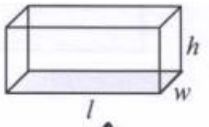
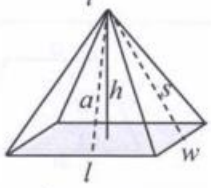
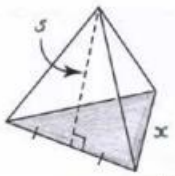
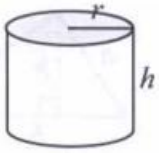
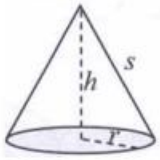
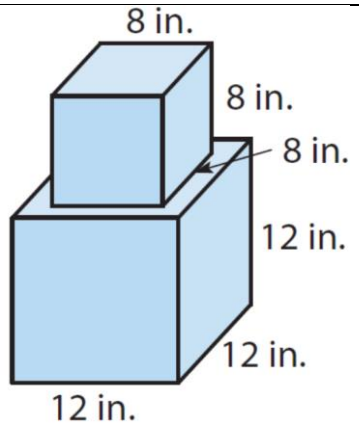
Composite Objects Practice

Refer to the following formulas.

Surface Area and Volume

Surface Area		Volume
$SA = 6x^2$		$V = x^3$
$SA = 2lw + 2wh + 2lh$		$V = lwh$
$SA = lw + 2\left(\frac{1}{2}al\right) + 2\left(\frac{1}{2}sw\right)$		$V = \frac{1}{3}lwh$
$SA = 4\left(\frac{1}{2}sx\right)$		$V = {}^1/_3$ (*Area of Base*) (*Height*)
$SA = 2\pi r^2 + 2\pi rh$		$V = \pi r^2 h$
$SA = \pi rs + \pi r^2$		$V = \frac{1}{3}\pi r^2 h$
$SA = 4\pi r^2$		$V = \frac{4}{3}\pi r^3$
Hemisphere: $SA = 3\pi r^2$		$V = \frac{2}{3}\pi r^3$

Use the following diagram to answer the first question.

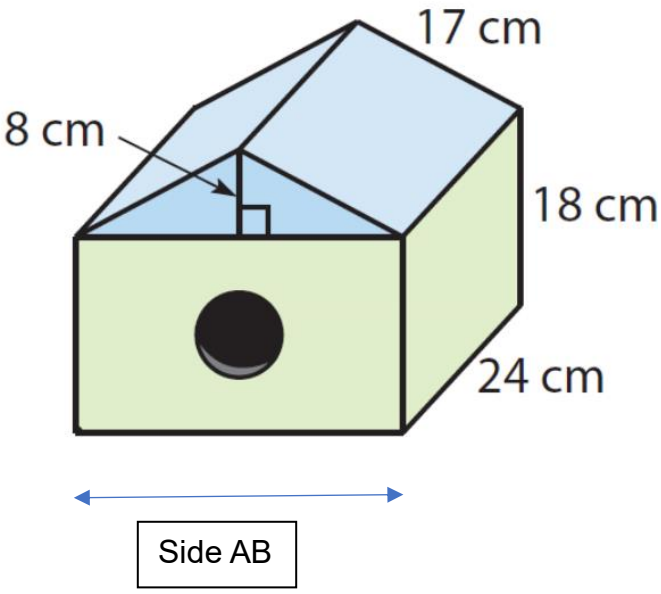


An 8-inch cube sits on top of a 12-inch cube.

1. The surface area on the top of the 12-inch cube (the side where the 8-inch cube sits) is

   A) 60 in^2 B) 75 in^2 C) 80 in^2 D) 98 in^2

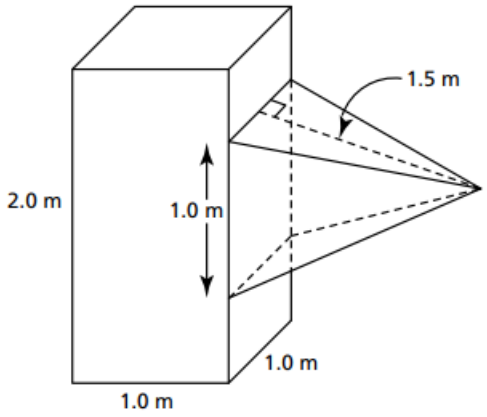
Use the following information to answer the next question.



