Buildings are solid geometrical shapes that are often constructed from basic geometrical shapes: cubes, pyramids, and spheres.

The Beijing National Aquatics Center, commonly called the Water Cube, is an amazing architectural and engineering feat. The building’s design is based on how soap bubbles naturally connect to each other. Each “bubble” in this building is a large, inflated plastic pillow that uses solar energy to help regulate the heating inside the building. Even though the structure is not actually a cube, as the nickname implies, it is a marvel of modern design.

**Learning Objectives**

- Find the volume of geometric solids
- Find the surface area of geometric solids

**Terminology**

**Previously Used**
- quadrilateral
- side
- triangle

**New Terms to Learn**
- face
- geometric solids
- prism
- surface area
Building Mathematical Language

Geometric Solids

The shapes introduced in section 3.4 were plane figures and therefore two-dimensional. Basic shapes also form the base and sides of objects in three dimensions—length, width, and height—and are called geometric solids. A box is an example of a geometric solid.

- **Volume**: Volume measures how much something “holds”. Volume is found by multiplying the area of the base by the height of the figure. Each of the length, width, and height measurements must be in the same unit (feet, meters, inches, etc.), so when multiplied together the result is in cubic units: ft³, m³, in³.

- **Surface Area**: Each face or surface of a geometric solid is a basic shape. Use the area formula for each surface and find the sum of all the surfaces. Measure surface area in square units: ft², m², or in².

- **Unit requirements**: All measurements must be in the same units or converted to the same units. Use standard conversion ratios for changing between units, if necessary.

### Cube

All six surfaces are squares of equal size

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = s^3 )</td>
<td>( SA = 6s^2 )</td>
</tr>
</tbody>
</table>

*Volume is equal to the length of any one side raised to the third power*

*Each face (6 total) is an equivalent square*

**OBSERVATIONS**

Dice are cubes with dots indicating each side.

### Rectangular Parallelepiped

Also called a rectangular prism or box. Each face is a rectangle and opposite faces are equivalent. The dimensions are length, width, and height (or depth). The base is a rectangle.

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = lwh )</td>
<td>( SA = 2lw + 2lh + 2wh )</td>
</tr>
</tbody>
</table>

*Volume = length times width times height (or depth)*

*Find the sum of the areas of each face*

**OBSERVATIONS**

A cereal box is a rectangular parallelepiped.
Section 3.5 — Geometric Solids

**Right Circular Cylinder**

The two ends, or bases, are equivalent circles. The distance between the bases is the height.

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = Bh )</td>
<td>( SA = 2B + Ch )</td>
</tr>
</tbody>
</table>

**Total surface area** is the sum of the areas of the two bases and the lateral surface area. **Lateral surface area** is the circumference multiplied by the height.

**Observations**

Canned food most often comes in right circular cylinders.

**Sphere**

Any cross section of a sphere is a circle of radius \( r \). All distances from the center of the sphere to the surface are of length \( r \).

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = \frac{4}{3} \pi r^3 )</td>
<td>( SA = 4\pi r^2 )</td>
</tr>
</tbody>
</table>

**Observations**

Round balls are spheres: baseballs, tennis balls, basketballs, as well as oranges, grapes, and cantaloupes.

**Pyramid**

Any solid figure with a typically square or triangular base and sides that taper to a point is a pyramid.

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = \frac{1}{3} Bh )</td>
<td>For a regular pyramid: ( SA = B + \frac{1}{2} Ps )</td>
</tr>
</tbody>
</table>

\( B = \text{area of the base} \)

\( h = \text{height} \)

\( P = \text{perimeter of the base} \)

\( s = \text{the slant height} \)

**Observations**

All sides of a pyramid are triangles; you can find the surface area of a pyramid by adding the area of the triangles that form its sides to the area of the base. Can you see how that process yields the formula above?

**Right Circular Cone**

The base is a circle and the height of the cone is defined as the distance from the center of the base to the apex or tip.

