Lake Elsinore
Unified School District

Instructional Module To Enhance the Teaching of Prentice Hall – CA Edition

WORK IN PROGRESS

Grade 6

Module 8
Prentice Hall Chapters 2 and 4
Algebraic Expressions

Revised September 2014

6th Grade Mathematics Sequence
2014-2015

August through October	Unit 1 Ratios (approximately 12 days)
	Unit 2 Rates, including Percent (approximately 14 days)
	Unit 3 Multi-digit Computation & Finding Common Factors & Multiples (approximately 11 days)
	Unit 4 Dividing Fraction (approximately 11 days)
	Unit 5 Representing Relationships (approximately 15 days)
November through March	Unit 6 Extending the Number System (approximately 13 days)
	Unit 7 Relationships in the Coordinate Plane (approximately 12 days)
	Unit 8 Algebraic Expressions (approximately12 days)
	Unit 9 Understanding, Writing & Solving Equations & Inequalities (approximately 16 days)
	Unit 10 Problem Solving with Area in 2-D Shapes (Approximately 11 days)
April through June	Unit 11 Problem Solving with Volume & Surface Area (approximately 11 days)
	Unit 12 Understanding Data Distributions (approximately 9 days)
	Unit 13 Analyzing Data (Approximately 13 days)

6th Grade
Module 8 at a Glance

Some lessons may take more than one day.

Lesson Number	Lesson Focus
1	Connect Coordinate Planes to identify area and volume
2	Connect Coordinate Planes to identify area and volume
3a	Compare volume and area formulas, linear expressions and how they are connected
3b	Compare volume and area formulas, linear expressions and how they are connected
4	Compare volume and area formulas, linear expressions and how they are connected
5	Formalize the vocabulary of linear expressions, area and volume.
6	Students understand that yyy= y3 and y3/y3 =1 and y0 =1
7	Use exponents as an introduction to Order of Operations
8	Clarifying order in Math Operations
9	To understand that the distributive property is the basis for combining “like” terms in an expression.
10	Generalize the term equivalent

Connecting Mathematical Practices and Content
Grade 6

The Standards for Mathematical Practice (MP) are developed throughout each grade and, together with the content standards, prescribe that students experience mathematics as a rigorous, coherent, useful, and logical subject that makes use of their ability to make sense of mathematics. The MP standards represent a picture of what it looks like for students to understand and do mathematics in the classroom and should be integrated into every mathematics lesson for all students.

Although the description of the MP standards remains the same at all grades, the way these standards look as students engage with and master new and more advanced mathematical ideas does change. Below are some examples of how the MP standards may be integrated into tasks appropriate for Grade 6 students.

Standards for Mathematical Practice	Explanation and Examples from Mathematics Framework
MP.1. Make sense of problems and persevere in solving them.	In grade six, students solve real world problems through the application of algebraic and geometric concepts. These problems involve ratio, rate, area, and statistics. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?" Students can explain the relationships between equations, verbal descriptions, and tables and graphs. Mathematically proficient students check their answers to problems using a different method.
MP.2. Reason abstractly and quantitatively.	Students represent a wide variety of real world contexts through the use of rational numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to operate with symbolic representations by applying properties of operations or other meaningful moves. Teachers might ask, "How do you know" or "What is the relationship of the quantities?" to reinforce students' reasoning and understanding.
MP.3. Construct viable arguments and critique the reasoning of others.	Students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (e.g., box plots, dot plots, histograms). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" and "Does that always work?" They explain their thinking to others and respond to others' thinking.
MP.4. Model with mathematics	In grade six, students model problem situations symbolically, graphically, in tables, contextually, and with drawings of quantities as needed. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students begin to explore covariance and represent two quantities simultaneously. Students use number lines to compare numbers and represent inequalities. They use measures of center and variability and data displays (e.g., box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use any of these representations as appropriate to a problem context. Students should be encouraged to answer questions, such as "What are some ways to represent the quantities?" or "What formula might apply in this situation?"

Connecting Mathematical Practices and Content
Grade 6

MP.5. Use appropriate tools strategically.	Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade six may decide to represent figures on the coordinate plane to calculate area. Number lines are used to create dot plots, histograms, and box plots to visually compare the center and variability of the data. Visual fraction models can be used to represent division of fractions situations. Additionally, students might use physical objects or applets to construct nets and calculate the surface area of three-dimensional figures. Students should be encouraged to answer questions such as, "What approach are you considering trying first?" or "Why was it helpful to use…?"
MP.6. Attend to precision.	Students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to rates, ratios, geometric figures, data displays, and components of expressions, equations, or inequalities. When using ratio reasoning in solving problems, students are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. Students also learn to determine an appropriate degree of precision when working with rational numbers in a situational problem. Teachers might ask "What mathematical language, definitions, properties…can you use to explain…?
MP.7. Look for and make use of structure.	Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables recognizing both the additive and multiplicative properties. Students apply properties to generate equivalent expressions (e.g., by distributive property) and solve equations (e.g., by subtraction property of equality, by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving area and volume. Teachers might ask, "What do you notice when…?" or "What parts of the problem might you eliminate, simplify…?"
MP.8. Look for and express regularity in repeated reasoning.	In grade six, students use repeated reasoning to understand algorithms and make generalizations about patterns. During opportunities to solve and model problems designed to support generalizing, they notice that and construct other examples and models that confirm their generalization. Students connect place value and their prior work with operations to understand algorithms to fluently divide multi-digit numbers and perform all operations with multi-digit decimals. Students informally begin to make connections between covariance, rates, and representations showing the relationships between quantities. Students should be encouraged to answer questions, such as "How would we prove that…?" or "How is this situation like and different from other situations?"

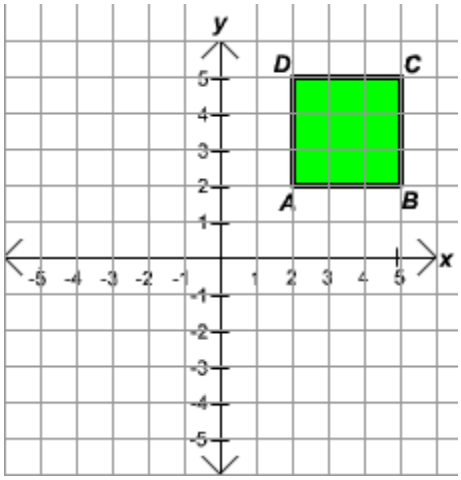
Instructional Strategies Used in K-7 Instructional Modules

Taken from the CA Mathematics Framework and 5 Practices for Orchestrating Productive Mathematics Discussions by Peg Smith and Kay Stein

POSE THE PROBLEM	Simply pose the problem, without suggesting or allowing other students to suggest any particular mathematical strategy to solve the problem.
INDEPENDENT	Students work independently and quietly, often for the purpose of letting students think about their own reasoning and informal assessment.
THINK-PAIR-SHARE	Students get time to think quietly, then share their thoughts with a partner and listen to their partners' thinking.
TABLE TALK	THINK-PAIR-SHARE with more than 2 students.
WHOLE GROUP	Focus is on pulling the whole class together.
CONSENSUS	Students share their individual ideas and come to an agreement within the group to share with the whole class.
MONITOR	Teacher pays close attention to students' mathematical thinking and solution strategies as they work on a task, for the purpose of using their observations to decide what and whom to focus on during the class discussion that follows.
SELECT	The teacher, through monitoring, selects student work samples or strategies to display or have students present.
SEQUENCE	The teacher purposefully chooses the order in which student strategies are displayed and/or discussed, often beginning with the more concrete strategies moving to more abstract.
CONNECT	The teacher helps students draw connections between their solutions/strategies and others' solutions/strategies for the purpose of connecting their thinking to the mathematics we want them to learn
DISPLAY	The teacher shows student work to the rest of the class for the purpose of allowing students to analyze the students' strategies.
CAROUSEL-MUSEUM WALK	Each group posts sample work on the wall while students rotate around the room to analyze other students' work. A leader from each group may, but does not need to stand near his/her own group's work.

