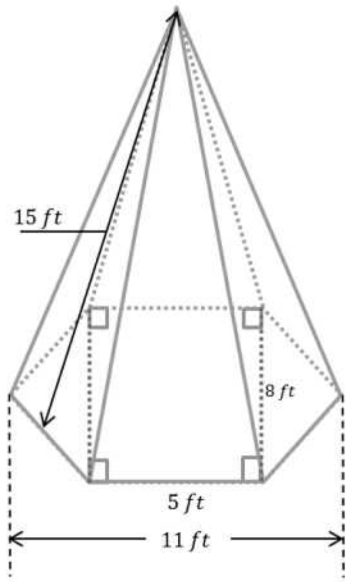
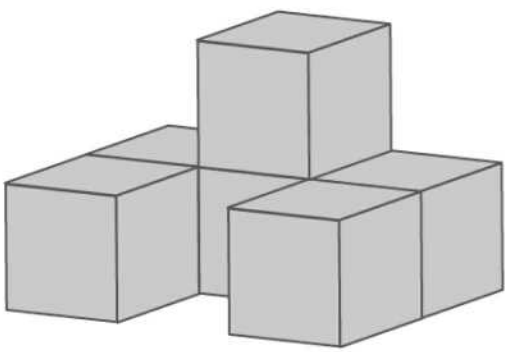
Name ____ Date ____________________

Surface Area

1. The right hexagonal pyramid has a hexagon base with equal-length sides. The lateral faces of the pyramid are all triangles (that are exact copies of one another) with heights of 15 ft. Find the surface area of the pyramid.

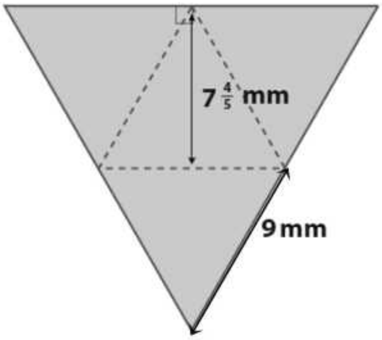


2. Six cubes are glued together to form the solid shown in the diagram. If the edges of each cube measure $1\frac{1}{2}$ inches in length, what is the surface area of the solid?

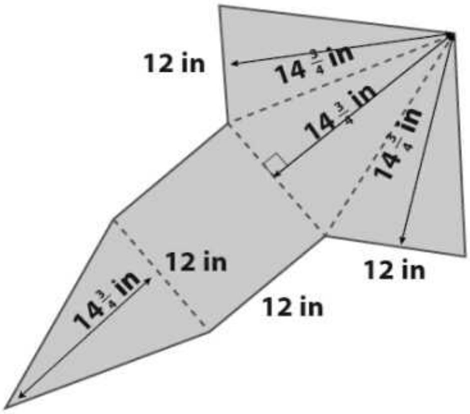


1. For each of the following nets, draw (or describe) the solid represented by the net and find its surface area.

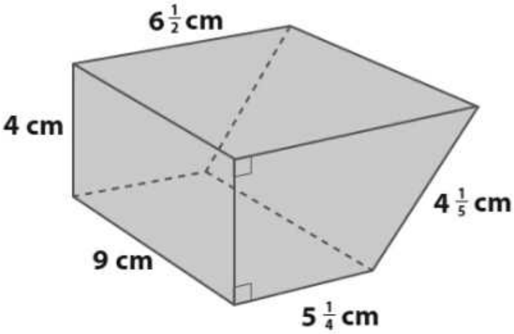
   a. The equilateral triangles are exact copies.



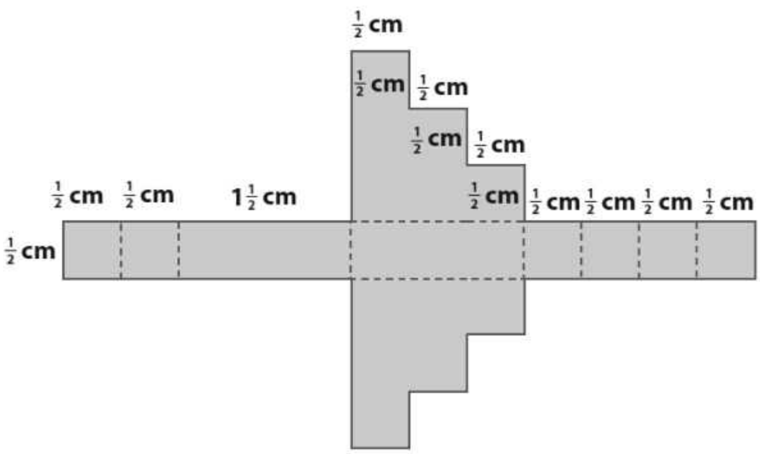
   b.