<table>
<thead>
<tr>
<th>Volume (V)</th>
<th>Surface Area (SA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V = \frac{1}{3} Bh )</td>
<td>( SA = \pi r^2 + \pi rs )</td>
</tr>
</tbody>
</table>

\( B = \pi r^2 \)

\( h = \text{height} \)

\( s = \text{the slant height} \)

The slant height \( s \) is defined as:

\[ s = \sqrt{r^2 + h^2} \]

The triangle made by the radius of the base, the height, and the slant height is a right triangle, so the Pythagorean Theorem applies.

**Observations**

Notice the similarity between the volume equations for the right circular cone and pyramid. This is because a pyramid is a cone with a **triangle, quadrilateral**, or hexagon (instead of a circle) for a base.
### Methodologies

#### Using Geometric Formulas

<table>
<thead>
<tr>
<th>Steps in the Methodology</th>
<th>Example 1</th>
<th>Example 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draw or examine a sketch of the information</td>
<td>Make a sketch if necessary.</td>
<td><img src="sketch.png" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine which formula to use</td>
<td>When choosing and writing the formula, make sure that each part is identified with the information given. Sometimes two or more formulas may be needed to complete the information.</td>
<td>( SA = 2B + Ch ) where ( B = \pi r^2 ) is the area for each circular base and ( C = \pi d ) is the circumference of the cylinder.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determine the units needed</td>
<td>Once the formula is chosen, look back to determine what units are required.</td>
<td>Surface area uses square units, so square feet or square inches would be the correct unit. We choose to work in feet.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make sure that all units agree</td>
<td>Units must be the same. Use common conversion ratios and a proportion equation to change units. Change the units in the diagram if necessary.</td>
<td>Units are given in feet and inches.</td>
</tr>
</tbody>
</table>

**Example 1**: Find the total surface area of a cylinder that is six feet high and 18 inches in diameter. Round to the nearest hundredth.

**Example 2**: Find the volume of the cylinder in Example 1. Round to the nearest tenth.

**Try It!**
### Section 3.5 — Geometric Solids

<table>
<thead>
<tr>
<th>Steps in the Methodology</th>
<th>Example 1</th>
<th>Example 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 4 (con’t)</strong></td>
<td>Make sure that all units agree</td>
<td><strong>Example 1</strong></td>
</tr>
<tr>
<td>Units must be the same. Use common conversion ratios and a proportion equation to change units. Change the units in the diagram if necessary.</td>
<td>Validate: Does 1.5 ft = 18 in?</td>
<td><strong>Example 2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>Substitute given measurements into the formula</td>
<td>In this case, use the area of a circle formula and the circumference formula before making the substitution.</td>
</tr>
<tr>
<td>Find needed information first. Round each calculation to the desired number of decimal places. It is a good idea to validate the arithmetic of intermediate steps, especially when working more complex or involved problems.*</td>
<td>d = 1.5 ft ( \frac{1.5 \text{ ft}}{2} ) r = ( \frac{1.5 \text{ ft}}{2} ) ( B = \pi \left( \frac{1.5 \text{ ft}}{2} \right)^2 ) and ( C = \pi (1.5 \text{ ft}) )</td>
<td>B \approx 3.14(0.75ft)^2 \approx 1.77 ft^2 ( B \approx 3.14(0.75ft)^2 \approx 1.77 ft^2 ) Validate: ( \frac{1.77}{3.14} \approx 0.75, \ 0.75 \cdot 2 = 1.5 ) ( C \approx 3.14 \times 1.5 \approx 4.71 \text{ ft} ) Validate: ( \frac{4.71}{3.14} \approx 1.5 ) ( SA \approx 2(1.77)\text{ft}^2 + (4.71 \text{ ft})(6 \text{ ft}) )</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>Solve</td>
<td>SA \approx 2(1.77 \text{ ft}^2) + (4.71 \text{ ft})(6 \text{ ft}) ( SA \approx 3.54 \text{ ft}^2 + 28.26 \text{ ft}^2 ) Answer: <strong>SA \approx 31.80 \text{ ft}^2</strong></td>
</tr>
<tr>
<td>Use Order of Operations to solve. Units multiply like numbers. In order to combine by addition or subtraction, the units must be the same.</td>
<td>Validate: 31.80 – 2(1.77) ( \frac{1}{2} ) (4.71)(6) ( 31.80 – 3.54 \approx 28.26 ) ( 28.26 = 28.26 )</td>
<td></td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>Validate:</td>
<td></td>
</tr>
<tr>
<td>Two steps:</td>
<td>• ( \text{ft}^2 ) was anticipated ( \checkmark )</td>
<td></td>
</tr>
<tr>
<td>• compare units</td>
<td>• ( 31.8 – 28.26 = 3.54 ) ( \checkmark )</td>
<td></td>
</tr>
<tr>
<td>• check computations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note that these intermediate validations will not always be shown in models and problems.*
Chapter 3 — Geometry

