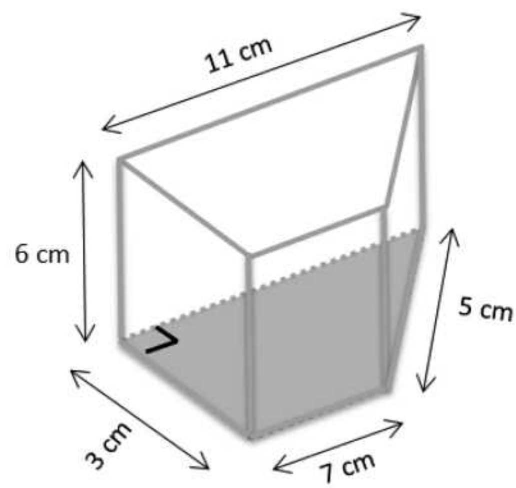
Name ____ Date ____________________

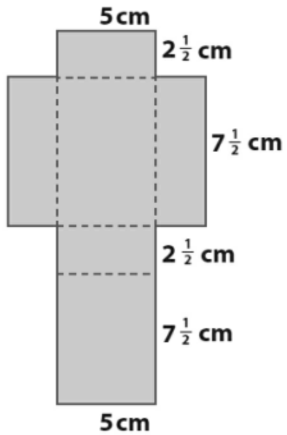
Surface Area

Find the surface area of the right trapezoidal prism. Show all necessary work.

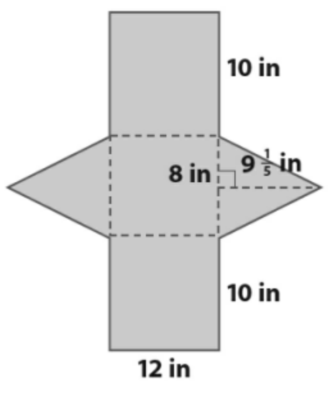


1. For each of the following nets, highlight the perimeter of the lateral area, draw the solid represented by the net, indicate the type of solid, and then find the solid's surface area.

a.



b.



2. Given a cube with edges that are $\frac{3}{4}$ inch long:

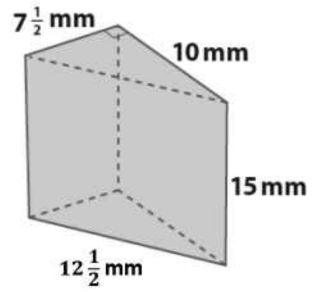
   a. Find the surface area of the cube.

   b. Joshua makes a scale drawing of the cube using a scale factor of 4. Find the surface area of the cube that Joshua drew.

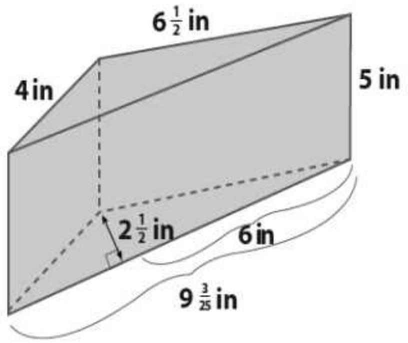
   c. What is the ratio of the surface area of the scale drawing to the surface area of the actual cube, and how does the value of the ratio compare to the scale factor?

3. Find the surface area of each of the following right prisms using the formula $SA = LA + 2B$.

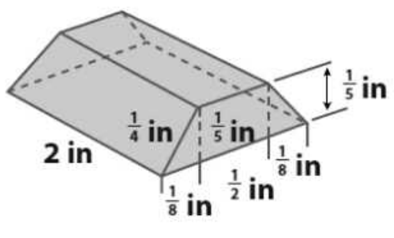
   a.