2. The length of side AB to the nearest cm is _____.

Use the following information to answer the next question.

A math student was asked to determine the surface area of the complex object below.



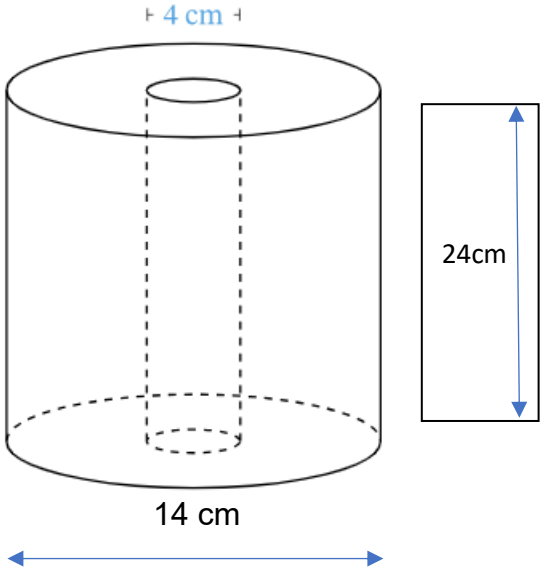
Analyze their work.

Step 1	Determine the surface area of the square based pyramid. $4\left[\frac{(1.0)(1.5)}{2}\right]$
Step 2	Determine the surface area of the 5 sides of the square based prism that are not connected to the pyramid. $2[(1.0)(1.0)] + 3[(1.0)(2.0)]$
Step 3	Determine the surface area of the side of the square based prism that is connected to the pyramid. $(1.0)(0.5)$
Step 4	Add the individual parts obtained from steps 1, 2 and 3.

3. The first error occurred in step

A) 1 B) 2 C) 3 D) 4

Use the following information to answer the next question.



A hole in the shape of a cylinder with a diameter of 4 cm and a height of 24 cm is made in a larger cylinder with a diameter of 14 cm and a height of 24 cm.

4. The volume of the larger cylinder, to the nearest cm^3 is

   A) 3393 B) 3452 C) 4109 D) 4435

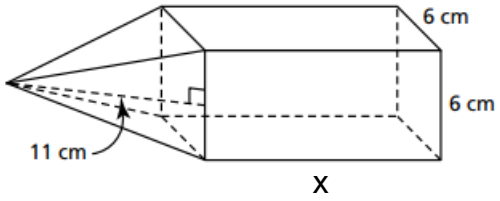
Use the following diagram to answer the next question.

The composite figure below is made up of a cylinder, with a hemisphere at each end. The length of the cylinder below is 12 ft.

5. Rounded to the nearest cubic foot, the volume of the figure above can be written in the form, Volume = WKM ft^3, where W, K, and M are integers. The values of W, K, and M respectively are ___, ___, and ___.

Use the following information to answer the next question.

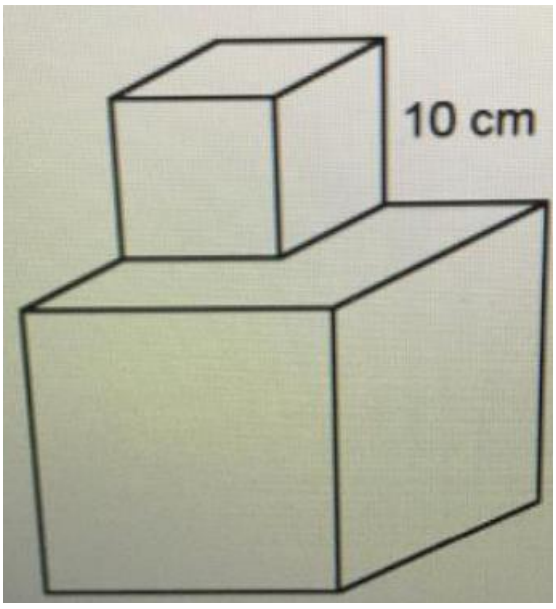
The volume of the square-based pyramid is 127 cm^3 and the total volume of the square-based pyramid **added** to the volume of the square-based prism is 667 cm^3.