The Rubik’s Cube is a mechanical puzzle that appears to be a cube made of cubes. If each little “cube” has a volume of 1 in$^3$, what is the volume of the whole cube? Can you calculate the surface area of the whole cube?

**Model 1: Volume**

Find the volume of a trunk measuring 2 feet by 1 yard by 18 inches.

**Step 1**

![Diagram of a trunk measuring 2 feet by 1 yard by 18 inches.]

**Step 2**  
$V = lwh$

**Step 3**  
Units needed are cubic inches, cubic feet, or cubic yards. We choose cubic feet.

**Step 4**  
Change 1 yard to feet: 3 ft  
$\frac{1 \text{ yd}}{x \text{ ft}} = \frac{1 \text{ yd}}{3 \text{ ft}}; \quad x = 3 \text{ ft}$  
Change 18 inches to feet: 1.5 ft  
$\frac{18 \text{ in}}{x \text{ ft}} = \frac{12 \text{ in}}{1 \text{ ft}}; \quad x = \frac{18 \text{ in} \cdot 1 \text{ ft}}{12 \text{ in}} = 1.5 \text{ ft}$

**Step 5**  
$V = lwh$  
$V = (3 \text{ ft})(2 \text{ ft})(1.5 \text{ ft})$

**Step 6**  
Answer: $V = 9 \text{ ft}^3$

**Step 7**
- $\text{ft} \times \text{ft} \times \text{ft} = \text{ft}^3$ ✓
- $9 \div 3 = 3; \quad 3 \div 2 = 1.5$ ✓
Model 2: Surface Area

What is the surface area of the trunk in Model 1 in square inches?

Step 1

Step 2
SA = 2lw + 2lh + 2wh

Step 3
Units needed are square inches

Step 4
Convert 1 yd to 36 inches
Convert 2 ft to 24 inches

Step 5
SA = 2lw + 2lh + 2wh
SA = 2(36 in)(24 in) + 2(36 in)(18 in) + 2(24 in)(18 in)
SA = 1728 in² + 1296 in² + 864 in²

Validate:

\[
\begin{align*}
\frac{1728}{24} &\overset{?}{=} 36 \cdot 2 \\
\frac{1296}{18} &\overset{?}{=} 2 \cdot 36 \\
\frac{864}{18} &\overset{?}{=} 2 \cdot 24
\end{align*}
\]

\[
\begin{align*}
72 &= 72 \checkmark \\
72 &= 72 \checkmark \\
48 &= 48 \checkmark
\end{align*}
\]

Step 6
SA = 1728 in² + 1296 in² + 864 in²
Answer: SA = 3888 in²

Step 7

• square inches is correct \(\checkmark\)
• \(3888 - 864 = 3024 - 1296 = 1728\) \(\checkmark\)
Model 3: Volume of a Sphere

Find the volume of a sphere with radius 15 centimeters. Round to the nearest whole number.

Step 1

Step 2

\[ V = \frac{4}{3} \pi r^3 \]

Step 3

Volume is measured in cubic units. We will need cm\(^3\) for our answer.

Step 4

The radius is given in centimeters.

Step 5

\[ V = \frac{4}{3} \pi r^3 \]

\[ V \approx \frac{4}{3}(3.14)(15 \text{ cm})^3 \]

Step 6

\[ V \approx (4.18667)(3375 \text{ cm}^3) \]

Answer: \( V \approx 14130 \text{ cm}^3 \)

Step 7

- square inches is correct ✓
- \[ \frac{14130}{3375} \approx 4.1867 \]
- \[ \frac{4.1867}{3.14} \approx 1.3333 \]
- \[ 1.3333 \approx \frac{4}{3} ✓ \]
Model 4: Surface Area of a Pyramid

Find the surface area of a pyramid with a square base 6 feet on a side, a height of 8 feet, and a slant height of 10 feet.