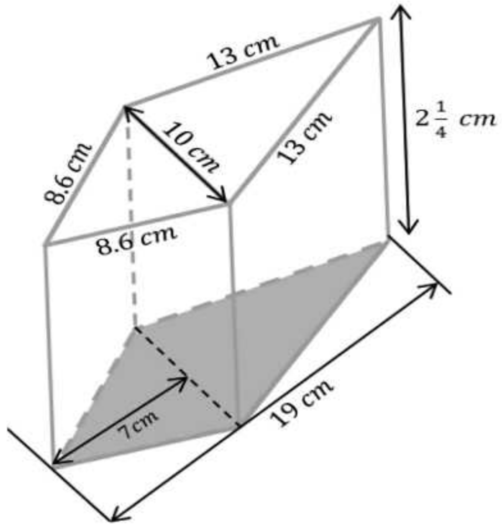
   b.



   c.



d.



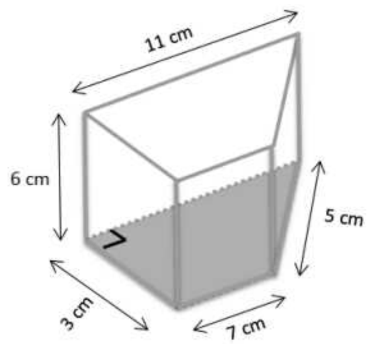
4. A cube has a volume of $64\ \text{m}^2$. What is the cube's surface area?

5. The height of a right rectangular prism is $4\frac{1}{2}$ ft. The length and width of the prism's base are 2 ft. and $1\frac{1}{2}$ ft. Use the formula $SA = LA + 2B$ to find the surface area of the right rectangular prism.

6. The surface area of a right rectangular prism is $68\frac{2}{3}\ \text{in}^2$. The dimensions of its base are 3 in. and 7 in. Use the formula $SA = LA + 2B$ and $LA = Ph$ to find the unknown height h of the prism.

7. A given right triangular prism has an equilateral triangular base. The height of that equilateral triangle is approximately 7.1 cm. The distance between the bases is 9 cm. The surface area of the prism is $319\frac{1}{2}\ \text{cm}^2$. Find the approximate lengths of the sides of the base.

Find the surface area of the right trapezoidal prism. Show all necessary work.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = (3 + 7 + 5 + 11)\text{ cm} \cdot 6\text{ cm}$

$LA = 26\text{ cm} \cdot 6\text{ cm}$

$LA = 156\text{ cm}^2$

Each base consists of a 3 cm *by* 7 cm *rectangle and right triangle with a base of* 3 cm *and a height of* 4 cm. *Therefore, the area of each base:*

$B = A_r + A_t$

$B = lw + \frac{1}{2}bh$

$B = (7\text{ cm} \cdot 3\text{ cm}) + \left(\frac{1}{2} \cdot 3\text{ cm} \cdot 4\text{ cm}\right)$

$B = 21\text{ cm}^2 + 6\text{ cm}^2$

$B = 27\text{ cm}^2$

$SA = LA + 2B$

$SA = 156\text{ cm}^2 + 2(27\text{ cm}^2)$

$SA = 156\text{ cm}^2 + 54\text{ cm}^2$

$SA = 210\text{ cm}^2$

The surface of the right trapezoidal prism is 210 cm^2.

1. **For each of the following nets, highlight the perimeter of the lateral area, draw the solid represented by the net, indicate the type of solid, and then find the solid's surface area.**

   a. *Right rectangular prism*

$SA = LA + 2B$

$LA = P \cdot h$

$LA = \left(2\frac{1}{2}\text{ cm} + 7\frac{1}{2}\text{ cm} + 2\frac{1}{2}\text{ cm} + 7\frac{1}{2}\text{ cm}\right) \cdot 5\text{ cm}$

$LA = 20\text{ cm} \cdot 5\text{ cm}$

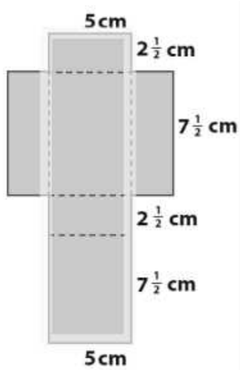
$LA = 100\text{ cm}^2$

$B = lw$

$B = 2\frac{1}{2}\text{ cm} \cdot 7\frac{1}{2}\text{ cm}$

$B = \frac{5}{2}\text{cm} \cdot \frac{15}{2}\text{cm}$

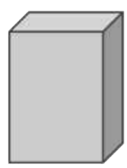
$B = \frac{75}{4}\text{ cm}^2$



$SA = 100\text{ cm}^2 + 2\left(\frac{75}{4}\text{ cm}^2\right)$

$SA = 100\text{ cm}^2 + 37.5\text{ cm}^2 = 137.5\text{ cm}^2$

The surface area of the right rectangular prism is 137.5 cm^2.