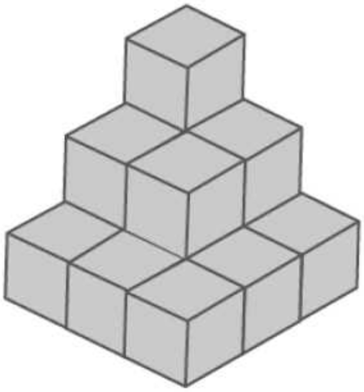
2. Find the surface area of the following prism.



3. The net below is for a specific object. The measurements shown are in meters. Sketch (or describe) the object, and then find its surface area.

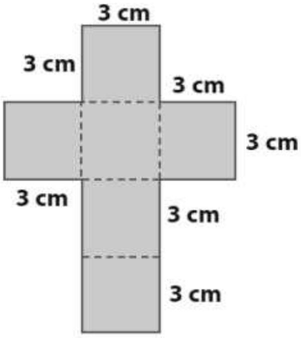


4. In the diagram, there are 14 cubes glued together to form a solid. Each cube has a volume of $\frac{1}{8}\text{ in}^2$. Find the surface area of the solid.

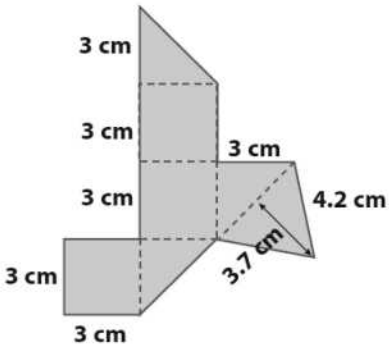


5. The nets below represent three solids. Sketch (or describe) each solid and find its surface area.

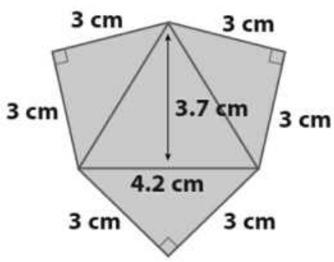
a.



b.

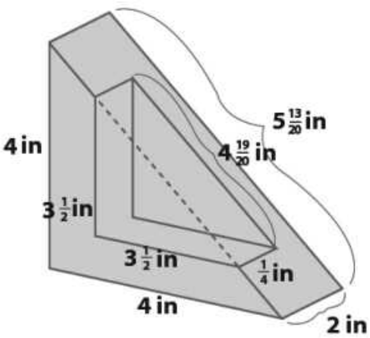


c.

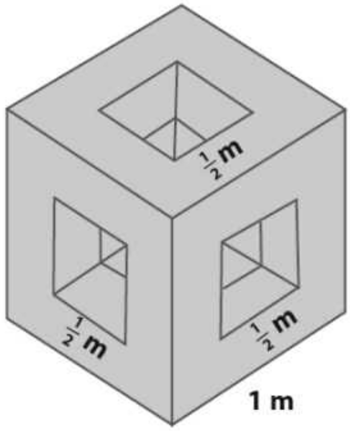


d. How are figures (b) and (c) related to figure (a)?

6. Find the surface area of the solid shown in the diagram. The solid is a right triangular prism (with right triangular bases) with a smaller right triangular prism removed from it.



7. The diagram shows a cubic meter that has had three square holes punched completely through the cube on three perpendicular axes. Find the surface area of the remaining solid.