Step 1

Step 2

\[ \text{SA} = s^2 + \frac{1}{2} P_s \]

Step 3
Surface area is measured in square units. We will need ft\(^2\) for our answer.

Step 4
The measurements are all given in feet.

Step 5

\[ \text{SA} = (6 \text{ ft})^2 + \frac{1}{2} (4 \cdot 6 \text{ ft})(10 \text{ ft}) \]

Step 6

\[ \text{SA} = (6 \text{ ft})^2 + \frac{1}{2} (4 \cdot 6 \text{ ft})(10 \text{ ft}) \]
\[ \text{SA} = 36 \text{ ft}^2 + (2 \cdot 6 \text{ ft})(10 \text{ ft}) \]
\[ \text{SA} = 36 \text{ ft}^2 + 120 \text{ ft}^2 \]
Answer: \( \text{SA} = 156 \text{ ft}^2 \)

Step 7
- square feet is correct
- \( 156 - 6^2 = \frac{1}{2} (4 \cdot 6)(10) \)
  \[ 120 = 120 \]
## Addressing Common Errors

<table>
<thead>
<tr>
<th>Issue</th>
<th>Incorrect Process</th>
<th>Resolution</th>
<th>Correct Process</th>
<th>Validation</th>
</tr>
</thead>
</table>
| Using the wrong formula   | Find the volume of a beach ball that is 6" in diameter.                           | Carefully choose and write the correct formula in Step 2 of the methodology.                     | $r = \frac{1}{2} \times 6" = 3"$  
$V = \frac{4\pi}{3}r^3$  
$V \approx \frac{4\cdot \pi \cdot 3^3}{3}$   
$V \approx 113.04 \text{ in}^3$ | • cubic inches ✓  
• $\frac{113.04}{3.14} = 36$ ✓ |
| Not validating units      | Find the surface area of a sphere with a radius of 3 ft.                          | Units should be included when substituting into the formula.                                       | Surface area is measured in square units.                                        | • square feet ✓  
• $\frac{36}{4} = 9$  
$\sqrt{9} = 3$ ✓ |
| Not converting to common units | A pyramid with a square base 6 feet on each side has a height of 4 yards. Find the volume of the pyramid. | Check to see that the units are the same. If not, convert to common units before substituting values into the formula. | First convert feet to yards:  
$x(\text{yd}) = \frac{1}{3} \text{ ft}$   
$x = 2 \text{ yd}$  
then substitute:  
$V = \frac{1}{3} \text{ Bh}$  
$V = \frac{1}{3} (2 \text{ yd})^2 \cdot (4 \text{ yd})$  
$V = \frac{4 \text{ yd}^2}{3} \cdot (4 \text{ yd})$  
$V = \frac{16 \text{ yd}^3}{3}$  
$V \approx 5.33 \text{ yd}^3$ | • cubic yards ✓  
• $\frac{5.33}{\frac{1}{3}} = 16 \left(2^3\right)$  
$1.33 \approx \frac{4}{3}$  
$1.33 \approx 1.33$ ✓ |
Before proceeding, you should be able to use corrected formulas to calculate the following:

- Volume and surface area of a rectangular parallelepiped
- Volume and surface area of a pyramid
- Volume and surface area of a right circular cylinder
- Volume and surface area of a sphere
Activity

**Geometric Solids**

**Performance Criteria**

- Finding the volume and surface area of geometric solids.
  - use of the appropriate formula
  - accuracy of calculations
  - validation of the answer

**Critical Thinking Questions**

1. What are three possible applications for surface area?

2. What shape is the lateral surface area of a right circular cylinder? (Hint: think of a paper label removed from a can of soup.)

3. Why are square units used for the area of quadrilaterals in a plane and the surface areas of geometric solids?
4. Once the basic shape formulas for area are learned, how is that knowledge applied to finding surface area?