Grade 6
Module 8, Lesson 1

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Connect Coordinate Planes to identify area and volume.	***PLC Notes***
Lesson Purpose	Identify why area is units (u^2) squared and volume in units cubed. (u^3)	
Content Standards	6.EE 2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6 s^2$ *to find the volume and surface area of a cube with sides of length* $s = 1/2$.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☐ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	Teacher Note: L is measured in certain unit and W is measured in the same unit so formula = L (units) × W (units) = L × W × (unit) × unit)= unit ^{2} (area) This is not to be confused with 4x4 = 4^2 (linear)  **POSE THE PROBLEM**: Using this model, can you write an expression that represents the problem? Teacher Note: You want them to say 3x3. Be sure to clarify which is length and which is width. Be sure to ask the students what the 9 refers to. ($9u^2$)	

Investigate *Materials* *34T*	**POSE THE PROBLEM**:  (teacher places 9 consecutive units connected in quadrant 1) **TABLE TALK**: Now ask, *is this model the same as the previous model? Why or why not?* **DISPLAY**: Diverse student work to promote thinking of area vs linear. **THINK-PAIR-SHARE:** on the following questions. Do the units cover the same space? How do you know? Do they do it the same way? Explain. **CONSENSUS**: Come to consensus on the answers and chart the findings. (teacher charts findings) <u>Instruction</u>: *Remove pictures*. **DISPLAY**: 3x3 =9 **POSE THE PROBLEM**: Which model does this refer to? **TABLE TALK**: Justify the answer Teacher Note: This is an opportunity to discuss area vs linear, and why units are squared. $9un^2$ refers to area, 9un refers to linear. * see teacher note	
Optional Practice	Use a model of 2x3 and repeat the steps above.	
Summarize *34T*	Are units and units squared the same thing? Why or why not, show examples to justify.	
Homework	Go home and graph 3x4 = $12un^2$ (area) Then graph 3x4 = 12 un (linear)	

Grade 6
Module 8, Lesson 2

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Connect Coordinate Planes to identify area and volume.	***PLC Notes***
Lesson Purpose	Clarify volume is units cubed. (un^3)	
Content Standards	6.EE 2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☐ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**POSE THE PROBLEM**: Look at this figure and write an expression for it. Teacher Note: Refer to module 7 lesson 8 for clarity  **INDEPENDENT**: Students should recognize that this is a 3 dimensional object and different measurements need to be applied. **CONSENSUS**: With other students in the class note similarities and differences in expressions and record new ideas. How is this shape similar and different than the previous lesson? (l x w)	

Investigate *Materials* *Graph paper*	**DISPLAY**: 2 x 3 x 4 Ask students to build this model . Teacher Note: Be sure to provide a rich variety of tools that support students making this model. Allow students time to work. (Teacher makes an exact model using base ten units displayed on a 10x10 graph paper for exit slip.) Encourage students to walk around and compare different examples of the models. Once they find the solution that makes the most sense to them, have them journal the characteristics that clarified the expression 2 x 3 x 4 with writing and illustrations Teacher Note: This lesson provides an opportunity to connect the formula of l x w =area ^{2} to l x w x h = volume^3 It's important to point out area is flat on 2 dimensions, and volume is raised on 3 dimensions. This difference accounts for squaring and cubing.	
Optional Practice	See worksheet on VOLUME (1) pictorial math	
Summarize *34T*	Teacher displays their own cube of 2 x 3 x 4 and allows students to generate feedback that confirms the model.	
Homework	Does order matter when you're building these things?	

Grade 6
Module 8, Lesson 3A

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Compare volume and area formulas, linear expressions and how they are connected	***PLC Notes***
Lesson Purpose	Understand the difference between flat planes and dimensional planes	
Content Standards	6.EE 2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☒ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials*	**POSE THE PROBLEM**: *What's the difference between volume, area and linear expressions?* This should be completed individually.	
Investigate *Materials* *Posters markers and glue- scissors and rulers, ect.*	**TABLES**: With kids in groups, have them create a poster comparing volume, area, and linear expression listing everything they know with examples. This should be neat, concise and presentation ready. Give students time to create poster. <u>Teacher Note</u>: Plan on one full class period to create posters. **DISPLAY**: (See 3B) Student posters and allow classroom survey of work. Students should work as a group and investigate one thing that they like, and one question they have that they observed. Use sticky notes to indicate observations for placement on posters. Once they've done that, allow students to clarify questions posed by other students in a revision process.	
Optional Practice	34T	
Summarize *34T*	Students have to make two changes to their poster based on student critique. (can be from omission)	
Homework	Students should go home and research topics presented on their posters to see if they can add information the next class day.	

Grade 6
Module 8, Lesson 3B

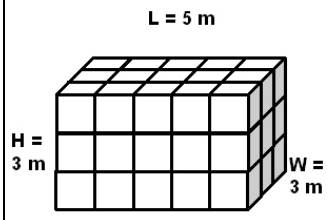
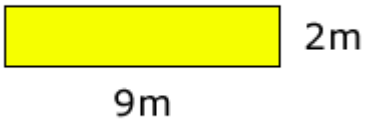
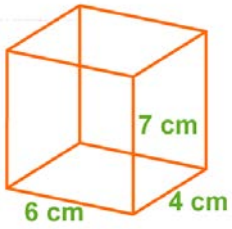
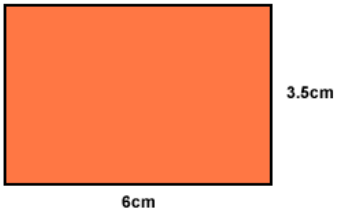
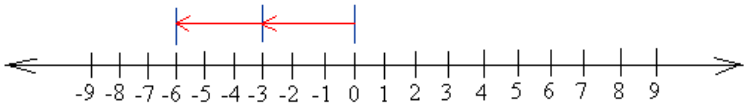
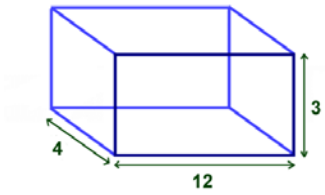
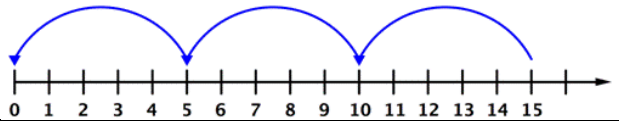
- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Compare volume and area formulas, linear expressions and how they are connected	***PLC Notes***
Lesson Purpose	Understand the difference between flat planes and dimensional planes	
Content Standards	6.EE 2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☒ Use appropriate tools strategically. ☐ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	Review lesson from yesterday and allow students to meet back into their poster groups and begin work.	
Investigate *Materials* *34T*	**DISPLAY**: Student posters and allow classroom survey of work. Students should work as a group and investigate one thing that they like, and one question they have that they observed. Use sticky notes to indicate observations for placement on posters. Once they've done that, allow students to clarify questions posed by other students in a revision process and display again. Teacher Note: This will take most of one class period	
Optional Practice	34T	
Summarize *34T*	**INDEPENDENT**: Students work independently to evaluate central ideas/repeating themes in notebooks from the posters.	
Homework	Write a summary of information taken from posters to show understanding of concepts with justification.	

