Examples for each lesson:

Lesson 11.1

Three-Dimensional Figures and Nets

**Solid figures** have three dimensions—length, width, and height. They can be named by the shapes of their bases, the number of bases, and the shapes of their lateral faces.

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**Identify and draw a net for the solid figure.**

**Step 1** Describe the base of the figure.
   The base is a square.

**Step 2** Describe the lateral surfaces.
   The lateral surfaces are triangles.

So, the figure is a square pyramid.

**Step 3** Name the shapes to be used in the net. Then make a sketch. Draw a square for the base, and four triangles for the lateral faces.
Lesson 11.2

Explore Surface Area Using Nets

The net of a solid figure shows you all of the faces or surfaces of the figure. A net can help you find the **surface area** of a figure.

Find the surface area of the rectangular prism.

**Step 1** Make a net of the rectangular prism.
The prism has 6 rectangular faces, so the net has 6 rectangles.

**Step 2** Find the area of each face of the prism.

First Way: Count the grid squares on each rectangle to find its area.

- A: 8 squares \(4 \times 2 = 8\)
- B: 8 squares \(4 \times 2 = 8\)
- C: 4 squares \(4 \times 1 = 4\)
- D: 4 squares \(4 \times 1 = 4\)
- E: 2 squares \(2 \times 1 = 2\)
- F: 2 squares \(2 \times 1 = 2\)

Second Way: Calculate the area of each rectangle by multiplying length \(\times\) width.

**Step 3** Add the areas of all the rectangular faces.

28 squares 28 square inches

So, the surface area of the rectangular prism is 28 square inches (in.\(^2\)).
Lesson 11.3

Algebra • Surface Area of Prisms

You can find the surface area of a figure by adding the lateral surface area to the sum of the areas of the bases.

Use a net to find the surface area.

**Step 1** Draw a net.

Note any faces that have equal areas.

**Step 2** Both triangular bases have the same area.

- Base A: \( A = \frac{1}{2} bh = \frac{1}{2} \times 8 \times 6 = 24 \text{ in.}^2 \)
- Base E: \( A = 24 \text{ in.}^2 \)

**Step 3** Find the areas of the rectangular faces.

- Face B: \( A = lw = 6 \times 12 = 72 \text{ in.}^2 \)
- Face C: \( A = lw = 8 \times 12 = 96 \text{ in.}^2 \)
- Face D: \( A = lw = 10 \times 12 = 120 \text{ in.}^2 \)

**Step 4** Add the areas: \( A + B + C + D + E = 24 + 72 + 96 + 120 + 24 = 336 \text{ in.}^2 \)

So, the surface area of the triangular prism is 336 square inches (in.²).

More information on this strategy is available on Animated Math Model #34.

Lesson 11.4

Algebra • Surface Area of Pyramids

To find the surface area of a pyramid, add the area of the base to the lateral area. The lateral area is the combined area of the triangular faces.

Find the surface area of the square pyramid.

**Step 1** The base is a square with side length of 6 in. Use the formula \( A = s^2 \) to find the area. Substitute 6 for the variable \( s \).

\( A = 6^2 = 36 \text{ in.}^2 \)

**Step 2** The lateral faces are four triangles with base of 6 in and height of 8 in. Find the area of one triangular lateral face using the formula \( A = \frac{1}{2} bh \). Substitute 6 for \( b \) and 8 for \( h \).

\( A = \frac{1}{2} (6)(8) = 24 \text{ in.}^2 \)

**Step 3** Multiply by 4 to find the total lateral area.

\( L = 24 \times 4 = 96 \text{ in.}^2 \)

**Step 4** Add the area of the base and the lateral area.

\( S = 36 \text{ in.}^2 + 96 \text{ in.}^2 = 132 \text{ in.}^2 \)

So, the surface area of the square pyramid is 132 square inches (in.²).
Lesson 11.5

Fractions and Volume

Find the volume of a rectangular prism that is $2\frac{1}{2}$ units long, 2 units wide, and $1\frac{1}{2}$ units high.