6. Determine the length (x) of the prism to the nearest cm. Show work.

Use the following diagram to answer the next question.

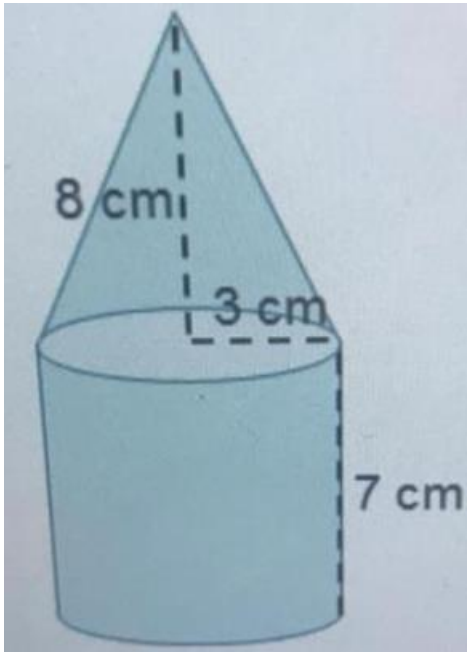
A 10 cm cube sits on top of a 16 cm cube.



7. The surface area of this complex object, to the nearest cm^2, is

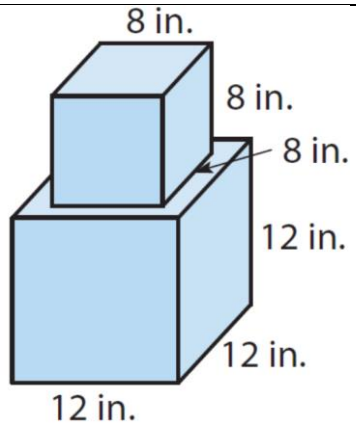
   A) 1892 B) 1908 C) 1936 D) 1978

8. Find the volume and surface area of the figure (a cone on top of a cylinder) below. Give answers to the nearest tenth. Show work.



Composite Objects Practice Solutions

Use the following diagram to answer the first question.



An 8-inch cube sits on top of a 12-inch cube.

