ask students:</p>	<p>Students work on the problems from investigation 4.1. They start with 5 minute individual time, then they work in groups at the whiteboard, while still recording their answer in their comp book. They are responsible for displaying evidence for each of their claims on the whiteboard. Students raise hands when</p>

<p>48-58 min Summarize</p>	<p>"Is the sum of three odd (and even) numbers even or odd? Four? Five? What is the pattern?"</p> <p>Half of the pairs of students will rotate to another group who will have to defend their statements with evidence. Explain that protocol and that the students should be listening because at the end of the class students will be randomly selected to describe what the student said in defense of their statement to the class.</p> <p>If there is extra time, these are good questions to ask (these can be used for extensions during the summarize too):</p> <p>"Find a rule that represents all even numbers and another rule that represents all odd numbers." "Without doing the addition, are the following sums even or odd? $203+312$, $934+116$, $199+0$" "What about these products? 59×45, 120×56, 59×0"</p>	<p>they need more guidance or extensions.</p> <p>Students offer up their reasoning and solutions as well as answer questions prompted by the teacher or other students. An emphasis is placed on students defending their argument with evidence/reasoning.</p>
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Classroom Management: Students are arranged into table groups of three or four. For this activity they first work alone, then work in pairs at the whiteboards that are mounted all around the room. CHAMPS expectations are used to communicate what is expected to the students. There is a think time protocol that the students know. If they are misbehaving they will first get a non-verbal or quiet cue to correct their behavior. If they continue doing it the teacher will ask them to "make a better choice." If they continue the behavior then they are sent to think time, where they go to another classroom and think about how they can be a better, more productive member of the class, eventually rejoining with an improved attitude.

Instructional & Assessment Accommodations/Modifications for Diverse Learners: The first method of differentiation in the classroom is the low floor, high ceiling nature of the problem-based exploration that occurs throughout the entire learning segment. This strategy allows students with math learning difficulties to engage with the problem at the entry level, while the extension questions provide challenging tasks for the students who are exceeding standard. For the students in the class who struggle with understanding math problems and directions (there are two with IEPs and others) the teacher provides clear verbal explanations/directions, simple written explanations/directions on slides, as well as the more in depth instructions and descriptions that are given in their textbook. The teacher will also model the task they will be working on with tiles on the document camera. For students who learn better by seeing visuals and by getting to manipulate physical objects tiles are provided that they can use to represent the numbers and relationships using rectangles. The teacher checks in often with the students who struggle with motivation and directions, giving them shorter quicker tasks to complete in between check-ins.

Instructional Materials, Community Resources, and Technology: For this lesson, students need their math composition books, their textbook, a pencil, and their planner. The teacher/classroom needs a projector attached to a computer, a document camera, and a whiteboard space (or poster paper) for each pair of students. Square tiles should be available to students to help them model the numbers.

School/Home Interactions (if applicable): Students are given homework that parents can help with.

LESSON PLAN 2

Teacher: Michael Mills **Subject/Lesson Title:** Prime Time 4.2: Using the distributive property
Grade: 6th

Curriculum Context/Rationale: In the previous lesson students were using rectangular arrays to represent numbers and making statements about sums and products of combinations of even and odd numbers. This required them to informally start using the distributive property by realizing that numbers that share 2 as a factor can be broken into two numbers that do not share 2 as a factor. This 2-day lesson builds on that idea by formally introducing the distributive property and having students use it to make equivalent expressions. Students build their concept of the distributive property by using rectangular arrays of square tiles to model operations with numbers. After practicing computations using equations and rectangles on day one of this lesson the students then, on day two, explore the distributive property in context through interesting word problems. This lesson, since it develops the idea of the distributive property, is directly related to Common Core standard 6.NS.B.4. It is also very important for success later, when students are introduced to algebra and finding equivalent algebraic expressions.

Curriculum citation: Lappan, G., & Phillips, E. (2014). Prime time: Factors and multiples. Boston, MA: Pearson Prentice Hall

Common Core Standards:

6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

Short Term Learning Targets/Objective(s) for This Lesson:

Focus question: *How is finding the area of a rectangle related to the distributive property?*

Learning target: *I can use the area of a rectangle as evidence to defend my equivalent expressions.*

The goal of this lesson is to provide practice to students in using the distributive property, as well as to have students struggle with interesting contextual problems that will increase conceptual understanding. The students should discuss their mathematical ideas with their peers when answering the questions in the investigation and be able to defend their answers with evidence and reasoning.