1. **The right hexagonal pyramid has a hexagon base with equal-length sides. The lateral faces of the pyramid are all triangles (that are exact copies of one another) with heights of 15 ft. Find the surface area of the pyramid.**

$SA = LA + 1B$

$LA = 6 \cdot \frac{1}{2}(bh)$ $\quad\quad$ $B = A_{\text{rectangle}} + 2A_{\text{triangle}}$

$LA = 6 \cdot \frac{1}{2}(5 \text{ ft.} \cdot 15 \text{ ft.})$ $\quad\quad$ $B = (8 \text{ ft.} \cdot 5 \text{ ft.}) + 2 \cdot \frac{1}{2}(8 \text{ ft.} \cdot 3 \text{ ft.})$

$LA = 3 \cdot 75 \text{ ft}^2$ $\quad\quad$ $B = 40 \text{ ft}^2 + (8 \text{ ft.} \cdot 3 \text{ ft.})$

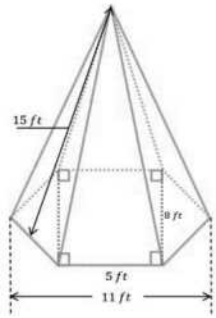
$LA = 225 \text{ ft}^2$ $\quad\quad$ $B = 40 \text{ ft}^2 + 24 \text{ ft}^2$

$B = 64 \text{ ft}^2$

$SA = LA + 1B$

$SA = 225 \text{ ft}^2 + 64 \text{ ft}^2 = 289 \text{ ft}^2$

The surface area of the pyramid is 289 ft^2.



2. **Six cubes are glued together to form the solid shown in the diagram. If the edges of each cube measure $1\frac{1}{2}$ inches in length, what is the surface area of the solid?**

There are 26 square cube faces showing on the surface area of the solid (5 each from the top and bottom view, 4 each from the front and back view, 3 each from the left and right side views, and 2 from the "inside" of the front).

$A = s^2$ $\quad\quad$ $SA = 26 \cdot \left(2\frac{1}{4} \text{ in}^2\right)$

$A = \left(1\frac{1}{2} \text{ in.}\right)^2$ $\quad\quad$ $SA = 52 \text{ in}^2 + \frac{26}{4} \text{ in}^2$

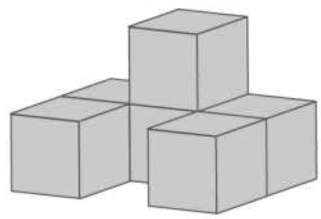
$A = \left(1\frac{1}{2} \text{ in.}\right)\left(1\frac{1}{2} \text{ in.}\right)$ $\quad\quad$ $SA = 52 \text{ in}^2 + 6 \text{ in}^2 + \frac{1}{2} \text{ in}^2$

$A = 1\frac{1}{2} \text{ in.}\left(1 \text{ in.} + \frac{1}{2} \text{ in.}\right)$ $\quad\quad$ $SA = 58\frac{1}{2} \text{ in}^2$

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

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

$A = 1\frac{2}{4} \text{ in}^2 + \frac{3}{4} \text{ in}^2 = 1\frac{5}{4} \text{ in}^2 = 2\frac{1}{4} \text{ in}^2$



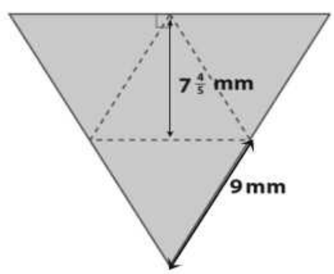
The surface area of the solid is $58\frac{1}{2} \text{ in}^2$.

1. **For each of the following nets, draw (or describe) the solid represented by the net and find its surface area.**

   a. **The equilateral triangles are exact copies.**

The net represents a triangular pyramid where the three lateral faces are congruent to each other and the triangular base.

$SA = 4B$ since the faces are all the same size and shape.



$B = \frac{1}{2}bh$ $\quad\quad$ $SA = 4B$

$B = \frac{1}{2} \cdot 9 \text{ mm} \cdot 7\frac{4}{5} \text{ mm}$ $\quad\quad$ $SA = 4\left(35\frac{1}{10} \text{ mm}^2\right)$

$B = \frac{9}{2} \text{ mm} \cdot 7\frac{4}{5} \text{ mm}$ $\quad\quad$ $SA = 140 \text{ mm}^2 + \frac{4}{10} \text{ mm}^2$

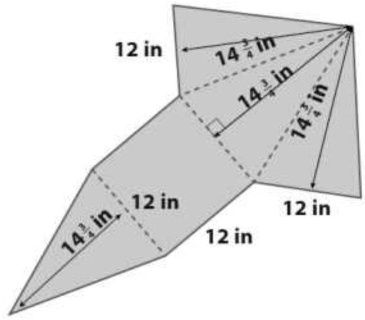
$B = \frac{63}{2} \text{ mm}^2 + \frac{36}{10} \text{ mm}^2$ $\quad\quad$ $SA = 140\frac{2}{5} \text{ mm}^2$

