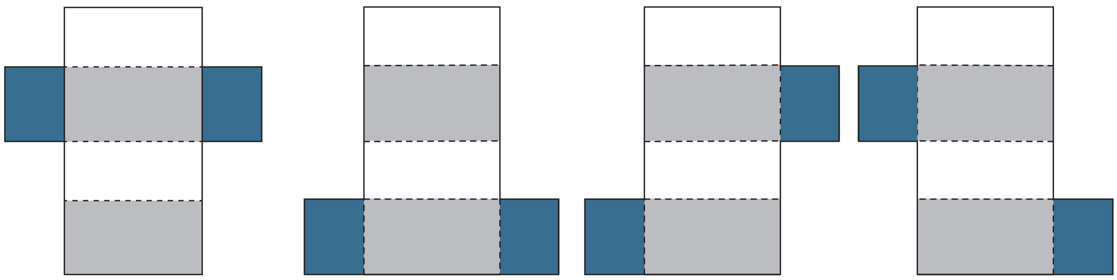
Appendix

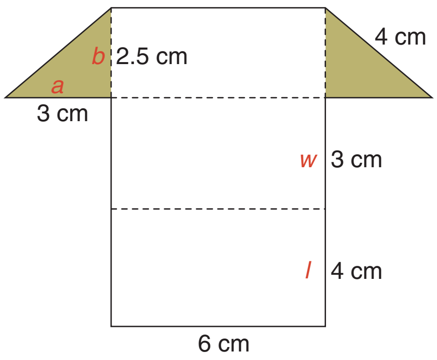
Lesson 2.1: Surface Area of 3-D Objects

Practice – I

1. Below is the net for a rectangular prism. Sketch another net that represents the same rectangular prism when folded along its dotted lines.



2. Determine the surface area, to the nearest tenth, of the following triangular prism.



$SA_{\text{triangular prism}} = bh + lh + wh + ab$

$w = a$

$SA_{\text{triangular prism}} = bh + lh + wh + wb$

$SA_{\text{triangular prism}} = (2.5\text{ cm})(6\text{ cm}) + (4\text{ cm})(6\text{ cm}) + (3\text{ cm})(6\text{ cm}) + (3\text{ cm})(2.5\text{ cm})$

$SA_{\text{triangular prism}} = 15\text{ cm}^2 + 24\text{ cm}^2 + 18\text{ cm}^2 + 7.5\text{ cm}^2$

$SA_{\text{triangular prism}} = 64.5\text{ cm}^2$

3. What is the difference in surface area, to the nearest square foot, between a 45 foot long semi-trailer (trailer only) and a 28 foot long cube van (storage compartment only)?

		Length	Width	Height	
	28 foot Cube Van	28 feet	102 inches	13 feet, 6 inches	
all images © *Thinkstock*	45 foot Semi-Trailer	45 feet	102 inches	13 feet, 6 inches	

Width: Both cube van and semi-trailer

Let w = width in feet

$$\frac{w}{102 \text{ in}} = \frac{1 \text{ ft}}{12 \text{ in}}$$
$$w = \frac{1 \text{ ft} \cdot 102 \cancel{\text{in}}}{12 \cancel{\text{in}}}$$
$$w = 8.5 \text{ ft}$$

Height: Both cube van and semi-trailer

Let h = height in feet

$$\frac{y}{6 \text{ in}} = \frac{1 \text{ ft}}{12 \text{ in}}$$
$$y = \frac{1 \text{ ft} \cdot 6 \cancel{\text{in}}}{12 \cancel{\text{in}}}$$
$$y = 0.5 \text{ ft}$$
$$h = 13 \text{ ft} + y$$
$$h = 13 \text{ ft} + 0.5 \text{ ft}$$
$$h = 13.5 \text{ ft}$$

$$SA_{28' \text{ cube van}} = 2lw + 2hw + 2lh$$
$$SA_{28' \text{ cube van}} = (2 \cdot 28 \text{ ft} \cdot 8.5 \text{ ft}) + (2 \cdot 13.5 \text{ ft} \cdot 8.5 \text{ ft}) + (2 \cdot 28 \text{ ft} \cdot 13.5 \text{ ft})$$
$$SA_{28' \text{ cube van}} = 476 \text{ ft}^2 + 229.5 \text{ ft}^2 + 756 \text{ ft}^2$$
$$SA_{28' \text{ cube van}} = 1461.5 \text{ ft}^2$$