Academic Language Objectives: Students continue to practice *defending their statements with evidence and/or reasoning*. The academic language *distributive property* is introduced and students continue to use the terms *distribute, equivalent expressions, even, odd, factor, multiple, sum, area, and product*.

The syntax they will be working on throughout this investigation involves organizing an expression using operations, using rectangular arrays to represent multiplicative and additive relationships, and using sentence frames such as: "I believe _____, because _____," to defend statements with reasoning and evidence.

Language Supports: This lesson begins with the students filling out a vocabulary sheet for the new vocabulary term introduced this lesson, *the distributive property*. Students also always have previous vocabulary sheets that they can reference at any time to help them with the other academic language needed in this lesson, as well as the provided sentence stems to give them support with the language function.

Assessment Plan & Rationale for Assessments (Why these types?):

Pre-Assessment: There is no pre-assessment for this lesson.

Formative Assessment: During the explore the teacher will be circulating around and listening to student ideas and asking probing, guiding, or extension questions. Often the students will be working at whiteboards which are on all of the walls of the classroom. This environment allows the teacher to quickly see what all of the students are working on and what they are understanding or struggling to understand. This way the teacher can immediately provide interventions for struggling students by going over and giving them small group instruction. The information gathered during the explore will guide the summarize so that concepts that still need to be developed are highlighted.

Summative Assessment: At the end of the learning segment, there will be a post-assessment that is similar to the pre-assessment which will be used as a summative measure of the students' growth.

Student Voice: During the explore and summarize students will be given the opportunity to express their own reasoning both written and verbal. On the white board and in their composition books they will record their reasoning. During the explore they will discuss with their peers and with the teacher and then during the summarize some of them will have an opportunity to explain their reasoning to the entire class. The quick self-assessments that students do provide an opportunity for them to express their progress towards the learning target.

INSTRUCTIONAL SEQUENCE

Activating Prior Knowledge: During the vocabulary word introduction and the launch, the teacher will point out the connection to the previous day's lesson when students were representing a number in two ways, as a product of two factors or as a sum of two addends. Students will be reminded of the statements they made in the previous lesson as the teacher displays some student work from that lesson.

Communicating Learning Targets: The focus question will be displayed at the beginning of class on the projector. The teacher will point it out, reinforce it during the explore, and highlight it again during the summarize. The quick self-assessments that students do regarding their progress towards the focus question remind them of the learning target.

Learning Experiences:

Time	Teacher Tasks	Student Tasks
0-10 min Vocabulary	Introduce the vocabulary word <i>distributive property</i> . On the document camera ask students to help fill out the vocabulary sheet, starting with definition, then examples, then "what it's not," then the picture.	Students offer up ideas for filling out the vocabulary sheet and copy down what the teacher writes.
10-20 min Launch	<p>Ask: "What are some ways of writing 48 as the product of two numbers?" "As the sum of two numbers?" (choose $40 + 8$) "Think about $8+40$ and $2(4) + 2(20)$. Are these expressions equivalent?"</p> <p>Use rectangles to demonstrate this relationship, and draw it on graph paper.</p> <p>Draw a picture of a 6x10 meter backyard, with a 2x6 m garden on the end. Ask: "What is the area of the entire backyard? Just the garden? Just the remaining yard? How are these parts related?"</p> <p>Tell the students to keep notes in front of you and don't just write the area of the whole rectangle.</p>	Students listen and raise hands when they have questions or to offer ideas when the teacher prompts.
20-48 min Explore	<p>During the explore, circulate around to all of the groups helping students that are stuck and asking extension questions to students who need it. Also ask probing questions and randomly pick students to defend their statements. Provide tiles if students want them.</p> <p>For students who are struggling with question C, ask them what the dimensions of the needed rectangle are, and how one could show that one side is separated into 2 lengths.</p> <p>For students that are getting the concept quickly and need extensions, ask them to explore how the distributive property works with subtraction. Also they can explore expressions of the form $(a + b)(c + d)$</p>	Students work on the problems from investigation 4.2 A, B, and C. They start with 5 minute individual time, then they work in pairs at the whiteboard, while still recording their answer in their composition book. Students raise hands when they need more guidance or extensions.
48-58 min Summarize	Ask for a few examples of ways that students solved A, B and C, (students selected during the explore by the teacher as good examples). Make sure that they see the connection of writing the expressions as both the sum of the	Students provide their ways of solving parts of A, B, and C as prompted by the teacher.