5. What value does a sketch provide for solving a three-dimensional geometric problem?

6. Why is slant height used in finding the surface area of a regular?

**Tips for Success**

- Identifying the shape of the base of an object is key to finding volume and surface area
- Good practice includes validating by correctly multiplying units of measure: square units for area, cubed units for volume
- Draw and label a diagram or sketch as accurately as possible
1. Find the volume as indicated, for each of the following:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Worked Solution</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Find the volume of a cube measuring 6.3 cm per side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Find the volume in cubic feet of a box that measures 18 inches by 2.5 feet by 4 feet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) How much air does Judy’s giant beach ball hold if it measures 3 feet in diameter?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The entrance pyramid at the Louvre Museum in Paris has a height of 20.6 meters and a square base measuring 35 meters on a side. What is its volume?

<table>
<thead>
<tr>
<th>Problem</th>
<th>Worked Solution</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>d) The entrance pyramid at the Louvre Museum in Paris has a height of 20.6 meters and a square base measuring 35 meters on a side. What is its volume?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The pyramid consists of 603 rhombus-shaped and 70 triangular glass segments.

*For more information on the Louvre Pyramid by I. M. Pei, visit:* [http://www.greatbuildings.com/buildings/Pyramide_du_Louvre.html](http://www.greatbuildings.com/buildings/Pyramide_du_Louvre.html)
4. Find the **surface area** as indicated:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Worked Solution</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Find the surface area of a cube measuring 2.7 feet per side.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Find the surface area in square feet of a box that measures 30 inches by 2.7 feet by 4 feet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) How much plastic is required for Judy’s giant beach ball if it measures 3 feet in diameter?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Back to the Louvre pyramid: What is the surface area (to the nearest tenth of a meter) of the glass in the skylight if the pyramid has a height of 20.6 meters, a base measuring 35 meters on a side, and a slant height of 27 meters. (See image on previous page.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Identify and Correct the Errors

In the second column, identify the error(s) in the worked solution or validate its answer. If the worked solution is incorrect, solve the problem correctly in the third column and validate your answer.

<table>
<thead>
<tr>
<th>Worked Solution</th>
<th>Identify Errors or Validate</th>
<th>Correct Process</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) A cylindrical can has a diameter of three inches. If the can is 5 inches high, what is its volume?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ V = 2\pi r^2 h ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = 2\pi (3\text{ in})^2 (5\text{ in}) ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = 90\pi \text{ in}^2 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = 282.6 \text{ in}^2 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Find the surface area of a square box measuring 22 cm on a side and 10 cm deep.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ SA = 22 \times 22 \times 10 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = 4840 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) How many cubic feet of air does a spherical tank hold if it is 30 yards in diameter?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ V = \frac{4}{3}\pi r^3 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = \frac{4}{3}\pi (45)^3 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ = 121500\pi \text{ ft}^3 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \approx 381,510 \text{ ft}^3 ]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worked Solution</td>
<td>Identify Errors or Validate</td>
<td>Correct Process</td>
<td>Validation</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------</td>
<td>-----------------</td>
<td>------------</td>
</tr>
<tr>
<td>4) What is the volume of a water tank that is 30 feet wide and 20 feet deep?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Diagram" /></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V = Bh$</td>
<td>$V = \pi r^2 h$</td>
<td>$V = 3.14(30)^2(20)$</td>
<td>$\approx 56520$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Find the surface area of the cone pictured below.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="https://via.placeholder.com/150" alt="Diagram" /></td>
<td>$SA = \pi r^2 + \pi rs$</td>
<td>$\text{Find } s$:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$s = \sqrt{r^2 + h^2}$</td>
<td>$r = 6, \ h = 8$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$s = \sqrt{(6 \text{ ft})^2 + (8 \text{ ft})^2}$</td>
<td>$s = \sqrt{36 \text{ ft}^2 + 64 \text{ ft}^2}$</td>
<td>$s = \sqrt{100 \text{ ft}^2} = 10 \text{ ft}$</td>
</tr>
<tr>
<td></td>
<td>then surface area:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$SA = \pi r^2 + \pi rs$</td>
<td>$SA = \pi(6 \text{ ft})^2 + \pi(6 \text{ ft})(10 \text{ ft})$</td>
<td>$SA = 36\pi \text{ ft}^2 + 60\pi \text{ ft}^2$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$SA = 96\pi \text{ ft}^2$</td>
<td></td>
</tr>
</tbody>
</table>