$B = \frac{315}{10} \text{ mm}^2 + \frac{36}{10} \text{ mm}^2$

$B = \frac{351}{10} \text{ mm}^2$ $\quad\quad$ *The surface area of the triangular pyramid is* $140\frac{2}{5} \text{ mm}^2$

$B = 35\frac{1}{10} \text{ mm}$

b. *The net represents a square pyramid that has four congruent lateral faces that are triangles. The base is a square.*



$SA = LA + B$

$LA = 4 \cdot \frac{1}{2}(bh)$ $\quad B = s^2$

$LA = 4 \cdot \frac{1}{2}\left(12 \text{ in.} \cdot 14\frac{3}{4} \text{ in.}\right)$ $\quad B = (12 \text{ in.})^2$

$LA = 2\left(12 \text{ in.} \cdot 14\frac{3}{4} \text{ in.}\right)$ $\quad B = 144 \text{ in}^2$

$LA = 2(168 \text{ in}^2 + 9 \text{ in}^2)$

$LA = 336 \text{ in}^2 + 18 \text{ in}^2$

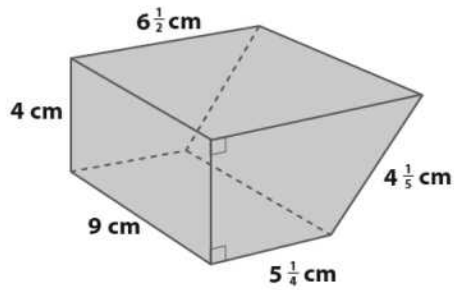
$LA = 354 \text{ in}^2$

$SA = LA + B$

$SA = 354 \text{ in}^2 + 144 \text{ in}^2 = 498 \text{ in}^2$

The surface area of the square pyramid is 498 in^2.

2. Find the surface area of the following prisms.



$SA = LA + 2B$

$LA = P \cdot h$

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

$LA = \left(19 \text{ cm} + \frac{1}{2} \text{ cm} + \frac{1}{5} \text{ cm} + \frac{1}{4} \text{ cm}\right) \cdot 9 \text{ cm}$

$LA = \left(19 \text{ cm} + \frac{10}{20} \text{ cm} + \frac{4}{20} \text{ cm} + \frac{5}{20} \text{ cm}\right) \cdot 9 \text{ cm}$

$LA = \left(19 \text{ cm} + \frac{19}{20} \text{ cm}\right) \cdot 9 \text{ cm}$

$LA = 171 \text{ cm}^2 + \frac{171}{20} \text{ cm}^2$

$LA = 171 \text{ cm}^2 + 8\frac{11}{20} \text{ cm}^2$

$LA = 179\frac{11}{20} \text{ cm}^2$

$B = A_{\text{rectangle}} + A_{\text{triangle}}$

$B = \left(5\frac{1}{4} \text{ cm} \cdot 4 \text{ cm}\right) + \frac{1}{2}\left(4 \text{ cm} \cdot 1\frac{1}{4} \text{ cm}\right)$

$B = (20 \text{ cm}^2 + 1 \text{ cm}^2) + \left(2 \text{ cm} \cdot 1\frac{1}{4} \text{ cm}\right)$

$B = 21 \text{ cm}^2 + 2\frac{1}{2} \text{ cm}^2$

$B = 23\frac{1}{2} \text{ cm}^2$

$SA = LA + 2B$

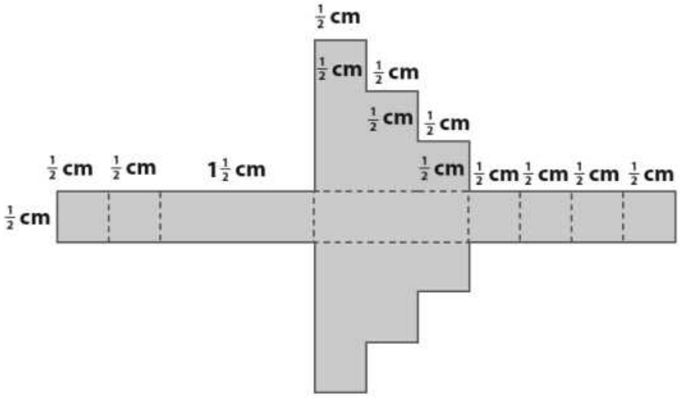
$SA = 179\frac{11}{20} \text{ cm}^2 + 2\left(23\frac{1}{2} \text{ cm}^2\right)$