Grade 6
Module 8, Lesson 4

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Compare volume and area formulas, linear expressions and how they are connected	***PLC Notes***
Lesson Purpose	To classify and solve area volume formulas, and linear expressions	
Content Standards	6.EE 2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6\ s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.	
Practice Standards	☐ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☒ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	

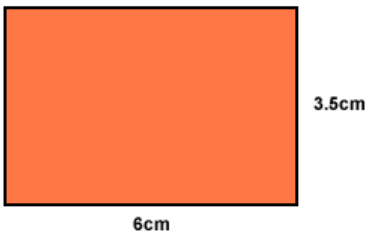
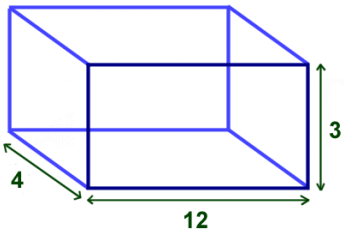
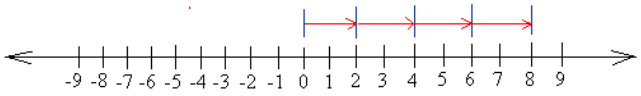
Introduce *Materials* *34T*	**DISPLAY**: Allow students to sort, classify and solve the following figures.       	
Investigate *Materials* *34T*	**MONITOR/SELECT/SEQUENCE:** Comparing classifications and computation. Work toward a formal definition supported by an example above. **CONNECT:** Each of the student examples to the previous work of linear, area and volume. Be explicit how and why these formulas are built on each other when connecting student work. <u>Teacher Note</u>: These connections will be explicitly formalized in Lesson 5	
Optional Practice	**DISPLAY:** Additional figures or use examples from students' posters to support the lesson purpose.	

Summarize *34T*	Why are linear expressions, area and volume multiplied?	
Homework	PRENTICE HALL; Pg. 357, numbers 5-7 (Volume) and Pg. 327, number 15 (area)	

Grade 6
Module 8, Lesson 5

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Formalize the vocabulary of linear expressions, area and volume.	***PLC Notes***
Lesson Purpose	Formalize linear expressions, area, and volume formulas.	
Content Standards	6.EE 2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6\ s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$. 2. Write, read, and evaluate expressions in which letters stand for numbers.	
Practice Standards	☐ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☐ Attend to precision. ☒ Look for and make use of structure. ☒ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**REVIEW**: Refer posters and summary notes for prior lesson. Students should be prepared to make connections from their notes to the upcoming direct instruction.	

Investigate *Materials* *34T*	Teacher Note: This lesson is a direct instruction to formalize Linear expressions, Area and Volume formulas. Suggested academic language and diagrams be included in the lecture.  Area = bh  Volume = bwh  2x 4=8 **Academic Vocabulary**: - Linear - Formula - Area - Volume - Squared - Cubed - Base - Constant - Coefficient - Factors - Equivalent - Variable - Exponent - Product - Term - Sum - Quoitent	
Optional Practice	Make flashcards with Academic Vocabulary for practice.	

Summarize *34T*	Students review their notes from posters, and revise any misconceptions or errors. Students must indicate revisions using a different medium so they are clear. This review will be utilized when writing a summary in their interactive notebooks.	
Homework	Complete summary if incomplete.	

Grade 6
Module 8, Lesson 6

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Students understand that yyy= y^3 and $y^3/y^3 = 1$ and $y^0 = 1$	***PLC Notes***
Lesson Purpose	Understanding base and exponents	
Content Standards	6EE **Apply and extend previous understandings of arithmetic to algebraic expressions.** 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. 4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☐ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☐ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**POSE THE PROBLEM**: Write y^3. **INDEPENDENT**: *What does that mean*? Show examples. **POSE THE PROBLEM**: Write yyy **INDEPENDENT**: *What does that mean*? Show examples. **TABLE TALK**: Allow time for students to discuss their findings, noting similarities and differences. **DISPLAY**: Student work that shows equivalence. <u>Teacher Note</u>: Look for base and exponent understanding. Try to draw this vocabulary out during discussion. (don't force it)	

Investigate *Materials* *34T*	**POSE THE PROBLEM**: Display g^5 x^4 r^7 5squared 3cubed. Teacher Note: Look for base and exponent understanding. Try to draw this vocabulary out during discussion. **TABLE TALK**: *What does this mean, show examples*? **MONITOR, SELECT, SEQUENCE** and **CONNECT**: Student work to the rule of base and exponent. (regardless of base being a whole number where you need to simplify) Teacher Note: Display and discuss multiple understandings of the posed problem for deeper evaluation of base, exponent and academic vocabulary. **POSE THE PROBLEM:** Display -2^5 **TABLE TALK**: *What does this mean, show examples*? *Simplify*	
Optional Practice	Teaching Student Centered Mathematics:" Exponent notation on the calculator" pg 174-176	
Summarize *34T*	Display $\mathbf{(1/2)^3}$ *What does this mean, show examples*? *Simplify*	
Homework	PRENTICE HALL: pg 62 (9-16)	

Grade 6
Module 8, Lesson 7

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Use exponents as an introduction to Order of Operations	***PLC Notes***
Lesson Purpose	Develop base understanding of Order of Operations	
Content Standards	**6.EE Apply and extend previous understandings of arithmetic to algebraic expressions**. 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. b. 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. For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms. c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas V = sP3P and A = 6 sP2 Pto find the volume and surface area of a cube with sides of length s = 1/2.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☒ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☐ Look for and make use of structure. ☒ Look for and express regularity in repeated reasoning.	

Introduce *Materials* *35T*	**POSE THE PROBLEM:** Display $2+4^3$, *Solve* **SELECT, MONITOR and SEQUENCE**: Teacher Note: When **selecting** student work- Look for: 2 + 4 times 4 times 4 2 + 64 66 6^3 216 8 + 64 72 **CONNECT**: Work that gives the correct answer. Why is 6^3 **NOT** the answer? What else does **NOT** give us the answer?	
Investigate *Materials* *35T*	**POSE THE PROBLEM**: Samurai swords are made by repeatedly heating a steel bar, hammering it, and then folding it in half. This process creates a sword with many layers. Each time you fold the steel, the number of layers doubles. **What is the number of layers in a piece of steel that has been folded 6 times.** ($2^6 = 64$) **SELECT, MONITOR, SEQUENCE, CONNECT**	
Optional Practice	Samurai swords are made by repeatedly heating a steel bar, hammering it, and then folding it in half. This process creates a sword with many layers. Each time you fold the steel, the number of layers doubles. **What is the number of layers in a piece of steel that has been folded 4 times**	
Summarize *35T*	$5^4 + 6.98$ *Solve*	
Homework	$2+ 4^3$ What would you have to do first to solve and why? Explain and Simplify. Does it matter what order you solve in, why or why not? Would you get different results?	