(3-Dimensional Form)

b. *Right triangular prism*

$SA = LA + 2B$

$LA = P \cdot h$

$LA = (10 \text{ in.} + 8 \text{ in.} + 10 \text{ in.}) \cdot 12 \text{ in.}$

$LA = 28 \text{ in.} \cdot 12 \text{ in.}$

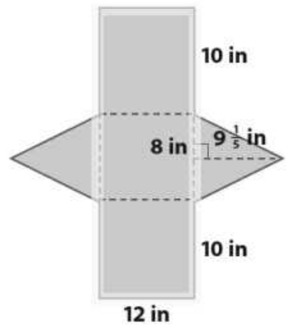
$LA = 336 \text{ in}^2$

$B = \frac{1}{2}bh$

$B = \frac{1}{2}(8 \text{ in.})\left(9\frac{1}{5} \text{ in.}\right)$

$B = 4 \text{ in.}\left(9\frac{1}{5} \text{ in.}\right)$

$B = \left(36 + \frac{4}{5}\right) \text{in}^2 = 36\frac{4}{5} \text{ in}^2$



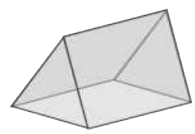
$SA = 336 \text{ in}^2 + 2\left(36\frac{4}{5} \text{ in}^2\right)$

$SA = 336 \text{ in}^2 + \left(72 + \frac{8}{5}\right) \text{in}^2$

$SA = 408 \text{ in}^2 + 1\frac{3}{5} \text{in}^2$

$SA = 409\frac{3}{5} \text{ in}^2$

The surface area of the right triangular prism is $409\frac{3}{5} \text{ in}^2$.



(3-Dimensional Form)

2. **Given a cube with edges that are $\frac{3}{4}$ inch long:**

a. **Find the surface area of the cube.**

$$SA = 6s^2$$
$$SA = 6\left(\frac{3}{4} \text{ in.}\right)^2$$
$$SA = 6\left(\frac{3}{4} \text{ in.}\right) \cdot \left(\frac{3}{4} \text{ in.}\right)$$
$$SA = 6\left(\frac{9}{16} \text{ in}^2\right)$$
$$SA = \frac{27}{8} \text{ in}^2 \textit{ or } 3\frac{3}{8} \text{ in}^2$$

b. **Joshua makes a scale drawing of the cube using a scale factor of 4. Find the surface area of the cube that Joshua drew.**

$\frac{3}{4} \text{ in.} \cdot 4 = 3 \text{ in.}$; *The edge lengths of Joshua's drawing would be* 3 *inches.*

$$SA = 6(3 \text{ in.})^2$$
$$SA = 6(9 \text{ in}^2) = 54 \text{ in}^2$$

c. **What is the ratio of the surface area of the scale drawing to the surface area of the actual cube, and how does the value of the ratio compare to the scale factor?**

$54 \div 3\frac{3}{8}$

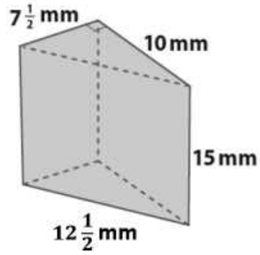
$54 \div \frac{27}{8}$

$54 \cdot \frac{8}{27}$

$2 \cdot 8 = 16$. *The ratios of the surface area of the scale drawing to the surface area of the actual cube is* $16:1$. *The value of the ratio is* 16. *The scale factor of the drawing is* 4, *and the value of the ratio of the surface area of the drawing to the surface area of the actual cube is* $4^2 = 16$.