1. The surface area on the top of the 12-inch cube (the side where the 8-inch cube sits) is

   A) 60 in^2 B) 75 in^2 C) 80 in^2 D) 98 in^2

Solution

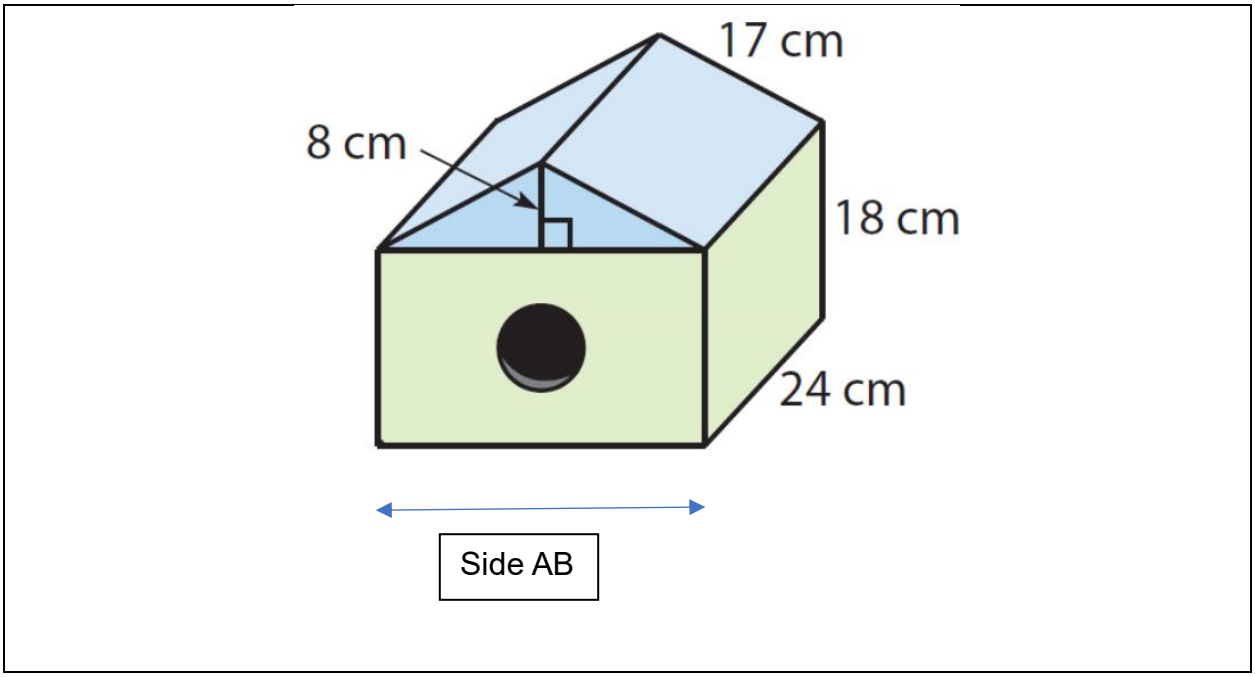
Without the 8-inch cube, the surface area of the top of the 12-inch cube is 12 X 12, or 144 in^2. The surface area of the bottom of the 8-inch cube is 8 X 8, or 64 in^2.

The answer is the difference between these two values.

144 – 64 = 80

The correct answer is C.

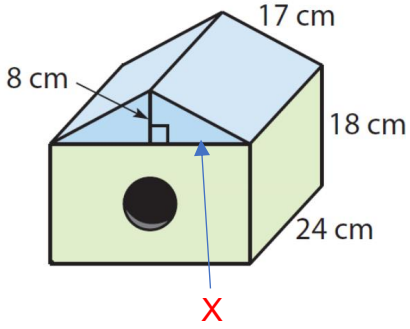
Use the following information to answer the next question.



2. The length of side AB to the nearest cm is __30__.

Solution

We need to use the Pythagorean Theorem.



The hypotenuse in the triangle is 17 cm and the two sides are 8 cm and x cm.

$hyp^2 = side^2 + side^2$

$17^2 = 8^2 + x^2$

$17^2 - 8^2 = x^2$

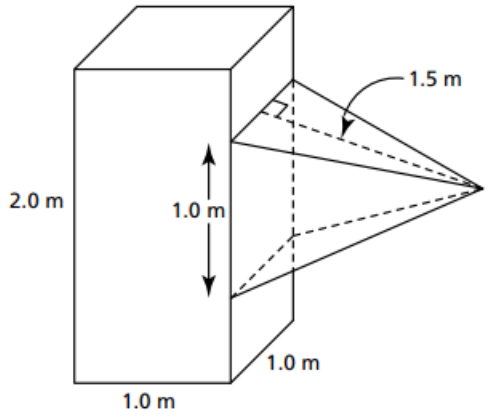
$225 = x^2$

Take the square root of both sides and the value of x is 15 cm. This represents half the length of side AB.

The length of side AB is 30 cm.

Use the following information to answer the next question.

A math student was asked to determine the surface area of the complex object below.



Analyze their work.

Step 1	Determine the surface area of the square based pyramid. $4\left[\frac{(1.0)(1.5)}{2}\right]$
Step 2	Determine the surface area of the 5 sides of the square based prism that are not connected to the pyramid. $2[(1.0)(1.0)] + 3[(1.0)(2.0)]$
Step 3	Determine the surface area of the side of the square based prism that is connected to the pyramid. $(1.0)(0.5)$
Step 4	Add the individual parts obtained from steps 1, 2 and 3.