	areas of the two smaller rectangles as well as the product of the two side lengths.	
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Classroom Management: Students are arranged into table groups of three or four. For this activity they first work alone, then work in pairs at the whiteboards that are mounted all around the room. CHAMPS expectations are used to communicate what is expected to the students. There is a think time protocol that the students know. If they are misbehaving they will first get a non-verbal or quiet cue to correct their behavior. If they continue doing it the teacher will ask them to "make a better choice." If they continue the behavior then they are sent to think time, where they go to another classroom and think about how they can be a better, more productive member of the class, eventually rejoining with an improved attitude.

Instructional & Assessment Accommodations/Modifications for Diverse Learners:

The first method of differentiation in the classroom is the low floor, high ceiling nature of the problem-based exploration that occurs throughout the entire learning segment. This strategy allows students with math learning difficulties to engage with the problem at the entry level, while the extension questions provide challenging tasks for the students who are exceeding standard. For the students in the class who struggle with understanding math problems and directions the teacher provides clear verbal explanations/directions, simple written explanations/directions on slides, as well as the more in depth instructions and descriptions that are given in their textbook. Students are given the option of using tiles to help them visualize the rectangles. The teacher checks in often with the students who struggle with motivation and directions, giving them shorter quicker tasks to complete in between check-ins.

Instructional Materials, Community Resources, and Technology: For this lesson, students need their math composition books, their textbook, a pencil, and their planner. The teacher/classroom needs a projector attached to a computer, a document camera, and a whiteboard space (or poster paper) for each pair of students. Square tiles should be available to students to help them model the numbers.

School/Home Interactions (if applicable): Students are given homework that parents can help with.

LESSON PLAN 3

Teacher: Michael Mills **Subject/Lesson Title:** Prime Time 4.2: Using the distributive property
Grade: 6th

Curriculum Context/Rationale: This is the second day of a 2-day lesson builds on the concept of the distributive property and using it to make equivalent expressions. Students use rectangular arrays to model operations with numbers. After practicing computations using equations and rectangles on day one of this lesson the students then, on day two, explore the distributive property in context through interesting word problems. This lesson, since it develops the idea of the distributive property, is directly related to Common Core standard 6.NS.B.4. It is also very important for success later, when students are introduced to algebra and finding equivalent algebraic expressions.

Curriculum citation: Lappan, G., & Phillips, E. (2014). Prime time: Factors and multiples. Boston, MA: Pearson Prentice Hall.

Common Core Standards:

6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

Short Term Learning Targets/Objective(s) for This Lesson:

Focus question: *How is the distributive property used to create equivalent expressions? How is finding the area of a rectangle related to the distributive property?*

Learning target: *I can use the distributive property to create equivalent expressions. I can use the area of a rectangle as evidence to defend my equivalent expressions.*

The goal of this lesson is to provide practice to students in using the distributive property, as well as to have students struggle with interesting contextual problems that will increase conceptual understanding. Students will discuss mathematical ideas and defend their statements with evidence and reasoning.

Academic Language Objectives: Students continue to practice *defending their statements with evidence and/or reasoning*. The academic language *distributive property* is introduced and students continue to use the terms *distribute, equivalent expressions, even, odd, factor, multiple, sum, area* and *product*.

The syntax they will be working on throughout this investigation involves organizing an expression using operations, using rectangular arrays to represent multiplicative and additive relationships, and using sentence frames such as: "I believe _____, because _____," to defend statements with reasoning and evidence.

Language Supports: Students have the vocabulary sheet about *the distributive property* introduced the day before and are encouraged to use it. Students also always have previous vocabulary sheets that they can reference at any time to help them with the other academic language needed in this lesson, as well as the provided sentence stems to give them support with the language function.

Assessment Plan & Rationale for Assessments (Why these types?):

Pre-Assessment: There is no pre-assessment for this lesson.