Grade 6
Module 8, Lesson 8

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

Lesson Focus	Clarifying order in Math Operations	***PLC Notes***
Lesson Purpose	Order of operations is not just a convention; it is based on the meaning of the operations.	
Content Standards	**6.EE Apply and extend previous understandings of arithmetic to algebraic expressions.** 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. 4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☐ Reason abstractly and quantitatively. ☒ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**POSE THE PROBLEM**: 5 x 4 x 4 - 6 and 5 x 4^2 -6. **INDEPENDENT**: "*What do you notice about these two problems? What you do different to solve them? What can you expect from the answers?"* **TABLE TALK**: Come to consensus. What did you notice? Teacher Note: The goal of the activity is for students to develop an understanding of equivalent expressions. Connect consensus to that idea. **POSE THE PROBLEM**: 5 x 4 x 4 – 6 *Inserting parentheses, can you change the order of operation in this expression to equal -40?* [5 x 4(4-6)] **TABLE TALK**: Come to consensus. *What is the role of the parenthesis? How does it change the meaning of the problem?*	

Investigate *Materials* *34T*	Teacher Note: Although part of the order of operations is due to convention (e.g.: working from left to right, using parenthesis) the order of the computations is due to the meanings of these operations. **POSE THE PROBLEM**: *Use the following expression to answer the questions below.* 3 x 4 + 14 – 5 - (-2) x 7 1. Add parenthesis to make the expression equal -23 2. Add parenthesis to make the expression equal 5 3. Add parenthesis to make the expression equal 35 *Which uses the Order of Operations to solve*? **TABLE TALK**: Discuss and come to consensus **MONITOR, SELECT, SEQUENCE, and CONNECT** **Common Misconceptions**: Students may not understand how to read the operations referenced with notations (e.g x^3, 4x, 3(x + 2y), a + 3a). Students are learning that: - X^3 means xxx , not 3x or3 times x - 4x means 4 times x or x + x + x + x , not forty-something - When evaluating 4x when x = 7 , substitution does not result in the expression meaning 47. - For expressions like a + 3a , students need to see a as 1a to know that a + 3a = 4a and not $3a^2$. - The use of the "x" notation as both the variable and the operation of multiplication can also be a source of confusion for students. In addition, students may need an explanation for why $x^0 = 1$ for all non-zero numbers. Full explanations of this and other rules of working with exponents appear in grade 8.	
Optional Practice	34T	
Summarize *34T*	Is it important to do things in a certain order?	
Homework	3 x 2 + 5^2 -3 ÷ 3 Evaluate the above expression, and clarify why order matters. Demonstrate the correct way to show order, and the incorrect way.	

Grade 6
Module 8, Lesson 9

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

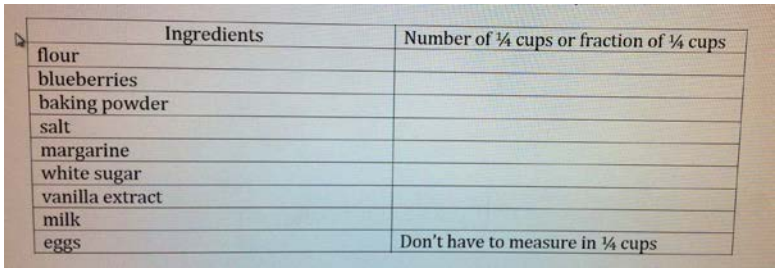
Lesson Focus	To understand that the distributive property is the basis for combining "like" terms in an expression.	***PLC Notes***
Lesson Purpose	Evaluate and write equivalent expressions using distributive property.	
Content Standards	**6.EE Apply and extend previous understandings of arithmetic to algebraic expressions.** 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. 4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☒ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☐ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☒ Look for and make use of structure. ☐ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**POSE THE PROBLEM**: 4a + 7a= 11a **INDEPENDENT**: Write down two things that you know about the problem. <u>Teacher Note</u>: Focus on the variable and "like" terms in an expression. **TABLE TALK**: Students can discuss and write down additional ideas shared. **POSE THE PROBLEM** : (4+7)a = 11a **INDEPENDENT**: *Write down two things that you know about the problem.* **TABLE TALK**: Students can discuss and write down additional ideas shared. **POSE THE PROBLEM:** *Is it possible to write two equivalent expressions that produce the same result?* <u>Teacher Note</u>: For example- 4a + 7a = (4+7)a = 11a **COME TO CONSENSUS**: Discuss problem	

Investigate *Materials* *34T*	Using the prior consensus: **POSE THE PROBLEM**: 5(n+3) +7n and 12n + 15 **TABLE TALK**: *What do you notice about the problem?* Teacher should be looking for equivalencies. **POSE THE PROBLEM**: *How can you show/prove that the two expressions are equivalent?* **MONITOR, SELET, SEQUENCE, and CONNECT** Teacher Note: By applying the distributive property, I know that 5(n+3) +7n can be rewritten as 5n + 15 + 7n because of the distributive property. Also, since 5n + 7n = (5 + 7)n = 12n, I can write the expression as 12n + 15	
Optional Practice	Apply the Distributive Property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y)	
Summarize *34T*	*Is it possible to write two equivalent expressions that yield the same answer? Why would you want to do that?* Teacher Note: Look for connections and misconceptions.	
Homework	Apply the Distributive Property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x	