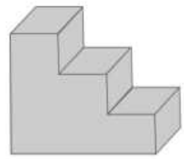
$SA = 179\frac{11}{20} \text{ cm}^2 + 47 \text{ cm}^2$

$SA = 226\frac{11}{20} \text{ cm}^2$

The surface area of the prism is $226\frac{11}{20} \text{ cm}^2$.

3. **The net below is for a specific object. The measurements shown are in meters. Sketch (or describe) the object, and then find its surface area.**





(3-Dimensional Form)

$SA = LA + 2b$

$LA = P \cdot h$

$LA = 6 \text{ cm} \cdot \frac{1}{2} \text{ cm}$

$LA = 3 \text{ cm}^2$

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

$b = \left(\frac{1}{4} \text{ cm}^2\right) + \left(\frac{1}{2} \text{ cm}^2\right) + \left(\frac{3}{4} \text{ cm}^2\right)$

$b = \left(\frac{1}{4} \text{ cm}^2\right) + \left(\frac{2}{4} \text{ cm}^2\right) + \left(\frac{3}{4} \text{ cm}^2\right)$

$b = \frac{6}{4} \text{ cm}^2$

$b = 1\frac{1}{2} \text{ cm}^2$

$SA = LA + 2b$

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

$SA = 3 \text{ cm}^2 + 3 \text{ cm}^2$

$SA = 6 \text{ cm}^2$

The surface area of the object is 6 cm^2.

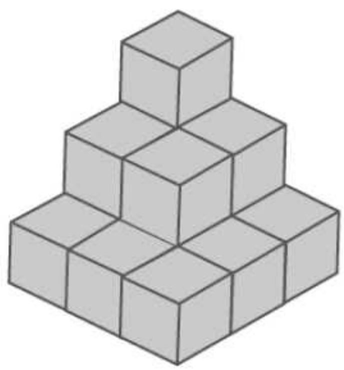
4. **In the diagram, there are 14 cubes glued together to form a solid. Each cube has a volume of $\frac{1}{8}$ in^2. Find the surface area of the solid.**

The volume of a cube is s^3*, and* $\frac{1}{8} = \left(\frac{1}{2}\right)^3$*, so the cubes have edges that are* $\frac{1}{2}$ in. *long. The cube faces have area* s^2*, or* $\left(\frac{1}{2} \text{ in.}\right)^2 = \frac{1}{4} \text{ in}^2$.
There are 42 *cube faces that make up the surface of the solid.*

$SA = \frac{1}{4} \text{ in}^2 \cdot 42$

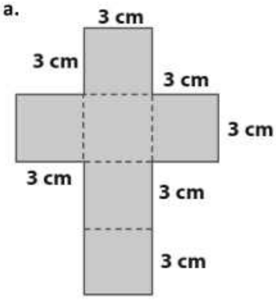
$SA = 10\frac{1}{2} \text{ in}^2$

The surface area of the solid is $10\frac{1}{2} \text{ in}^2$.

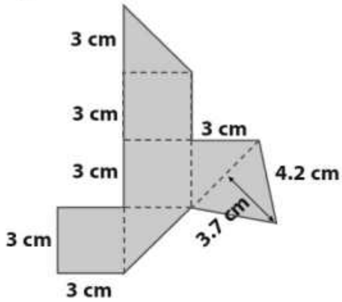


5. **The nets below represent three solids. Sketch (or describe) each solid and find its surface area.**

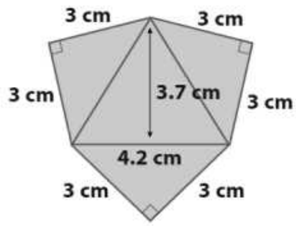
a.



b.



c.