**Step 1** Stack cubes with $\frac{1}{2}$-unit side length to form a rectangular prism.

- Length: 5 cubes $= \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2\frac{1}{2}$ units
- Width: 4 cubes $= \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ units
- Height: 3 cubes $= \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 1\frac{1}{2}$ units

**Step 2** Count the total number of cubes.

**Step 3** It takes 8 cubes with $\frac{1}{2}$-unit side lengths to make 1 unit cube. So, each smaller cube has $\frac{1}{8}$ the volume of a unit cube.

Divide 60 by 8 to find how many unit cubes it would take to form the prism. Write the remainder as a fraction and simplify.

$60 \div 8 = 7 \text{ R}4 
\quad 7\frac{4}{8} = 7\frac{1}{2}$

So, the volume of the prism is $7\frac{1}{2}$ cubic units.
Lesson 11.6

Algebra • Volume of Rectangular Prisms

You can find the volume of a prism by using the formula $V = Bh$. $V$ stands for volume, $B$ stands for the area of the base, and $h$ stands for the height.

For a rectangular prism, any face can be the base, since all faces are rectangles.

Find the volume of the rectangular prism.

**Step 1** Find the area of the base.
The base is $3 \frac{1}{2}$ ft by $3 \frac{1}{2}$ ft.

$A = l \times w$

$A = 3 \frac{1}{2} \text{ ft} \times 3 \frac{1}{2} \text{ ft} = 8 \frac{3}{4} \text{ ft}^2$

**Step 2** Multiply the area of the base by the height.

$V = Bh$

$V = 8 \frac{3}{4} \text{ ft}^2 \times 5 \text{ ft} = 43 \frac{3}{4} \text{ ft}^3$

So, the volume of the rectangular prism is $43 \frac{3}{4} \text{ ft}^3$.

Find the volume of the cube.

**Step 1** Because the length, width, and height are all equal, you can use a special formula.

$V = Bh = l \times w \times h$

$V = s^3$

So, the volume of the cube is $15 \frac{5}{8} \text{ yd}^3$.

More information on this strategy is available on Animated Math Model #35.
Lesson 11.7

Problem Solving • Geometric Measurements

Leslie stores gardening supplies in this shed shaped like a rectangular prism. What is the area of the ground covered by the shed?

<table>
<thead>
<tr>
<th>Read the Problem</th>
<th>Solve the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What do I need to find?</strong></td>
<td>Choose the measure—area, surface area, or volume—that gives the area of the ground covered by the barrel. Explain.</td>
</tr>
<tr>
<td>I need to find</td>
<td></td>
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<td></td>
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<tr>
<td><strong>What information do I need to use?</strong></td>
<td></td>
</tr>
<tr>
<td>I need to use</td>
<td></td>
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<td></td>
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<tr>
<td><strong>How will I use the information?</strong></td>
<td>Replace the variables $l$ and $w$ in the area formula with their values in the dimensions of the shed.</td>
</tr>
<tr>
<td>First, I will decide __________________________________</td>
<td>$l = \underline{\hspace{2cm}}$ ft  $w = \underline{\hspace{2cm}}$ ft</td>
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<td></td>
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<tr>
<td></td>
<td>Evaluate the formula.</td>
</tr>
<tr>
<td></td>
<td>$A = \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$</td>
</tr>
<tr>
<td></td>
<td>$= \underline{\hspace{2cm}}$ ft$^2$</td>
</tr>
</tbody>
</table>
**Vocabulary**

**Lateral area** – the sum of the areas of all the lateral faces or surfaces of a three-dimensional figure

**Net** – a two-dimensional pattern that can be folded to make a three-dimensional shape

**Solid figure** – a three-dimensional figure

**Surface area** – the sum of the areas of all of the faces or surfaces of a solid figure

**Volume** -- a measure of the amount of space a solid figure occupies

**Area** – the number of square units needed to cover a flat surface

**Base (of a solid figure)** – a flat surface of a solid figure by which the figure is measured or classified

**Polygon** – a closed plane figure formed by three or more line segments that intersect only at endpoints

**Prism** – a solid figure that has two congruent, polygon-shaped bases and other faces that are all parallelograms

**Pyramid** – a solid figure with a polygon-shaped base and other faces that are all triangles and that meet at a common vertex