



Grade 6 Unit 3: Equations and Geometry

Unit Length: 15 days

Updated 2/12/2020

UBD Stage One

Essential Questions

- What does it mean to evaluate an expression?
- How do formulas or equations help us solve real-world geometric problems?

Enduring Understandings

- Evaluating an expression involves the process of replacing the variables, if there are any, with numerical values and simplifying it while following the conventional order of operations and attending to precision.
- Students should recognize that solving geometric problems involves using formulas, which are conventional equations that represent the area, volume, or other common attribute of a geometric figure. Real-world examples should be given.

Standards

Read an in depth explanation by the writers of the standards: [Progressions](#)

When attending to precision at grade level, use the *highlighted* words to communicate mathematically.

Apply and extend previous understandings of arithmetic to algebraic expressions.

AR.MATH.CONTENT.6.EE.A.1

Write and *evaluate numerical expressions* involving whole-number *exponents*.

AR.MATH.CONTENT.6.EE.A.2

Write, read, and evaluate *expressions* in which letters stand for numbers.

AR.MATH.CONTENT.6.EE.A.2.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.*

AR.MATH.CONTENT.6.EE.A.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 $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$.*

AR.MATH.CONTENT.6.EE.A.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 $3y$.

Reason about and solve one-variable equations and inequalities.

AR.MATH.CONTENT.6.EE.B.7

*Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all **nonnegative rational numbers**.*

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

AR.MATH.CONTENT.6.NS.A.1

*Interpret and compute **quotients** of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?*

Compute fluently with multi-digit numbers and find common factors and multiples.

AR.MATH.CONTENT.6.NS.B.3

Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Solve real-world and mathematical problems involving area, surface area, and volume.

AR.MATH.CONTENT.6.G.A.1

*Find the area of **right triangles**, **other triangles**, **special quadrilaterals**, and **polygons** by **composing** into rectangles or **decomposing** into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.*

AR.MATH.CONTENT.6.G.A.2

*Find the volume of a **right rectangular prism** with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the **prism**. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.*

AR.MATH.CONTENT.6.G.A.4

Represent three-dimensional figures using **nets** made up of rectangles and triangles, and use the nets to find the **surface area** of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

UBD Stage Two- Tasks

These are common formative assessment tasks for discussion in PLCs.

- Student Self Assessment: [6 Unit 3 Target Scale](#)
- [6 Unit 3 District Formative Assessment](#)

UBD Stage Three- Additional Tasks

Choose tasks according to student thinking. If alternative tasks are used, please submit a copy to the District TOSA to help build unit problem banks.

The following badges are linked to language support tools to be used in conjunction with the UbD units created by the district ToSAs.

Language Support, Notetaker, and Structured Student Talk Badges (NT)						
Cause and Effect 	Compare Contrast 	Question & Conjecture 	Explain & Describe 	Proposition Support 	Sequence 	Multiple Representations
						
Think Write Pair Share 	Give One, Get One 	Talking Stick 	Lines of Communication 	Agree, Agree, Disagree 	Collaboration PlanIT 	Act Aspire Support 

The following table represents beginning levels of technology integration, as written, within the lessons. Increased levels can occur from changes in delivery.

Substitution 	Augmentation 	S: Technology acts as a direct tool substitute with no functional change A: Technology acts as a direct tool substitute with functional improvement M: Technology allows for significant project/task redesign R: Technology allows for the creation of new tasks – previously inconceivable
Modification 	Redefinition 	

Enduring Understanding: Evaluating an expression involves the process of replacing the variables, if there are any, with numerical values and simplifying it while following the conventional order of operations and attending to precision.			
Essential Question: What does it mean to evaluate an expression? How do formulas or equations help us solve real-world geometric problems?			15 days
Learning Goal	Task (possible SAMR)	Class Starter/ Exit Slip	Extension/ Scaffolding
Students will write and evaluate expressions and be able to describe and elaborate.	Juan's Garden Plot and Apple Trees		Juan's Garden Plot Slides 6HC10 Apple Trees 6HC10 Rubric Answer Key  
Students will write expressions and be able to compare and contrast equivalent expressions.	Patio and Sandbox	Class Starter: Carpeting	
Students will write and factor expressions and be able to describe and elaborate.	Distributive Property with Area	Class Starter: Perimeter	
Students will find area by decomposing into triangles and other shapes and be able to describe and elaborate their strategies.	Fraction Area Teacher Notes	Class Starter: Draw the Square Inches	Fraction Area Slides 
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	 6 Unit 3.1 6 Unit 3.2		Timing: Reg Ed: 7 min ELL: 14 or 21 min (according to LEP)
Students will find the area of triangles on a grid and generalize and be able to describe and elaborate their strategies.	Triangles, Triangles, and more Triangles		
Students will write expressions to represent area and perimeter and be able to compare and contrast equivalent expressions.	Building Sets and Wallpaper	Balance the Scale 2 Balance the Scale Teacher Info	Building Sets & Wallpaper Slides (with HC) 6HC11 Wallpaper 6HC11 Rubric  
Students will interpret and compute quotients of fractions and will be able to describe and elaborate.	Land Mass and Repairing the Road	Class Starter: Leftover Cake	Fraction Division Practice
Students will write and evaluate numerical expressions and will be able to compare rates.	Bubble Wrap		6HC12 Bubble Wrap 6HC12 Rubric Dan Meyer  

Students will create nets of a cube and will be able to compare and contrast characteristics of each.	Cube Nets Teacher Page		Cube Nets Slides 
Students will reason about surface area and will be able to propose and support the best possible box by writing.	Block Boxes 		Block Boxes Slides 
Students will decompose shapes into triangles to find the area, use decimal operations and will be able to sequence their strategies.	The Louvre Pyramid	Balance the Scale 3	 
Students will use decimal operations and the net of a triangular prism to find the surface area and will be able to sequence their strategies.	Triangular Prism Packaging	Balance the Scale 5	
Students will use rational number operations to find the surface area and will be able to sequence their strategies.	Painting Boxes	Balance the Scale 6	Kaplinsky Foil Prank
Students will use decimal operations to find the surface area and will be able to compare and contrast their strategies.	Jewelry Boxes		Jewelry Boxes Slides 
Students will write numerical expressions to represent surface area problems and will be able to compare and contrast strategies.	Triangular Platform and Storage Box Reg		6HC13 Storage Box 6HC13 Rubric  
Required: Collect and Report Data Give this DFA question as a class starter or exit slip.	 6 Unit 3.3 6 Unit 3.4 6 Unit 3.5		Timing: Reg Ed: 12 min ELL: 24 or 36 min (according to LEP)
Students will find the square feet needed to cover a space and will be able to describe and elaborate on their strategies.	Storage Unit	Alternate or practice: IM: Teacher Page	
Required: Collect and Report Data Give this DFA question as a performance assessment.	 6 Unit 3.6		Timing: Reg Ed: 15 min ELL: 30 or 45 min (according to LEP)

Considerations for 6th Grade Unit 2: Expressions and Equations

Where do I start? What should they know?

Expressions, Geometry

5.OA.1

Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.2

Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

5.MD.4

Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5.MD.5a

Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes.

5.MD.5b

Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

5.MD.5c

Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Considerations for 6th Grade Unit 2: Expressions and Equations

What do they need to be ready for? Where are they going?

Linear Equations and Three-Dimensional Geometry

7.EE.1

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.3

Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

7.EE.4

Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

8.EE.8

Analyze and solve pairs of simultaneous linear equations.

8.EE.1

Know and apply the properties of integer exponents to generate equivalent numerical expressions.

8.EE.2

Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.EE.3

Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

7.G.6

Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.