$SA = LA + 2B$

$LA = P \cdot h$

$LA = 12 \cdot 3 = 36 \text{ cm}^2$

$B = s^2$

$B = (3 \text{ cm})^2 = 9 \text{ cm}^2$

$SA = 36 \text{ cm}^2 + 2(9 \text{ cm}^2)$

$SA = 36 \text{ cm}^2 + 18 \text{ cm}^2$

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

$SA = 3A_{square} + 3A_{rt\ triangle} + A_{equ\ triangle}$

$A_{square} = s^2$

$A_{square} = (3 \text{ cm})^2 = 9 \text{ cm}^2$

$A_{rt\ triangle} = \frac{1}{2}bh$

$A_{rt\ triangle} = \frac{1}{2} \cdot 3 \text{ cm} \cdot 3 \text{ cm}$

$A_{rt\ triangle} = \frac{9}{2} = 4\frac{1}{2} \text{ cm}^2$

$A_{equ\ triangle} = \frac{1}{2}bh$

$A_{equ\ triangle} = \frac{1}{2} \cdot \left(4\frac{1}{5} \text{ cm}\right) \cdot \left(3\frac{7}{10} \text{ cm}\right)$

$A_{equ\ triangle} = 2\frac{1}{10} \text{ cm} \cdot 3\frac{7}{10} \text{ cm}$

$A_{equ\ triangle} = \frac{21}{10} \text{ cm} \cdot \frac{37}{10} \text{ cm}$

$A_{equ\ triangle} = \frac{777}{100} \text{ cm}^2 = 7\frac{77}{100} \text{ cm}^2$

$SA = 3(9 \text{ cm}^2) + 3\left(4\frac{1}{2} \text{ cm}^2\right) + 7\frac{77}{100} \text{ cm}^2$

$SA = 27 \text{ cm}^2 + \left(12 + \frac{3}{2}\right) \text{ cm}^2 + 7\frac{77}{100} \text{ cm}^2$

$SA = 47 \text{ cm}^2 + \frac{1}{2} \text{ cm}^2 + \frac{77}{100} \text{ cm}^2$

$SA = 47 \text{ cm}^2 + \frac{50}{100} \text{ cm}^2 + \frac{77}{100} \text{ cm}^2$

$SA = 47 \text{ cm}^2 + \frac{127}{100} \text{ cm}^2$

$SA = 47 \text{ cm}^2 + 1 \text{ cm}^2 + \frac{27}{100} \text{ cm}^2 = 48\frac{27}{100} \text{ cm}^2$

$SA = 3A_{rt\ triangle} + A_{equ\ triangle}$

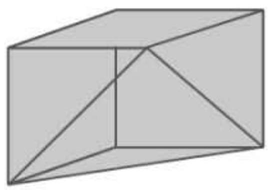
$SA = 3\left(4\frac{1}{2}\right) \text{ cm}^2 + 7\frac{77}{100} \text{ cm}^2$

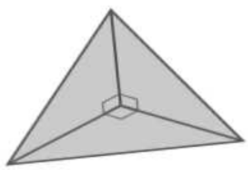
$SA = 12 \text{ cm}^2 + \frac{3}{2} \text{ cm}^2 + 7 \text{ cm}^2 + \frac{77}{100} \text{ cm}^2$

$SA = 20 \text{ cm}^2 + \frac{1}{2} \text{ cm}^2 + \frac{77}{100} \text{ cm}^2$

$SA = 20 \text{ cm}^2 + 1 \text{ cm}^2 + \frac{27}{100} \text{ cm}^2$

$SA = 21\frac{27}{100} \text{ cm}^2$

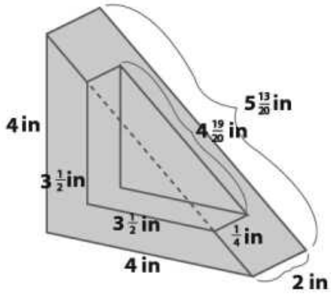




d. **How are figures (b) and (c) related to figure (a)?**

If the equilateral triangular faces of figures (b) and (c) were matched together, they would form the cube in part (a).