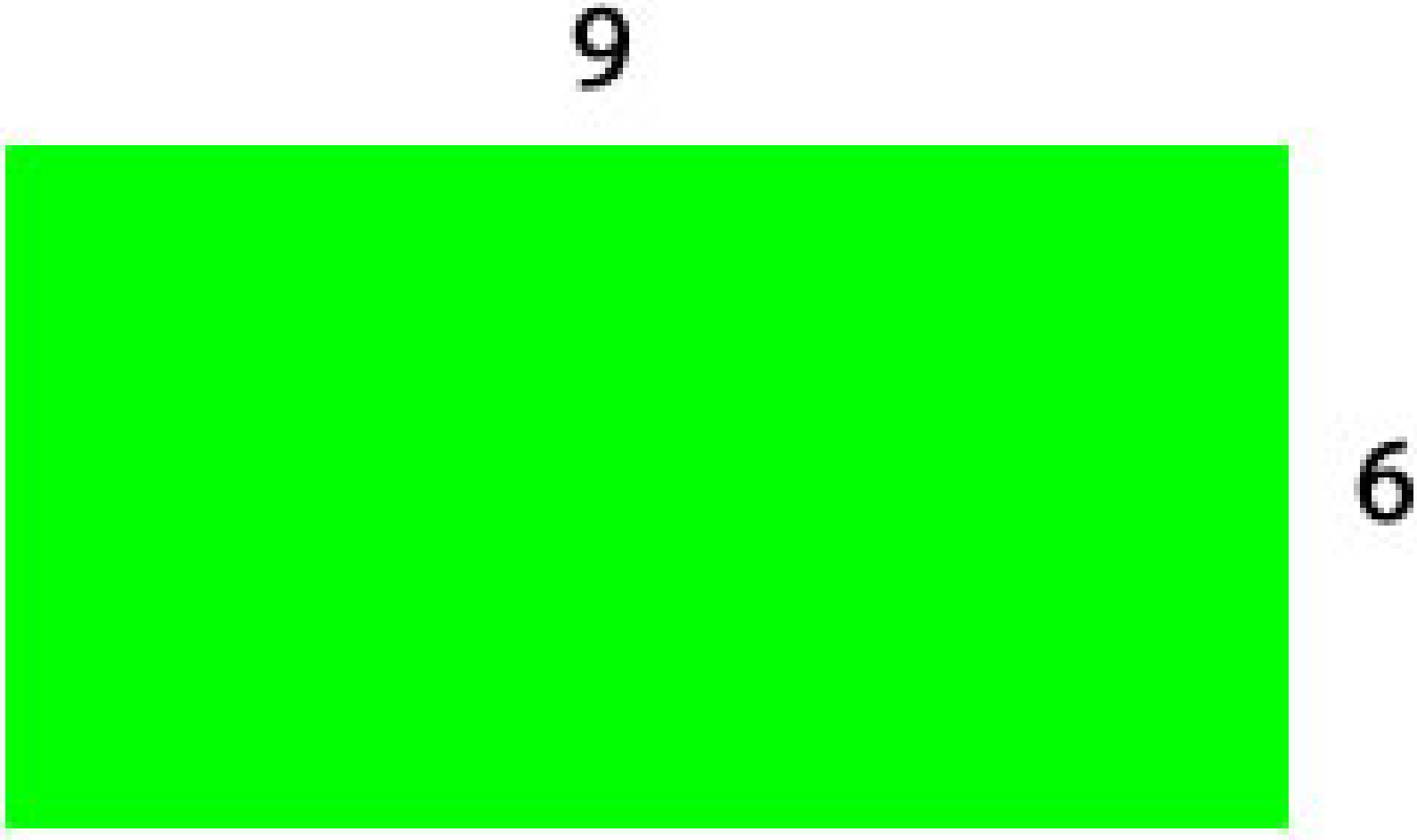
Grade 6
Module 8, Lesson 10

- **Since the common-core standards are based on student-centered mathematics, it is possible that lessons may take longer than one class period. Adjust to fit the needs of your students as necessary.**

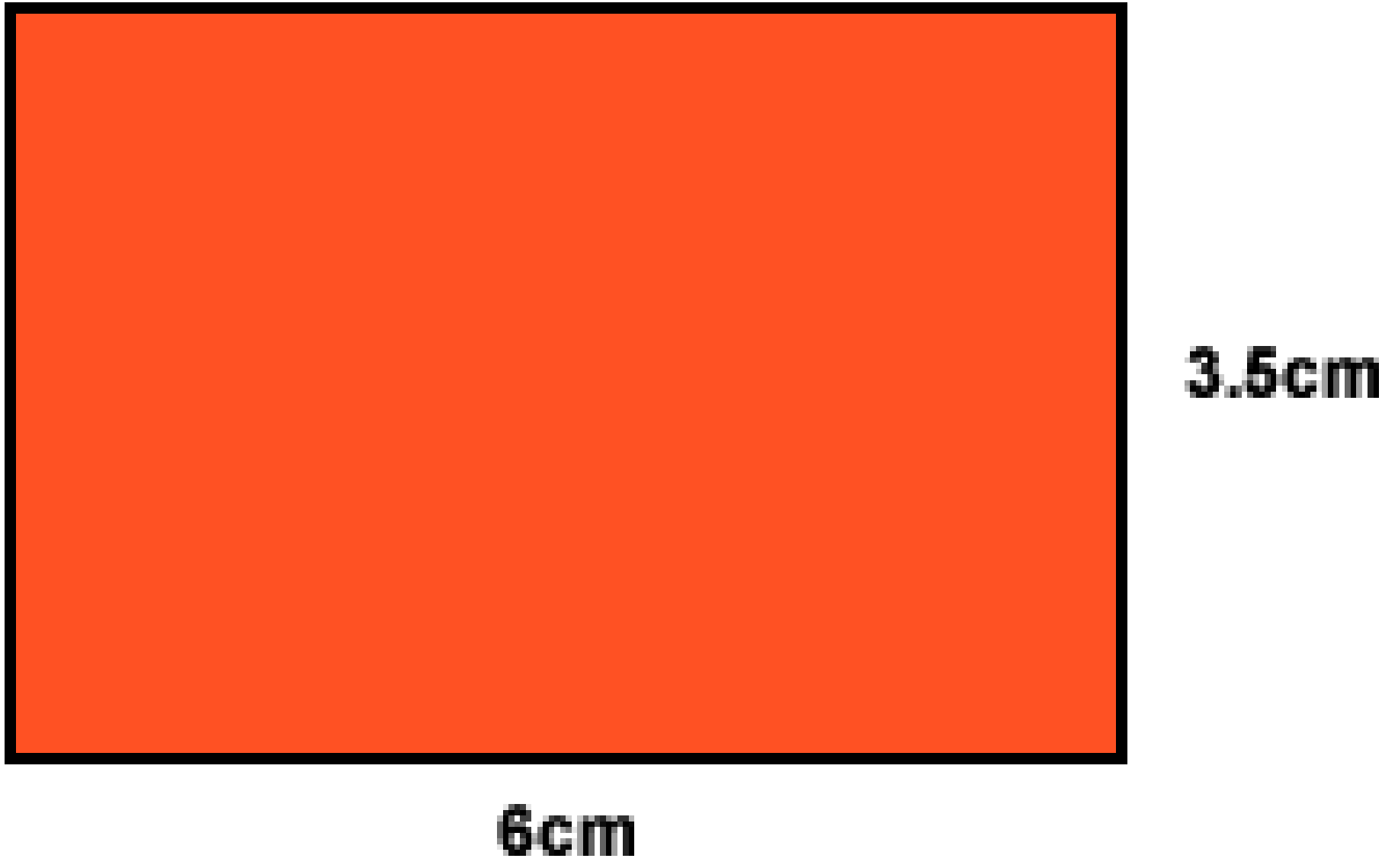
Lesson Focus	Generalize the term equivalent.	***PLC Notes***
Lesson Purpose	Connect past experience with equivalent expressions to fractions.	
Content Standards	**6.EE Apply and extend previous understandings of arithmetic to algebraic expressions.** 3. Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y. 4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.	
Practice Standards	☒ Make sense of problems and persevere in solving them. ☐ Reason abstractly and quantitatively. ☐ Construct viable arguments and critique the reasoning of others. ☒ Model with mathematics. ☐ Use appropriate tools strategically. ☒ Attend to precision. ☐ Look for and make use of structure. ☒ Look for and express regularity in repeated reasoning.	
Introduce *Materials* *34T*	**POSE THE PROBLEM**: This Sunday is Father's Day. I looked up a recipe for something that I'm sure that my dad will love and I'm going to surprise him. I already bought the fresh blueberries and I'm going to make blueberry muffins. This is going to be great. But … I couldn't find any measuring cups in the kitchen. I could only find a small cup that was marked ¼ cup. 1. *Here is my recipe. Would you please help me figure out how many of these little ¼ cups to fill to make these muffins?* **Ingredients** • 2 cups fresh blueberries • 2 and 1/2 cups all-purpose flour • 4 teaspoons baking powder • 1 teaspoon salt • 1/4 cup margarine • 1-1/2 cups white sugar • 2 eggs • 1 teaspoon vanilla extract • 1 cup milk	

Investigate *Materials* *Handout*	**POSE THE PROBLEM:** *How many ¼ cups would I need to use for any number (n) of cups of blueberries?* *How would your answers (number of ¼ cups needed for each item) in the table change if you only had a ½ cup measuring cup?* <u>Teacher Note</u>: Refer to Father's Day Breakfast Surprise Handout 	
Optional Practice	34T	
Summarize *34T*	*How would your answers (number of ¼ cups needed for each item) in the table change if you only had a 1/8 cup measuring cup?*	
Homework	What does today's activity have to do with equivalent expressions?	