$$SA_{45' \text{ semi}} = 2lw + 2hw + 2lh$$
$$SA_{45' \text{ semi}} = (2 \cdot 45 \text{ ft} \cdot 8.5 \text{ ft}) + (2 \cdot 13.5 \text{ ft} \cdot 8.5 \text{ ft}) + (2 \cdot 45 \text{ ft} \cdot 13.5 \text{ ft})$$
$$SA_{45' \text{ semi}} = 765 \text{ ft}^2 + 229.5 \text{ ft}^2 + 1215 \text{ ft}^2$$
$$SA_{45' \text{ semi}} = 2209.5 \text{ ft}^2$$

$$d_{\text{difference}} = SA_{45' \text{ semi}} - SA_{28' \text{ cube van}}$$
$$d_{\text{difference}} = 2209.5 \text{ ft}^2 - 1461.5 \text{ ft}^2$$
$$d_{\text{difference}} = 748 \text{ ft}^2$$

The difference in surface area is 748 ft^2.

Please return to *Unit 2: Surface Area and Volume Lesson 2.1* in the *Module* to continue your exploration.

Lesson 2.1: Surface Area of 3-D Objects

Practice – II

1. The soup can shown is a perfect storage container for a set of coloured pens, each 15 cm in length. The radius of the can's base is 4 cm. The surface area of the soup can is 406.8 cm². Is the can tall enough to fit the pens with the lid on?

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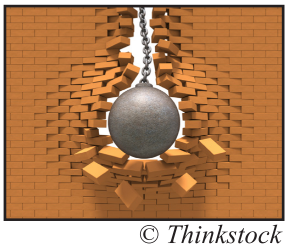
Let $SA = 406.8 \text{ cm}^2$, $r = 4 \text{ cm}$

$$\begin{aligned}
SA_{\text{soup can}} &= 2\pi r^2 + 2\pi rh \\
406.8 \text{ cm}^2 &= 2\pi(4 \text{ cm})^2 + (2\pi \cdot 4 \text{ cm} \cdot h) \\
406.8 \text{ cm}^2 &= 100.530\ldots \text{ cm}^2 + 25.132\ldots \text{ cm} \cdot h \\
406.8 \text{ cm}^2 - 100.530\ldots \text{ cm}^2 &= \cancel{100.530\ldots \text{ cm}^2} - \cancel{100.530\ldots \text{ cm}^2} + 25.132\ldots \text{ cm} \cdot h \\
306.269\ldots \text{ cm}^2 &= 25.132\ldots \text{ cm} \cdot h \\
\frac{306.269\ldots \text{ cm}^2}{25.132\ldots \text{ cm}} &= \frac{\cancel{25.132\ldots \text{ cm}}}{\cancel{25.132\ldots \text{ cm}}} \cdot h \\
12.2 \text{ cm} &\doteq h
\end{aligned}$$

With a pen length of 15 cm and a can height of approximately 12.2 cm, the pens will not fit in the soup can when the lid is on.

2. A 4 000 pound wrecking ball has a surface area of 2 642.01 in². Determine the diameter of the wrecking ball to the nearest inch.



