

Grade 6 Unit 3: Equations and Geometry

Unit Length: 15 days

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?

Updated 2/12/2020

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 $A = 6 s^2$ 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 = lxwxh and V = bxh 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: <u>6 Unit 3 Target Scale</u>
- 6 Unit 3 District Formative Assessment

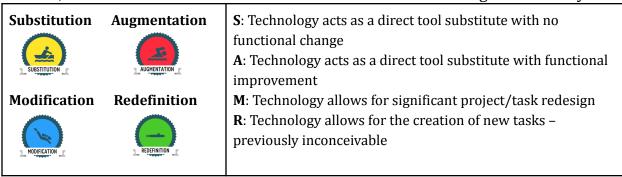
UBD Stage Three-Additional Tasks

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		
NT	NT	NT	NT	NT	NT	NT		
Think Write Pair Share	Give One, Get One	Talking Stick SST	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.



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

Students will create nets of a	<u>Cube Nets</u>		<u>Cube Nets Slides</u>
cube and will be able to	<u>Teacher Page</u>		7
compare and contrast			
characteristics of each.			
Students will reason about	Block Boxes		Block Boxes Slides
surface area and will be able to			<u>Diock Boxes Straes</u>
propose and support the best			
possible box by writing.	A NORTH HINE		
Students will decompose	The Louvre Pyramid	Balance the Scale 3	
shapes into triangles to find			$(\ \ \) (\ \ \ \)$
the area, use decimal			
operations and will be able to			
sequence their strategies.			
Students will use decimal	Trian and an Driana	Dalamas tha Casla F	
	<u>Triangular Prism</u>	Balance the Scale 5	(SST)
operations and the net of a	<u>Packaging</u>		
triangular prism to find the			
surface area and will be able to			
sequence their strategies.			
Students will use rational	<u>Painting Boxes</u>	Balance the Scale 6	Kaplinsky Foil Prank
number operations to find the			
surface area and will be able to			
sequence their strategies.			
Students will use decimal	Jewelry Boxes		Jewelry Boxes
operations to find the surface			Slides
area and will be able to			
compare and contrast their			
strategies.			
Students will write numerical	Triangular Platform		6HC13 Storage Box
expressions to represent	and		6HC13 Rubric
surface area problems and will	Storage Box Reg		Honors
be able to compare and			Challenge
contrast strategies.			
Required: Collect and Report			Timing:
Data	DFA		Reg Ed: 12 min
Give this DFA question as a			ELL: 24 or 36 min
class starter or exit slip.	6 Unit 3.3 6 Unit 3.4		(according to LEP)
class starter or exit sup.	<u>6 Unit 3.5</u>		(according to LLI)
Students will find the square	Storage Unit	Alternate or	
feet needed to cover a space		practice:	
and will be able to describe		IM: Teacher Page	
and elaborate on their			
strategies.			
Required: Collect and Report			Timing:
Data	DFA		Reg Ed: 15 min
Give this DFA question as a			ELL: 30 or 45 min
performance assessment.	<u>6 Unit 3.6</u>		(according to LEP)
perioritianee assessificine.	1	l	(according to LLI)

Considerations for 6th Grade Unit 2: Expressions and Equations

Where do I start? What should they know?

Expressions, Geometry

5.0A.1

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

5.0A.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 x2 = p and x3 = 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.