3. **Find the surface area of each of the following right prisms using the formula $SA = LA + 2B$.**

a.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = \left(12\frac{1}{2}\text{ mm} + 10\text{ mm} + 7\frac{1}{2}\text{ mm}\right) \cdot 15\text{ mm}$

$LA = 30\text{ mm} \cdot 15\text{ mm} = 450\text{ mm}^2$

$B = \frac{1}{2}bh$

$B = \frac{1}{2} \cdot \left(7\frac{1}{2}\text{ mm}\right) \cdot (10\text{ mm})$

$B = \frac{1}{2} \cdot (70 + 5)\text{ mm}^2$

$B = \frac{1}{2} \cdot 75\text{ mm}^2 = \frac{75}{2}\text{ mm}^2$

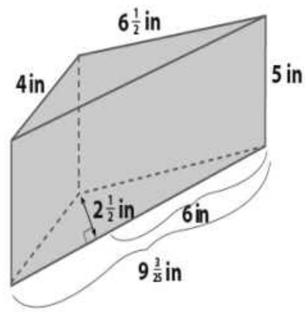
$SA = 450\text{ mm}^2 + 2\left(\frac{75}{2}\text{ mm}^2\right)$

$SA = 450\text{ mm}^2 + 75\text{ mm}^2$

$SA = 525\text{ mm}^2$

The surface area of the prism is 525 mm^2.

b.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = \left(9\frac{3}{25}\text{ in.} + 6\frac{1}{2}\text{ in.} + 4\text{ in.}\right) \cdot 5\text{ in.}$

$LA = \left(\frac{228}{25}\text{ in.} + \frac{13}{2}\text{ in.} + 4\text{ in.}\right) \cdot 5\text{ in.}$

$LA = \left(\frac{456}{50}\text{ in.} + \frac{325}{50}\text{ in.} + \frac{200}{50}\text{ in.}\right) \cdot 5\text{ in.}$

$LA = \left(\frac{981}{50}\text{ in.}\right) \cdot 5\text{ in.}$

$LA = \frac{49{,}050}{50}\text{ in}^2$

$LA = 98\frac{1}{10}\text{ in}^2$

$B = \frac{1}{2}bh$

$B = \frac{1}{2} \cdot 9\frac{3}{25}\text{ in.} \cdot 2\frac{1}{2}\text{ in.}$

$B = \frac{1}{2} \cdot \frac{228}{25}\text{ in.} \cdot \frac{5}{2}\text{ in.}$

$B = \frac{1{,}140}{100}\text{ in}^2$

$B = 11\frac{2}{5}\text{ in}^2$

$2B = 2 \cdot 11\frac{2}{5}\text{ in}^2$

$2B = 22\frac{4}{5}\text{ in}^2$

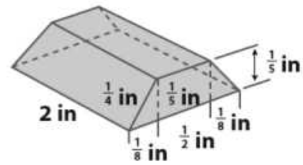
$SA = LA + 2B$

$SA = 98\frac{1}{10}\text{ in}^2 + 22\frac{4}{5}\text{ in}^2$

$SA = 120\frac{9}{10}\text{ in}^2$

The surface area of the prism is $120\frac{9}{10}\text{ in}^2$.

c.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = \left(\frac{1}{8}\text{ in.} + \frac{1}{2}\text{ in.} + \frac{1}{8}\text{in.} + \frac{1}{4}\text{ in.} + \frac{1}{2}\text{in.} + \frac{1}{4}\text{ in.}\right) \cdot 2\text{ in.}$

$LA = \left(1\frac{3}{4}\text{ in.}\right) \cdot 2\text{ in.}$

$LA = 2\text{ in}^2 + 1\frac{1}{2}\text{ in}^2$

$LA = 3\frac{1}{2}\text{ in}^2$

$b = A_{rectangle} + 2A_{triangle}$

$b = \left(\frac{1}{2}\text{ in.}\cdot\frac{1}{5}\text{ in.}\right) + 2 \cdot \frac{1}{2}\left(\frac{1}{8}\text{ in.} \cdot \frac{1}{5}\text{ in.}\right)$