Formative Assessment: During the explore the teacher will be circulating around and listening to student ideas and asking probing, guiding, or extension questions. Often the students will be working at whiteboards which are on all of the walls of the classroom. This environment allows the teacher to quickly see what all of the students are working on and what they are understanding or struggling to understand. This allows the teacher to immediately provide interventions for struggling students by going over and giving them small group instruction. The information gathered during the explore will guide the summarize so that concepts that still need to be developed are highlighted. At the end of the lesson the students will complete a short exit ticket regarding their progress towards the learning target. This exit ticket will inform the teacher of what the students need to work on the most so that instruction can be adjusted, if needed, for day two. On the exit ticket, students will also assess their own growth towards the learning target. Students will be doing quick 1-4 self-assessments at the beginning and once with the exit ticket about their ability to answer the focus question.

Summative Assessment: At the end of the learning segment, there will be a post-assessment that is similar to the pre-assessment which will be used as a summative measure of the students' growth.

Student Voice: During the explore and summarize students will be given the opportunity to express their own reasoning both written and verbal. On the white board and in their composition books they will record their reasoning. During the explore they will discuss with their peers and with the teacher and then during the summarize they will have an opportunity to explain their reasoning to the entire class. The exit ticket completed at the end of the lesson will provide some written student voice that reflects the students' progress towards the learning target. The quick self-assessments that students do provide an opportunity for them to express their own progress towards the learning target.

INSTRUCTIONAL SEQUENCE

Activating Prior Knowledge: During the launch, the teacher will remind the students that the day before they were representing these expressions as both products of two factors and as sums of two addends. The teacher will walk them through the connection between these expressions and their rectangular array representations. Students will be reminded of the work they did in the previous lesson as the teacher displays some student work from that lesson.

Communicating Learning Targets: The focus question will be displayed at the beginning of class on the projector. The teacher will point it out, reinforce it during the explore, and highlight it again during the exit ticket. The quick self-assessments that students do regarding their progress towards the focus question remind them of the learning target.

Learning Experiences:

Time	Teacher Tasks	Student Tasks
0-10 min Math Review	<p>Display math review slide and start timer for 10 minutes, then help students who are stuck or facilitate students helping each other. Give students a “thumbs-up” when they have completed the first math review, this indicates to them to help one other student if they wish and then move on to the challenge review problem.</p> <p>Review: Calculations with distributive property</p>	<p>Students know the everyday routine of coming in, writing in their planner and then going to their spots on the whiteboard to complete the math review. When a student is done with the first math review problem they raise their hand and the teacher gives them a thumbs up if they are right, and tells them to check their work if they are wrong. If they get the first problem right they can move on to the challenge problem.</p>
10-20 min Launch	<p>Remind the students what the class is working on, show them the problems that they were working on the previous day, make connections between the expressions they were writing and the rectangles they were drawing, and take questions about them. Then show students the problems that they will work on during this day (D and E). Read D aloud and be sure that students completely understand what the question is asking them to do.</p>	<p>Students listen and raise hands when they have questions or to offer ideas when the teacher prompts.</p>
20-48 min Explore	<p>During the explore, circulate around to all of the groups helping students that are stuck and asking extension questions to students who need it. Also ask probing questions and randomly pick students to defend their statements. Provide tiles if students want them.</p> <p>For students who are struggling with question C, ask them what the dimensions of the needed rectangle are, and how one could show that one side is separated into 2 lengths.</p> <p>For students that are getting the concept quickly and need extensions, ask them to explore how the distributive property works with subtraction. Also they can explore expressions of the form $(a + b)(c + d)$. Any summarize questions that did not get asked from day one would be good extension questions.</p>	<p>Students work on problems 4.2 D and E on. Some students may still need to finish up C, the two-day structure allows students to work at their own pace. They start with 5 minute individual time, then they work in groups at the whiteboard, while still recording their answer in their comp book. Students raise hands when they need more guidance or extensions.</p>

48-58 Summa rize	Allow for a longer discussion centering around the focus question. Ask if using the distributive property ever makes calculations easier, especially with regards to mental math. Have the students do a mental math problem and ask if any used the distributive property. If so, how? Represent it with a rectangle too, If there is time and students seem ready, explore the idea of using the distributive property with subtraction. Be sure to leave time for the exit ticket.	Students talk to shoulder partner and raise hands when prompted to discuss the questions raised by the teacher. Students complete the exit ticket.
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Classroom Management: Students are arranged into table groups of three or four. For this activity they first work alone, then work in pairs at the whiteboards that are mounted all around the room. CHAMPS expectations are used to communicate what is expected to the students. There is a think time protocol that the students know. If they are misbehaving they will first get a non-verbal or quiet cue to correct their behavior. If they continue doing it the teacher will ask them to "make a better choice." If they continue the behavior then they are sent to think time, where they go to another classroom and think about how they can be a better, more productive member of the class, eventually rejoining with an improved attitude.