6. **Find the surface area of the solid shown in the diagram. The solid is a right triangular prism (with right triangular bases) with a smaller right triangular prism removed from it.**



$$SA = LA + 2B$$

$$LA = P \cdot h$$

$$LA = \left(4 \text{ in.} + 4 \text{ in.} + 5\frac{13}{20} \text{ in.}\right) \cdot 2 \text{ in.}$$

$$LA = \left(13\frac{13}{20} \text{ in.}\right) \cdot 2 \text{ in.}$$

$$LA = 26 \text{ in}^2 + \frac{13}{10} \text{ in}^2$$

$$LA = 26 \text{ in}^2 + 1 \text{ in}^2 + \frac{3}{10} \text{ in}^2$$

$$LA = 27\frac{3}{10} \text{ in}^2$$

The $\frac{1}{4}$ in. *by* $4\frac{19}{20}$ in. *rectangle has to be taken away from the lateral area:*

$$A = lw$$

$$A = 4\frac{19}{20} \text{ in.} \cdot \frac{1}{4} \text{ in.}$$

$$A = 1 \text{ in}^2 + \frac{19}{80} \text{ in}^2$$

$$A = 1\frac{19}{80} \text{ in}^2$$

$$27\frac{3}{10} \text{ in}^2 - 1\frac{19}{80} \text{ in}^2$$

$$27\frac{24}{80} \text{ in}^2 - 1\frac{19}{80} \text{ in}^2$$

$$26\frac{5}{80} \text{ in}^2$$

$$26\frac{1}{16} \text{ in}^2$$

Two lateral faces of the smaller triangular prism must be added.

$$SA = 26\frac{1}{16} \text{ in}^2 + 2\left(3\frac{1}{2} \text{ in.} \cdot \frac{1}{4} \text{ in.}\right)$$

$$SA = 26\frac{1}{16} \text{ in}^2 + 2 \cdot \frac{1}{4} \text{ in.} \cdot 3\frac{1}{2} \text{ in.}$$

$$SA = 26\frac{1}{16} \text{ in}^2 + \frac{1}{2} \text{ in.} \cdot 3\frac{1}{2} \text{ in.}$$

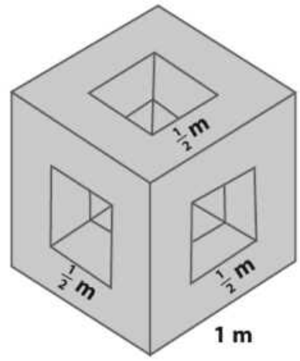
$$SA = 26\frac{1}{16} \text{ in}^2 + \left(\frac{3}{2} \text{ in}^2 + \frac{1}{4} \text{ in}^2\right)$$

$$SA = 26\frac{1}{16} \text{ in}^2 + 1 \text{ in}^2 + \frac{8}{16} \text{ in}^2 + \frac{4}{16} \text{ in}^2$$

$$SA = 27\frac{13}{16} \text{ in}^2$$

The surface area of the solid is $27\frac{13}{16}$ in^2.

7. The diagram shows a cubic meter that has had three square-holes punched completely through the cube on three perpendicular axes. Find the surface area of the remaining solid.



Exterior surfaces of the cube (SA_1)*:*

$$SA_1 = 6(1 \text{ m})^2 - 6\left(\frac{1}{2} \text{ m}\right)^2$$

$$SA_1 = 6(1 \text{ m}^2) - 6\left(\frac{1}{4} \text{ m}^2\right)$$

$$SA_1 = 6 \text{ m}^2 - \frac{6}{4} \text{ m}^2$$

$$SA_1 = 6 \text{ m}^2 - \left(1\frac{1}{2} \text{ m}^2\right)$$

$$SA_1 = 4\frac{1}{2} \text{ m}^2$$

Just inside each square hole are four intermediate surfaces that can be treated as the lateral area of a rectangular prism. Each has a height of $\frac{1}{4}$ *inch and perimeter of* $\frac{1}{2} \text{ m} + \frac{1}{2} \text{ m} + \frac{1}{2} \text{ m} + \frac{1}{2} \text{ m} = 2 \text{ m}$.

$$SA_2 = 6(LA)$$

$$SA_2 = 6\left(2 \text{ m} \cdot \frac{1}{4} \text{ m}\right)$$

$$SA_2 = 6 \cdot \frac{1}{2} \text{ m}^2$$

$$SA_2 = 3 \text{ m}^2$$

The total surface area of the remaining solid is the sum of these two areas:

$$SA_T = SA_1 + SA_2.$$

$$SA_T = 4\frac{1}{2} \text{ m}^2 + 3 \text{ m}^2$$

$$SA_T = 7\frac{1}{2} \text{ m}^2$$

The surface area of the remaining solid is $7\frac{1}{2} \text{ m}^2$.