Ingredients	Number of ¼ cups or fraction of ¼ cups
flour	
blueberries	
baking powder	
salt	
margarine	
white sugar	
vanilla extract	
milk	
eggs	Don't have to measure in ¼ cups


9
6


7
5


3.5cm
6cm

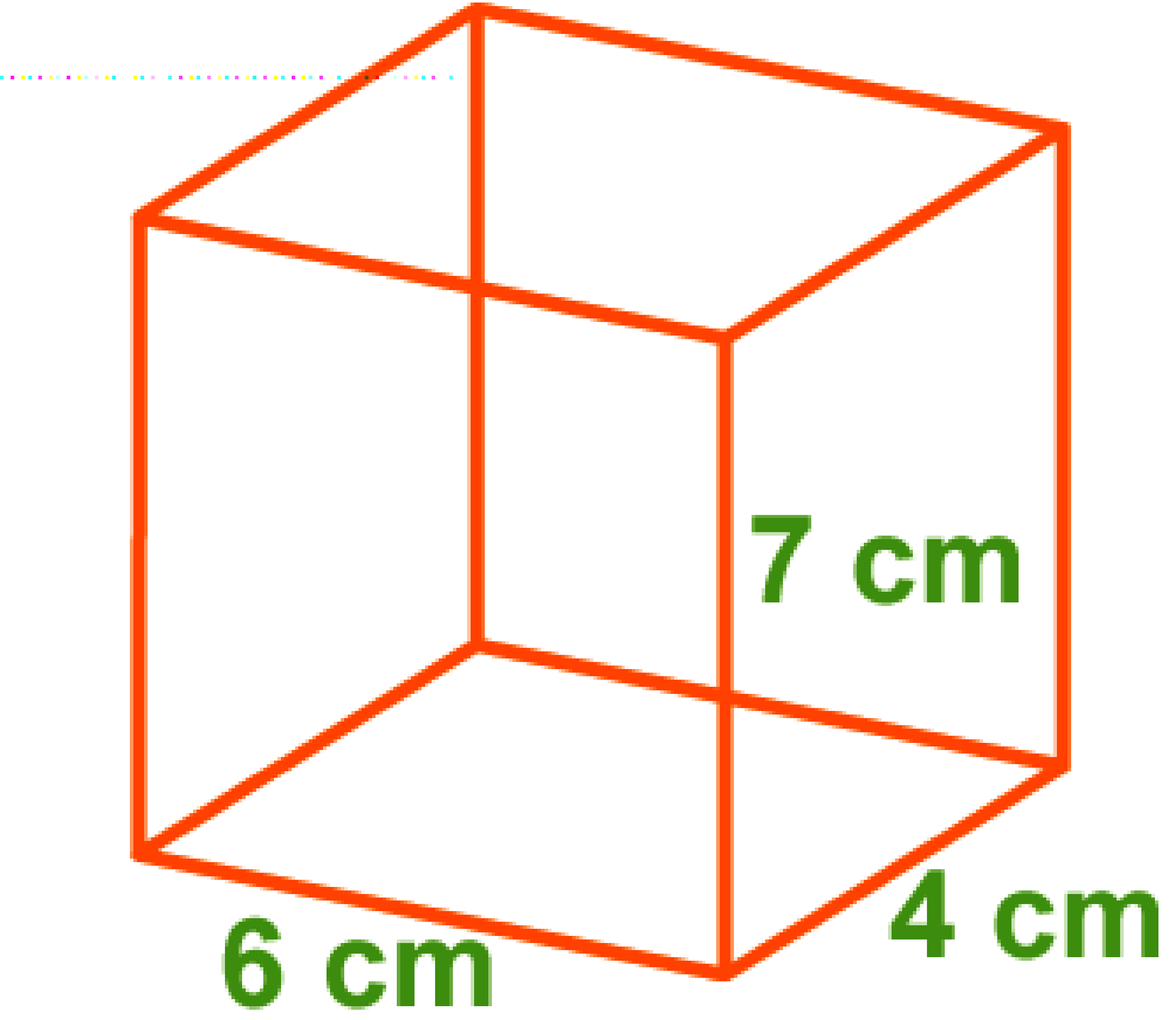
Area of a rectangle

Since it is a rectangle all its angles are 90 degree

A = width x height

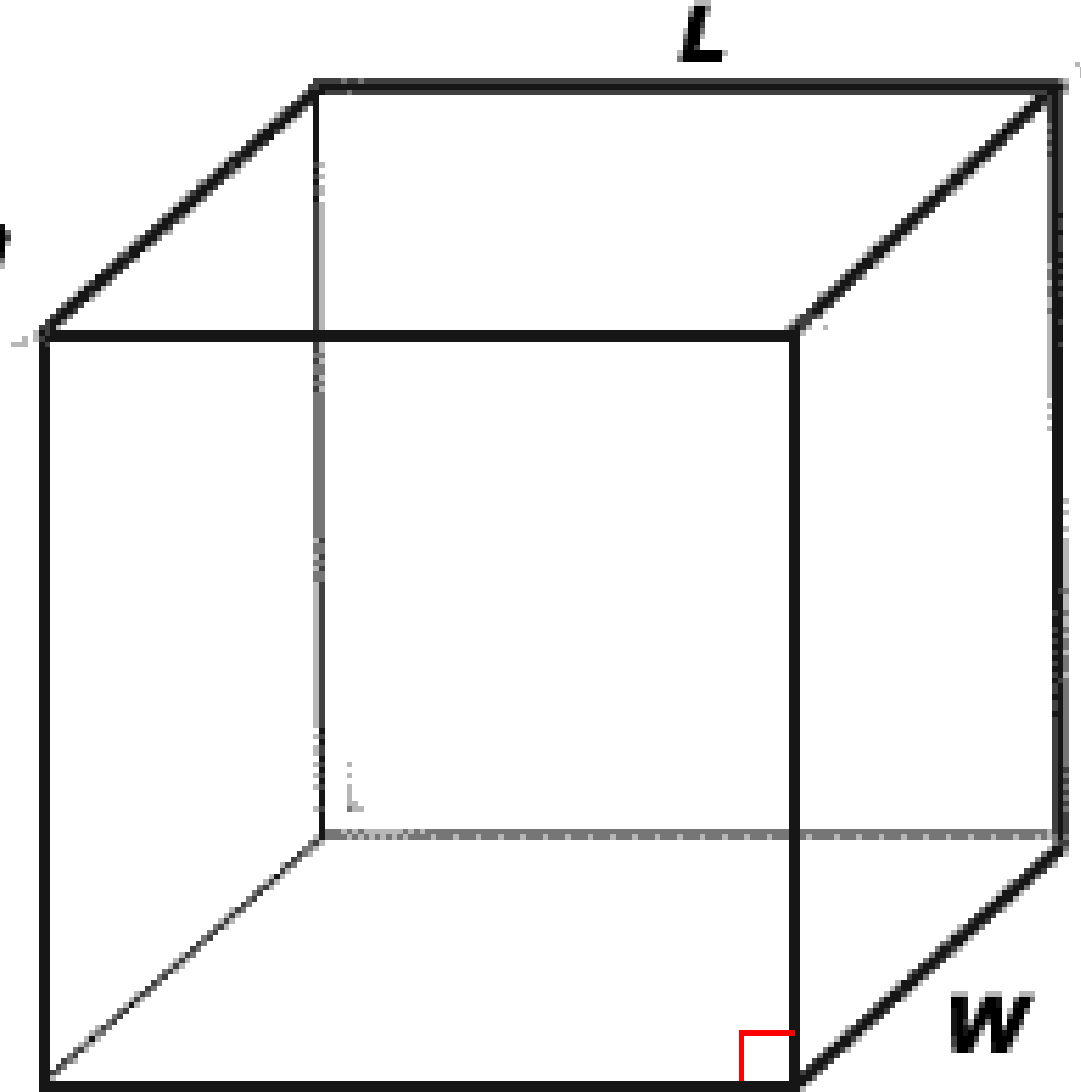
A = w x h