3. The first error occurred in step

A) 1 B) 2 C) 3 D) 4

Solution

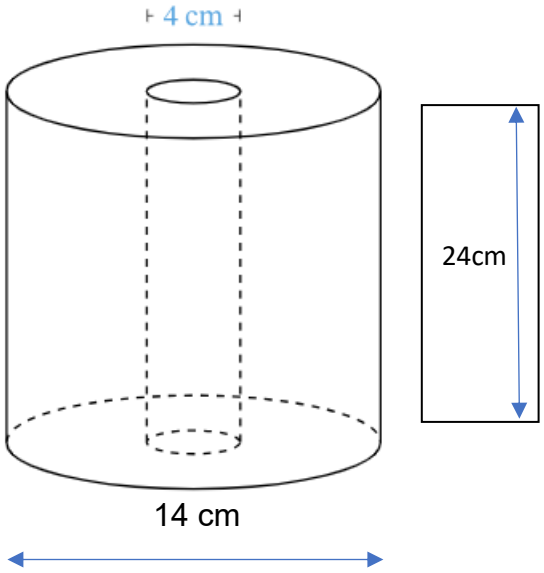
The first 2 steps are correct.

The first error occurs in step 3. The surface area of the side of the square based prism that is connected to the pyramid is (1.0) (1.0).

Then, the areas of these individual parts are added together.

The correct answer is C.

Use the following information to answer the next question.



A hole in the shape of a cylinder with a diameter of 4 cm and a height of 24 cm is made in a larger cylinder with a diameter of 14 cm and a height of 24 cm.

4. The volume of the larger cylinder, to the nearest cm^3 is

A) 3393 B) 3452 C) 4109 D) 4435

Solution

The formula for the volume of a cylinder is $V = \pi r^2 h$

$\text{Volume}_{\text{large cylinder}} = \text{Volume}_{\text{large cylinder without the hole}} - \text{Volume}_{\text{small cylinder creating the hole}}$

$= (\pi)(7)^2(24) - (\pi)(2)^2(24)$

$= 1176\pi - 96\pi$

$= 3392.92\ldots$

Use the following diagram to answer the next question.

The composite figure below is made up of a cylinder, with a hemisphere at each end. The length of the cylinder below is 12 ft.

5. Rounded to the nearest cubic foot, the volume of the figure above can be written in the form, Volume = WKM ft^3, where W, K, and M are integers. The values of W, K, and M respectively are _4_, _5_, and _2_.

Solution

The figure above consists of two hemispheres (1 full sphere) and a cylinder.

The formula for the volume of a sphere is $V = \left(\frac{4}{3}\right)\pi r^3$

The formula for the volume of a cylinder is $V = \pi r^2 h$

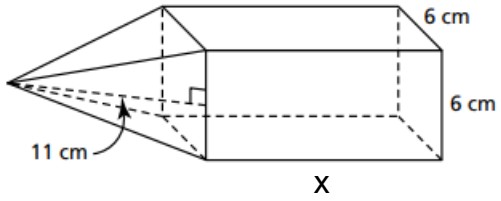
Volume $_{\text{composite figure}}$	= Volume $_{\text{sphere}}$	+	Volume $_{\text{cylinder}}$
	$= \left(\frac{4}{3}\right)\pi(3^3)$	+	$\pi(3^2)(12)$
	$= 36\pi$	+	108π

= 452.389…

The values of W, K, and M respectively are 4, 5, and 2.

Use the following information to answer the next question.

The volume of the square-based pyramid is 127 cm^3 and the total volume of the square-based pyramid **added** to the volume of the square-based prism is 667 cm^3.



6. Determine the length (x) of the prism to the nearest cm. Show work.

Solution

The volume of the composite figure is the sum of the volumes of the square-based pyramid and the square-based prism.

The volume of the prism is (6) (6) (x), or 36x.

Total volume = Volume $_{pyramid}$ + Volume $_{prism}$

667 = 127 + 36x

Subtract 127 from both sides.