$b = \left(\frac{1}{10}\text{ in}^2\right) + \left(\frac{1}{40}\text{ in}^2\right)$

$b = \frac{1}{10}\text{ in}^2 + \frac{1}{40}\text{ in}^2$

$b = \frac{4}{40}\text{ in}^2 + \frac{1}{40}\text{ in}^2$

$b = \frac{5}{40}\text{ in}^2$

$b = \frac{1}{8}\text{ in}^2$

$SA = 3\frac{1}{2}\text{ in}^2 + 2\left(\frac{1}{8}\text{ in}^2\right)$

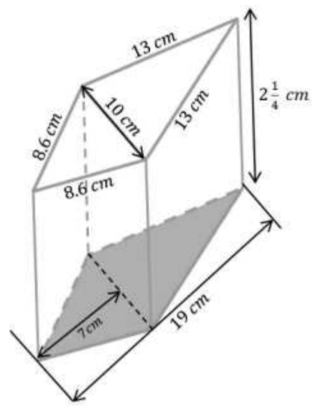
$SA = 3\frac{1}{2}\text{ in}^2 + \frac{1}{4}\text{ in}^2$

$SA = 3\frac{2}{4}\text{ in}^2 + \frac{1}{4}\text{ in}^2$

$SA = 3\frac{3}{4}\text{ in}^2$

The surface area of the prism is $3\frac{3}{4}\text{ in}^2$.

d.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = (13\text{ cm} + 13\text{ cm} + 8.6\text{ cm} + 8.6\text{ cm}) \cdot 2\frac{1}{4}\text{cm}$

$LA = (26 + 17.2)\text{ cm} \cdot 2\frac{1}{4}\text{ cm}$

$LA = (43.2)\text{ cm} \cdot 2\frac{1}{4}\text{cm}$

$LA = (86.4 + 10.8)\text{ cm}^2$

$LA = 97.2\text{ cm}^2$

$SA = LA + 2B$

$SA = 97.2\text{ cm}^2 + 2(95\text{ cm}^2)$

$SA = 97.2\text{ cm}^2 + 190\text{ cm}^2$

$SA = 287.2\text{ cm}^2$

$B = \frac{1}{2}(10\text{ cm} \cdot 7\text{ cm}) + \frac{1}{2}(12\text{ cm} \cdot 10\text{ cm})$

$B = \frac{1}{2}(70\text{ cm}^2 + 120\text{ cm}^2)$

$B = \frac{1}{2}(190\text{ cm}^2)$

$B = 95\text{ cm}^2$

The surface area of the prism is 287.2 cm^2.

4. **A cube has a volume of $64\ \text{m}^2$. What is the cube's surface area?**

A cube's length, width, and height must be equal. $64 = 4 \cdot 4 \cdot 4 = 4^3$*, so the length, width, and height of the cube are all* $4\ \text{m}$.

$SA = 6s^2$

$SA = 6(4\ \text{m})^2$

$SA = 6(16\ \text{m}^2)$

$SA = 96\ \text{m}^2$

5. **The height of a right rectangular prism is $4\frac{1}{2}$ ft. The length and width of the prism's base are 2 ft. and $1\frac{1}{2}$ ft. Use the formula $SA = LA + 2B$ to find the surface area of the right rectangular prism.**

$SA = LA + 2B$

$LA = P \cdot h$

$LA = \left(2\text{ ft.} + 2\text{ ft.} + 1\frac{1}{2}\text{ ft.} + 1\frac{1}{2}\text{ ft.}\right) \cdot 4\frac{1}{2}\text{ ft.}$

$LA = (2\text{ ft.} + 2\text{ ft.} + 3\text{ ft.}) \cdot 4\frac{1}{2}\text{ ft.}$