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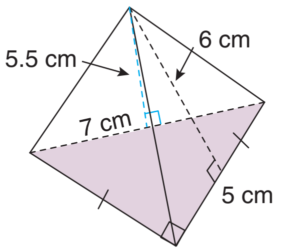
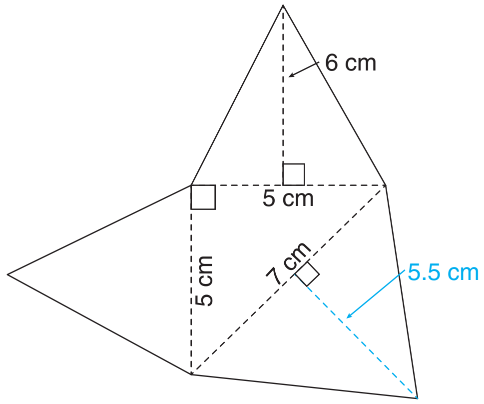
$$\begin{aligned}
SA_{\text{wrecking ball}} &= 4\pi r^2 \\
2\,642.01 \text{ in}^2 &= 4\pi r^2 \\
\frac{2\,642.01 \text{ in}^2}{4\pi} &= \frac{\cancel{4\pi}}{\cancel{4\pi}} r^2 \\
210.244\ldots \text{ in}^2 &= r^2 \\
\sqrt{210.244\ldots \text{ in}^2} &= \sqrt{r^2} \\
14.499\ldots \text{ in} &\doteq r
\end{aligned}$$

$$\begin{aligned}
\text{diameter} &= 2r \\
\text{diameter} &= 2 \cdot 14.499\ldots \text{ in} \\
\text{diameter} &= 28.999\ldots \text{ in} \\
\text{diameter} &\doteq 29 \text{ in}
\end{aligned}$$

The diameter is 29 inches.

3. The following diagram is a tetrahedron. Sketch and label its net and determine its surface area, to the nearest hundredth.





$SA_{\text{tetrahedron}}$ = Area of 2 identical triangles + trianglular base + back triangle

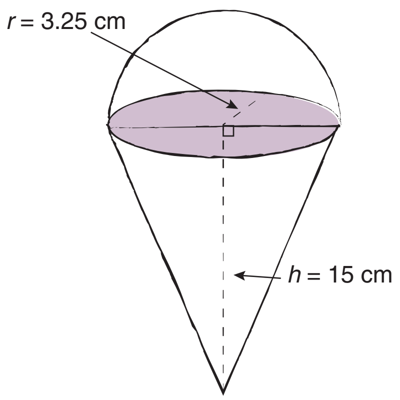
$$SA_{\text{tetrahedron}} = \cancel{2}\left(\frac{5\text{ cm} \cdot 6\text{ cm}}{\cancel{2}}\right) + \frac{5\text{ cm} \cdot 5\text{ cm}}{2} + \frac{7\text{ cm} \cdot 5.5\text{ cm}}{2}$$

$$SA_{\text{tetrahedron}} = 30\text{ cm}^2 + 12.5\text{ cm}^2 + 19.25\text{ cm}^2$$

$$SA_{\text{tetrahedron}} = 61.75\text{ cm}^2$$

4. An ice cream cone with a radius of 3.25 cm and a height of 15 cm, has a scoop of ice cream sitting on it.

   a. If the visible portion of the ice cream scoop is a hemisphere, sketch and label a diagram using the measurements provided.



   b. Explain how you would determine the surface area of the ice cream cone and scoop.

   The surface area of the cone would not include the circle area part of the cone because it is not exposed. The hemisphere is half a sphere, so the surface area of the hemisphere would be the surface area of a sphere, divided by two. The total surface area would be the sum of the two parts.

Please complete *Lesson 2.1 Explore Your Understanding Assignment* located in *Workbook 2.1* before proceeding to *Lesson 2.2*.

Lesson 2.2: Volume of 3-D Objects

Practice – III

1. A right rectangular pyramid has base dimensions 10 ft by 4 ft, and a height of 15 ft. Determine its volume, to the nearest cubic foot.

$$V_{\text{right pyramid}} = \frac{1}{3}Bh$$
$$V_{\text{right pyramid}} = \frac{1}{3}(10\text{ ft} \bullet 4\text{ ft}) \bullet 15\text{ ft}$$
$$V_{\text{right pyramid}} = \frac{1}{3} \bullet 600\text{ ft}^3$$
$$V_{\text{right pyramid}} = 200\text{ ft}^3$$

2. A right rectangular prism with base dimensions 5.8 m by 3.1 m has a volume of 187 m³. Determine the height of the prism, to the nearest tenth of a metre.

$$V_{\text{right rectangular prism}} = lwh$$
$$187\text{ m}^3 = 5.8\text{ m} \bullet 3.1\text{ m} \bullet h$$
$$\frac{187\text{ m}^3}{17.98\text{ m}^2} = \frac{\cancel{17.98\text{ m}^2}}{\cancel{17.98\text{ m}^2}} \bullet h$$
$$10.4\text{ m} \doteq h$$

3. A cylindrical drum has a circumference of 47 inches and a height of 18 inches. What is the volume of the drum, to the nearest tenth of a cubic inch?