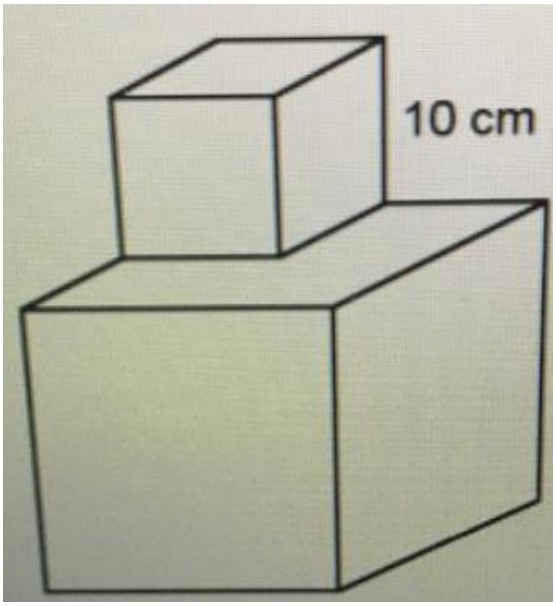
540 = 36x

15 = x

The length (x) of the prism is 15 cm.

Use the following diagram to answer the next question.

A 10 cm cube sits on top of a 16 cm cube.



16 cm

7. The surface area of this complex object, to the nearest cm^2, is

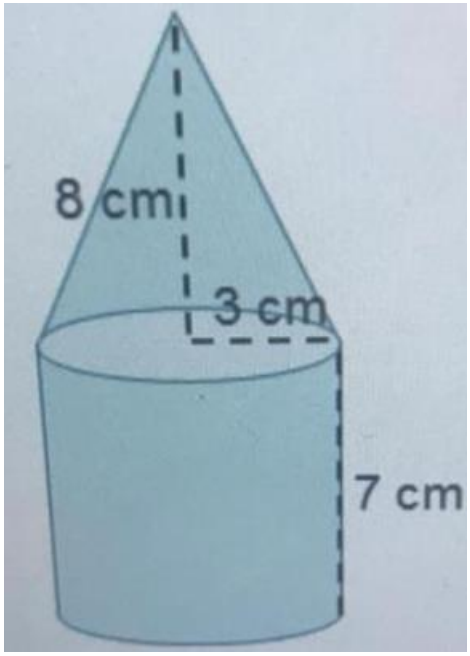
A) 1892 B) 1908 C) 1936 D) 1978

Solution

Total Surface Area	= SA of 10-inch cube	+	SA of 12-inch cube
	= 5(10 X 10)	+	5(16 X 16) + [(16)(16) – (10)(10)]
	= 500	+	1280 + 156
	= 500	+	1436
	= 1936 cm^2		

The correct answer is C.

8. Find the volume and surface area of the figure (a cone on top of a cylinder) below. Give answers to the nearest tenth. Show work.



Solution

Volume

Total Volume = V_{cone} + $V_{cylinder}$

= $\left(\frac{1}{3}\right)\pi r^2 h$ + $\pi r^2 h$

= $\left(\frac{1}{3}\right)\pi(3^2)(8)$ + $\pi(3^2)(7)$

= 24π + 63π

= 273.318…

The volume of the figure is 273.3 cm^3.

Surface Area

The bottom of the cone and the top of the cylinder are connecting parts that are inside the object, and thus not part of the surface area.

In the formula below for the cone, *'l'* represents slant height, and must be determined using the Pythagorean Theorem.

$(l^2) = (3)^2 + (8)^2$

$(l^2) = 9 + 64$

$(l^2) = 73$

$l = \sqrt{73}$

$l = 8.544\ldots$

Total Surface Area	= SA_{cone} (only curved portion)	+	$SA_{cylinder}$ (not the top)
	= πrl	+	$\pi r^2 + 2\pi rh$
	= $\pi(3)(8.544\ldots)$	+	$\pi(3^2) + 2\pi(3)(7)$
	= 80.525…	+	160.221…
	= 240.746…		

The surface area of the figure is 240.7 cm^2.