$LA = 7\text{ ft.} \cdot 4\frac{1}{2}\text{ ft.}$

$LA = 28\text{ ft}^2 + 3\frac{1}{2}\text{ ft}^2$

$LA = 31\frac{1}{2}\text{ ft}^2$

$b = lw$

$b = 2\text{ ft.} \cdot 1\frac{1}{2}\text{ ft.}$

$b = 3\text{ ft}^2$

$SA = LA + 2b$

$SA = 31\frac{1}{2}\text{ ft}^2 + 2(3\text{ ft}^2)$

$SA = 31\frac{1}{2}\text{ ft}^2 + 6\text{ ft}^2$

$SA = 37\frac{1}{2}\text{ ft}^2$

The surface area of the right rectangular prism is $37\frac{1}{2}\text{ ft}^2$.

6. **The surface area of a right rectangular prism is $68\frac{2}{3}\ \text{in}^2$. The dimensions of its base are 3 in. and 7 in. Use the formula $SA = LA + 2B$ and $LA = Ph$ to find the unknown height h of the prism.**

$SA = LA + 2B$

$SA = P \cdot h + 2B$

$68\frac{2}{3}\ \text{in}^2 = 20\text{ in.} \cdot (h) + 2(21\ \text{in}^2)$

$68\frac{2}{3}\ \text{in}^2 = 20\text{ in.} \cdot (h) + 42\ \text{in}^2$

$68\frac{2}{3}\ \text{in}^2 - 42\ \text{in}^2 = 20\text{ in.} \cdot (h) + 42\ \text{in}^2 - 42\ \text{in}^2$

$26\frac{2}{3}\ \text{in}^2 = 20\text{ in.} \cdot (h) + 0\ \text{in}^2$

$26\frac{2}{3}\ \text{in}^2 \cdot \frac{1}{20\text{ in.}} = 20\text{ in.} \cdot \frac{1}{20\text{ in.}} \cdot (h)$

$\frac{80}{3}\ \text{in}^2 \cdot \frac{1}{20\text{ in.}} = 1 \cdot h$

$\frac{4}{3}\text{ in.} = h$

$h = \frac{4}{3}$ in. or $1\frac{1}{3}$ in.

The height of the prism is $1\frac{1}{3}$ in.

7. **A given right triangular prism has an equilateral triangular base. The height of that equilateral triangle is approximately 7.1 cm. The distance between the bases is 9 cm. The surface area of the prism is $319\frac{1}{2}$ cm^2. Find the approximate lengths of the sides of the base.**

$SA = LA + 2B$ *Let x represent the number of centimeters in each side of the equilateral triangle.*

$LA = P \cdot h$

$LA = 3(x \text{ cm}) \cdot 9 \text{ cm}$

$LA = 27x \text{ cm}^2$

$B = \frac{1}{2}lw$

$B = \frac{1}{2} \cdot (x \text{ cm}) \cdot 7.1 \text{ cm}$

$B = 3.55x \text{ cm}^2$

$319\frac{1}{2} \text{ cm}^2 = LA + 2B$

$319\frac{1}{2} \text{ cm}^2 = 27x \text{ cm}^2 + 2(3.55x \text{ cm}^2)$

$319\frac{1}{2} \text{ cm}^2 = 27x \text{ cm}^2 + 7.1x \text{ cm}^2$

$319\frac{1}{2} \text{ cm}^2 = 34.1x \text{ cm}^2$

$319\frac{1}{2} \text{ cm}^2 = 34\frac{1}{10}x \text{ cm}^2$

$\frac{639}{2} \text{ cm}^2 = \frac{341}{10}x \text{ cm}^2$

$\frac{639}{2} \text{ cm}^2 \cdot \frac{10}{341 \text{ cm}} = \frac{341}{10}x \text{ cm}^2 \cdot \frac{10}{341 \text{ cm}}$

$\frac{3195}{341} \text{ cm} = x$

$x = \frac{3195}{341} \text{ cm}$

$x \approx 9.4 \text{ cm}$

The lengths of the sides of the equilateral triangles are approximately 9.4 cm each.