Instructional & Assessment Accommodations/Modifications for Diverse Learners:

The first method of differentiation in the classroom is the low floor, high ceiling nature of the problem-based exploration that occurs throughout the entire learning segment. This strategy allows students with math learning difficulties to engage with the problem at the entry level, while the extension questions provide challenging tasks for the students who are exceeding standard. For the students in the class who struggle with understanding math problems and directions I provide clear verbal explanations/directions, simple written explanations/directions on slides, as well as the more in depth instructions and descriptions that are given in their textbook. The teacher checks in often with the students who struggle with motivation and directions, giving them shorter quicker tasks to complete in between check-ins.

Instructional Materials, Community Resources, and Technology: For this lesson, students need their math composition books, their textbook, a pencil, and their planner. The teacher/classroom needs a projector attached to a computer, a document camera, and a whiteboard space (or poster paper) for each pair of students. Square tiles should be available to students to help them model the numbers.

School/Home Interactions (if applicable): Students are given homework that parents can help with.

LESSON PLAN 4

Teacher: Mike Mills **Subject/Lesson Title:** Prime Time 4.3: Ordering Operations **Grade:** 6th

Curriculum Context/Rationale: In this lesson students apply the knowledge gained in this segment about the distributive property to write equivalent expressions in both factored and expanded form. They defend their equivalent expression claims by providing evidence in the form of area models. Students strengthen their understanding of the distributive property by searching for how to make different numbers using parentheses and addition symbols when they engage in problem B. The activities in this lesson deepen student's understanding of the distributive property while giving them practice with the computations in the context of simplifying number sentences using the order of operations. Again, this relates directly to standard 6.NS.B.4.

Curriculum citation: Lappan, G., & Phillips, E. (2014). Prime time: Factors and multiples. Boston, MA: Pearson Prentice Hall.

Common Core Standards:

6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

Short Term Learning Targets/Objective(s) for This Lesson:

The focus question for this lesson is: *How do you decide the order when you work on number sentences with more than one operation?*

The learning target is: *I can use the order of operations to write equivalent expressions.*

The goal of this lesson is for students to be able to flexibly use the distributive property as well as compute the value of an expression correctly using the order of operations.

Academic Language Objectives: Students continue practicing *defending their statements with evidence/reasoning*. The term *order of operations* is introduced by having the students take notes on a vocabulary sheet, and by using the acronym, PEMDAS. Students continue to use the terms *distributive property, distribute, equivalent expressions, even, odd, factor, multiple, sum, and product*.

The syntax they will be working on throughout this investigation involves organizing an expression using operations, using rectangular arrays to represent multiplicative and additive relationships, and using sentence frames such as: "I believe _____, because _____," to defend statements with reasoning and evidence.

Language Supports: Students may refer to vocabulary sheets and the provided sentence stems to give them support with the language function.

Assessment Plan & Rationale for Assessments (Why these types?):

Pre-Assessment: There is no pre-assessment for this lesson.

Formative Assessment: During the explore the teacher will be circulating around and listening to student ideas and asking probing, guiding, or extension questions. Often the students will be working at whiteboards which are on all of the walls of the classroom. This environment allows the teacher to quickly see what all of the students are working on and what they are understanding or struggling to understand. This allows the teacher to immediately provide interventions for struggling students by going over and giving them small group instruction. The information gathered during the explore will guide the summarize so that concepts that still need to be developed are highlighted.

Summative Assessment: At the end of the learning segment, there will be a post-assessment that is similar to the pre-assessment which will be used as a summative measure of the students' growth.

Student Voice: During the launch the students get the opportunity to discuss with their peers what they think the term "order of operations" is. During the explore and summarize students will be given the opportunity to express their own reasoning, both written and verbal. On the white board and in their composition books they will record their reasoning. During the explore they will discuss with their peers and with the teacher and then during the summarize they will have an opportunity to explain their reasoning to the entire class. The quick self-assessments that students do provide an opportunity for them to express their progress towards the learning target. After this lesson the students will be taking a post-assessment. They will complete a self-assessment about their progress towards the learning target from the pre-assessment to now and will reflect on what they still need to learn, and how they will learn it.