Determine the radius of the drum.

$$C = 2\pi r$$
$$47\text{ in} = 2\pi r$$
$$\frac{47\text{ in}}{2\pi} = \frac{\cancel{2\pi}}{\cancel{2\pi}} \bullet r$$
$$7.4802\ldots\text{ in} \doteq r$$

$$V_{\text{drum}} = \pi r^2 h$$
$$V_{\text{drum}} = \pi(7.480\ldots\text{in})^2 \bullet 18\text{ in}$$
$$V_{\text{drum}} = \pi \bullet 55.954\ldots\text{ in}^2 \bullet 18\text{ in}$$
$$V_{\text{drum}} \doteq 3164.2\text{ in}^3$$

4. Explain why volume is measured in cubic units.

   Volume represents the space occupied by a three-dimensional object. As such, there are three dimensions to consider, each of which is measured in linear units. When the three linear dimensions' units are multiplied, the result is cubic units.

5. A beach ball holds 804 in^3 of air. Determine the diameter, to the nearest tenth, of the beach ball.

$$V_{\text{beach ball}} = \frac{4}{3}\pi r^3$$

$$804 \text{ in}^3 = \frac{4}{3}\pi r^3$$

$$3 \cdot 804 \text{ in}^3 = \cancel{3} \cdot \frac{4}{\cancel{3}}\pi r^3$$

$$\frac{2412 \text{ in}^3}{4\pi} = \frac{\cancel{4\pi}}{\cancel{4\pi}} \cdot r^3$$

$$191.940\ldots \text{ in}^3 = r^3$$

$$\sqrt[3]{191.940\ldots \text{ in}^3} = \sqrt[3]{r^3}$$

$$5.76840591 \text{ in} \doteq r$$

   The radius of the beach ball is approximately 5.8 inches.

   The diameter is

$$d = 2r$$
$$d \doteq 2(5.76840591)$$
$$d \doteq 11.53681182$$

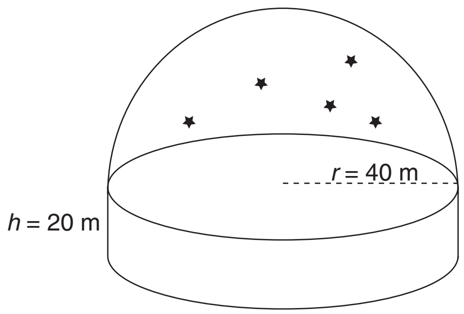
   The diameter of the beach ball is approximately 11.5 inches.

Please complete *Lesson 2.2 Explore Your Understanding Assignment* located in *Workbook 2.2* before proceeding to *Lesson 2.3*.

Lesson 2.3: Composite Objects Applications

Practice – IV

1. a. A space dome theatre is composed of a cylindrical base and a hemispherical roof. Sketch the space dome theatre with a base radius of 40 m and a cylindrical height of 20 m.



b. What is the total volume of the space dome theatre?

$$V_{\text{theatre}} = \left(\frac{4}{3}\pi r^3\right) \div 2 + \pi r^2 h$$

$$V_{\text{theatre}} = \frac{2}{3}\pi r^3 + \pi r^2 h$$

$$V_{\text{theatre}} = \frac{2}{3}\pi(40\text{ m})^3 + \pi(40\text{ m})^2 \bullet 20\text{ m}$$

$$V_{\text{theatre}} = \frac{2}{3}\pi(64\,000\text{ m}^3) + \pi(32\,000\text{ m}^3)$$

$$V_{\text{theatre}} \doteq 234\,572.25\text{ m}^3$$

Please complete *Lesson 2.3 Explore Your Understanding Assignment* located in *Workbook 2.3.*