Example:
If w = 8 units and h = 5 units then
Area (A) = 8 x 5 = 40 square units

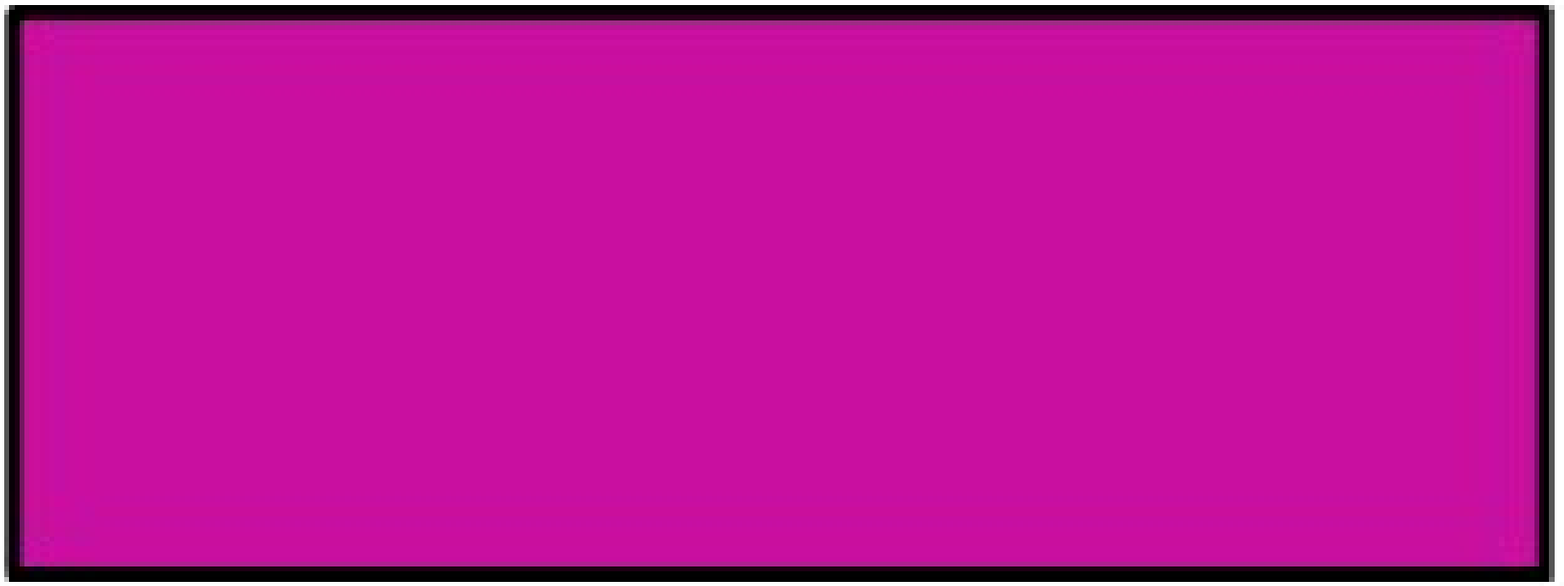

7 cm
6 cm
4 cm

Volume of a Cube

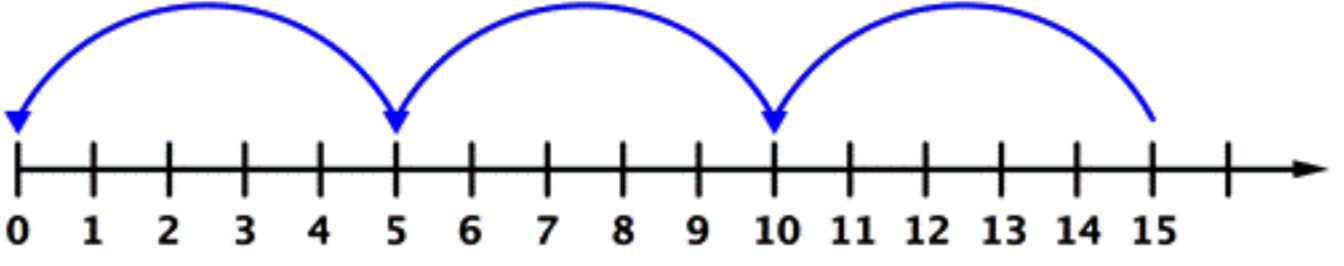
Volume = L x W x h

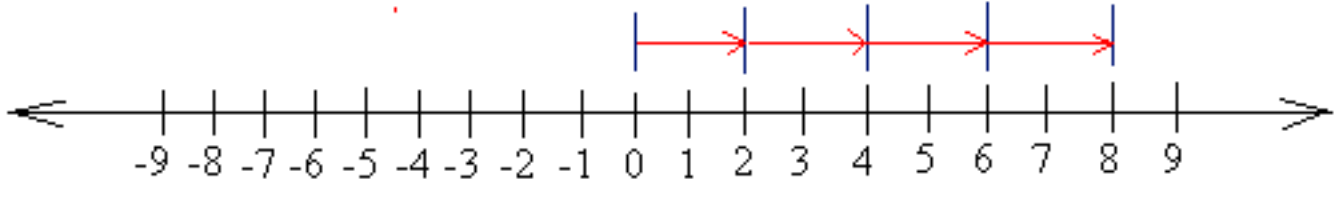


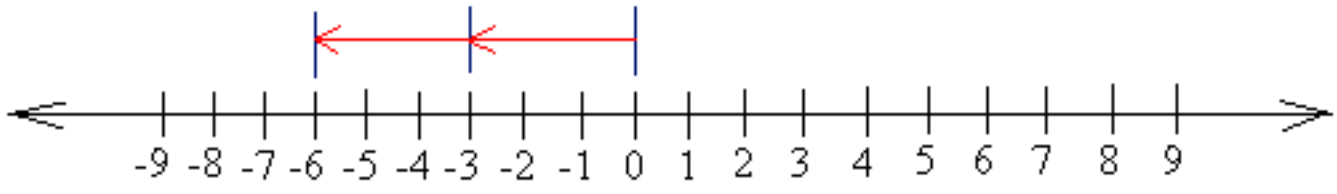
Like a rectangular solid, multiply the length, times the width times the height.

