Grade 6 - Unit A - Area & Surface Area

Unit Focus

In this unit, students extend their reasoning about area begun in third grade to include shapes that are not composed of rectangles. Through activities designed and sequenced to allow students to make sense of problems and persevere in solving them, students build their knowledge of areas of rectangles to find the areas of polygons by decomposing and rearranging them to make figures whose areas they can determine. They learn strategies for finding areas of parallelograms and triangles, and use regularity in repeated reasoning to develop formulas for these areas, using geometric properties to justify the correctness of these formulas. They use these formulas to solve problems. They understand that any polygon can be decomposed into triangles, and use this knowledge to find areas of polygons. Students find the surface areas of polyhedra with triangular and rectangular surfaces. They study, assemble, and draw nets, a pattern that you can cut and fold to make a model of a solid shape, for polyhedra and use nets to determine surface areas.

Stage 1: Desired Results - Key Understandings

Standard(s)

Standards
- Common Core
- *Mathematics: 6*
- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Write and evaluate numerical expressions involving whole-number exponents. *(CCSS.MATH.CONTENT.6.EE.A.1)*
- Write, read, and evaluate expressions in which letters stand for numbers. *(CCSS.MATH.CONTENT.6.EE.A.2)*
- 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 $s = 1/2$. *(CCSS.MATH.CONTENT.6.EE.A.2C)*
- Solve real-world and mathematical problems involving area, surface area, and volume.
- 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. *(CCSS.MATH.CONTENT.6.G.A.1)*
- 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 $V = l\, w\, h$

Transfer

Students will be able to independently use their learning to...
T1 Initiate a plan using a variety of methods/strategies appropriately, execute it, and evaluate the reasonableness and accuracy of the solution.
T2 Apply models to solve problems.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Mathematicians work to make sense of the problem before trying to solve it. **U2** Mathematicians monitor progress while problem solving, change course if necessary and evaluate the reasonableness of their solution. **U3** Mathematicians create or use models to generalize, represent, and solve problems.	*Students will keep considering...* **Q1** What do effective problem solvers do when they get stuck? **Q2** What model best represents this problem? **Q3** How can constructing and deconstructing help me? **Q4** How are area, surface area and volume similar and different?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** strategies for composing and decomposing polygons **K2** volume is calculated based on the number of unit cubes that can pack a rectangular prism	*Students will be skilled at...* **S1** calculating the area of triangles, quadrilaterals and other polygons **S2** calculating the volume of right rectangular prisms

Stage 1: Desired Results - Key Understandings

and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. *(CCSS.MATH.CONTENT.6.G.A.2)*
- 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. *(CCSS.MATH.CONTENT.6.G.A.4)*
- Mathematical Practices
- Make sense of problems and persevere in solving them. *(CCSS.MATH.MP.1)*
- Model with mathematics. *(CCSS.MATH.MP.4)*

Madison Public Schools Profile of a Graduate
  Design: Engaging in a process to refine a product for an intended audience and purpose. *(POG.2.2)*

K3 a three-dimensional figure can be represented with a net
K4 the formula for calculating volume
K5 the formula for calculated surface area
K6 Vocabulary: area, region, plane, gap, compose, decompose, rearrange, two-dimensional, three-dimensional, quadrilateral, parallelogram, base, height, polygon, vertex, edge, face, prism, pyramid, squared, cubed, net, surface area, volume, horizontal, vertical, polyhedron, polyhedra, exponent
K7 the meaning of exponents in terms of squared and cubed related to volume

S3 using nets to calculate surface area
S4 drawing and recognizing nets for specific 3-D shapes
S5 writing and evaluating whole number exponents