INSTRUCTIONAL SEQUENCE

Activating Prior Knowledge: Students are reminded about the distributive property and are asked to talk to a shoulder partner about what the phrase "order of operations" means. During the launch the teacher will have students think about expressions with parentheses to be sure that feel comfortable evaluating expressions with them.

Communicating Learning Targets: The focus question will be displayed at the beginning of class on the projector. The teacher will point it out, reinforce it during the explore, and highlight it again during the summarize. The quick self-assessments that students do regarding their progress towards answering the focus question remind them of the learning target.

Learning Experiences:

Time	Teacher Tasks	Student Tasks
0-10 min	Display math review slide and start timer for 10 minutes, then help students who are stuck or facilitate students helping each other. Give students a "thumbs-up"	Students know the everyday routine of coming in, writing in their planner and then going to their spots on the whiteboard to complete the math review. When a student

	<p>when they have completed the first math review, this indicates to them to help one other student if they wish and then move on to the challenge review problem.</p> <p>Review: Calculations with distributive property</p>	<p>is done with the first math review problem they raise their hand and the teacher gives them a thumbs up if they are right, and tells them to check their work if they are wrong. If they get the first problem right they can move on to the challenge problem.</p>
10-20 min Vocabulary and Launch	<p>Show the launch video.</p> <p>Have students discuss with a shoulder partner which answer they agree with and why. After they have discussed, introduce the vocabulary word PEMDAS: Order of Operations. On the document camera ask students to help fill out the vocabulary sheet, starting with definition, then examples, then "what it's not," then the picture</p> <p>Vocabulary: PEMDAS: Order of Operations</p>	<p>Students watch video.</p> <p>Students talk to shoulder partner for 30 seconds, then raise hands and offer up their ideas in their own words. Then they take notes and raise hands to contribute to the filling out of the vocabulary sheet.</p>
20-48 Explore	<p>Tell students that they will be working on their own at the whiteboard but can check their work and answers with their neighbors. During the explore, circulate around to all of the groups helping students that are stuck and asking extension questions to students who need it. Also ask probing questions and randomly pick students to defend their statements.</p> <p>While students are working on whiteboard ask students to say in words how the questions they write or interpret should be computed.</p>	<p>Students work on the problems from investigation 4.3 starting with C, then D, then A and B. Students will be working independently at the whiteboards but checking answers with each other and with the teacher. Students raise hands when they need more guidance or extensions.</p>
48-58 Summarize	<p>During the summarize, review question A and ask some students to read their number sentences. Ask how they are using the distributive property for questions A and B.</p>	<p>Students offer up their reasoning and solutions as well as answer questions prompted by the teacher or other students. An emphasis is placed on students defending their argument with evidence/reasoning. They complete the self-assessment as an exit ticket.</p>

Classroom Management: Students are arranged into table groups of three or four. For this activity they first work alone, then work in pairs at the whiteboards that are mounted all around the room. CHAMPS expectations are used to communicate what is expected to the students.

There is a think time protocol that the students know. If they are misbehaving they will first get a non-verbal or quiet cue to correct their behavior. If they continue doing it the teacher will ask them to "make a better choice." If they continue the behavior then they are sent to think time, where they go to another classroom and think about how they can be a better, more productive member of the class, eventually rejoining with an improved attitude.

Instructional & Assessment Accommodations/Modifications for Diverse Learners:

The first method of differentiation in the classroom is the low floor, high ceiling nature of the problem-based exploration that occurs throughout the entire learning segment. This strategy allows students with math learning difficulties to engage with the problem at the entry level, while the extension questions provide challenging tasks for the students who are exceeding standard. For the students in the class who struggle with understanding math problems and directions the teacher provides clear verbal explanations/directions, simple written explanations/directions on slides, as well as the more in depth instructions and descriptions that are given in their textbook. The teacher checks in often with the students who struggle with motivation and directions, giving them shorter quicker tasks to complete in between check-ins.

Instructional Materials, Community Resources, and Technology: For this lesson, students need their math composition books, their textbook, a pencil, and their planner.

The teacher/classroom needs a projector attached to a computer, a document camera, and a whiteboard space (or poster paper) for each pair of students.

School/Home Interactions (if applicable): Not applicable.