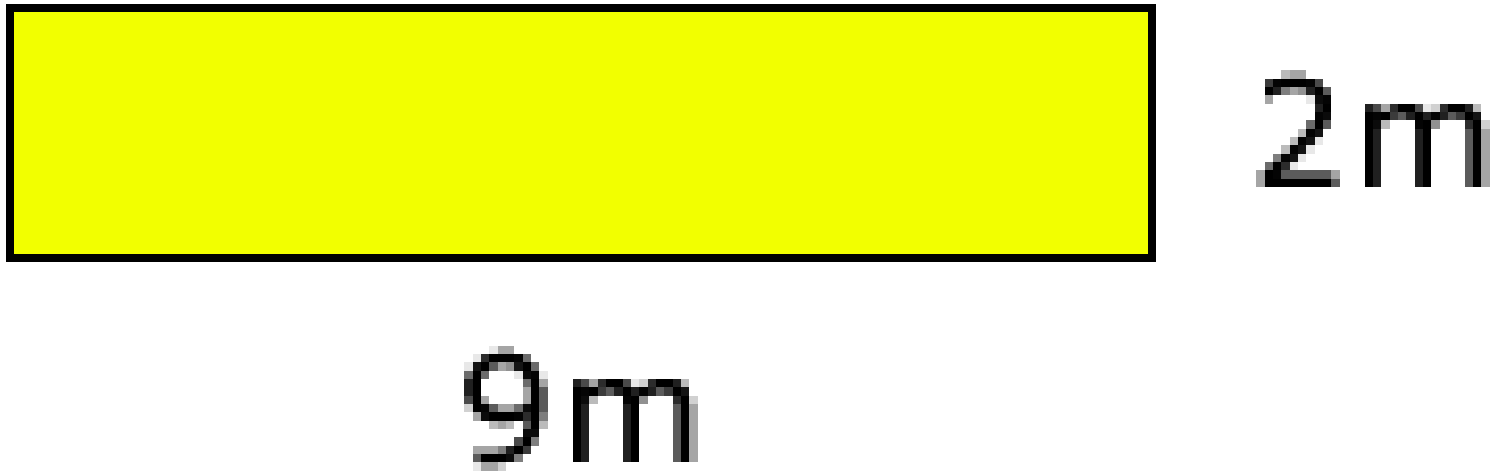


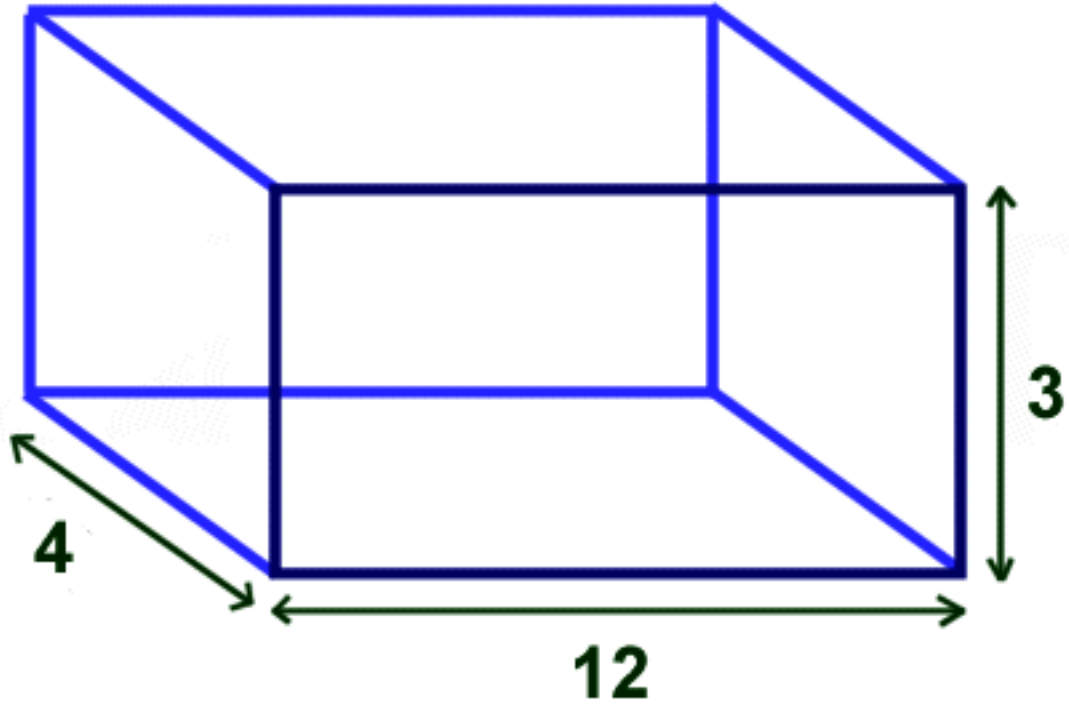
$$\text{Area} = b \times h$$

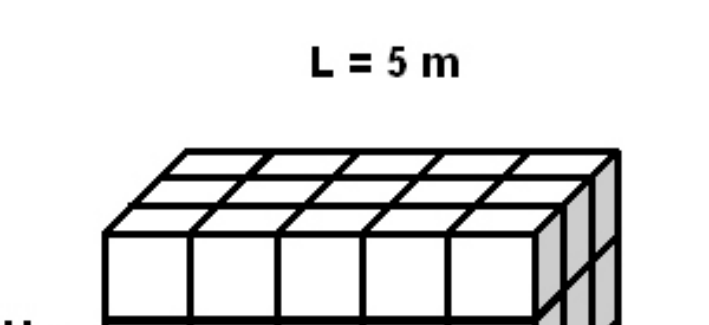

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15


-9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9


-9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9

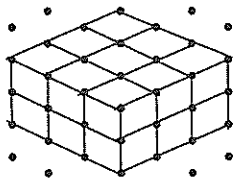

2m
9m


3
4
12


L = 5 m
H =
3 m
W =
3 m

Volume (1)

Find the volume of each shape. Assume each small block measures 1 cm^3.



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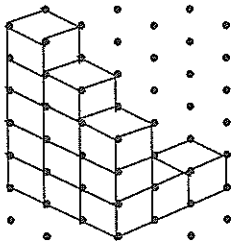

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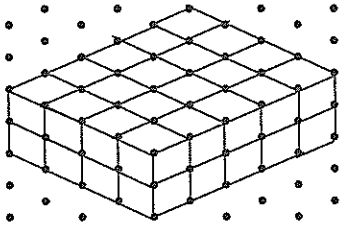
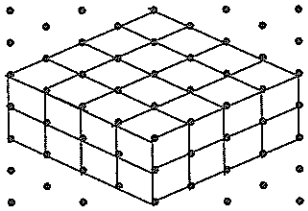
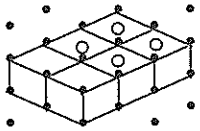


Volume: _____



Add one block on top of the blocks marked with the little circles, and two blocks under the other two blocks.



Volume: _____

$V = L \cdot W \cdot H$