Name: _____ Date: _____

Lesson 2.3 – Working with Composite Objects

Goal: Determine the surface area and volume of composite 3-dimensional objects

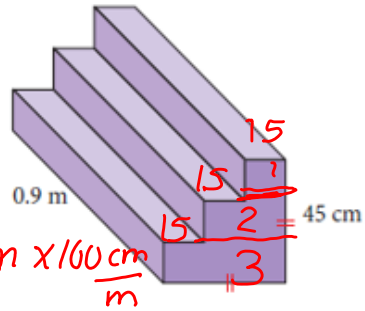
Composite object: when a structure or object is make up from several simple objects

Calculating Volume of a Composite Figure

1. Calculate the volume of each part of the composite object
2. Add the volumes
3. Subtract the volume of any parts that are removed from the object

EXAMPLE

1. You need to construct a concrete staircase with the dimensions shown.
   a) Determine the volume, to two decimal places, of concrete needed.



$V_1 = 15 \times 15 \times 90$
$= 20250\ cm^3$

$V_2 = 15 \times 30 \times 90$
$= 40500\ cm^3$

$V_3 = 15 \times 45 \times 90$
$= 60750$

$0.9m \times \frac{100cm}{m} = 90m$

45cm

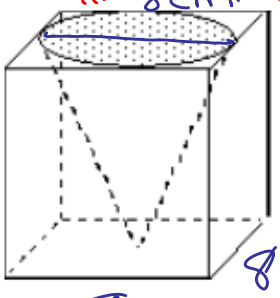
$Total = 20250 + 40500 + 60750$
$= 121500\ cm^3$

b) Concrete costs $0.02 per cubic cm. How much will the stairs cost?

$\$0.02/cm^3$

$Cost = 121500cm^3 \times \$0.02/cm^3 = \$2430$

2. A machinist drilled a conical hole into a cube of metal as shown. If the cube has sides of length 8 cm, what is the volume of the metal after the hole is drilled? Round to the nearest tenth



$d = 2r$

$V_{CUBE} = l \cdot w \cdot h$
$= 8 \times 8 \times 8\ cm^3$
$= 512\ cm^3$

$V_{cone} = \frac{\pi r^2 h}{3}$
$= \frac{\pi (4)^2 (8)}{3}$
$= \frac{402.124}{3}$
$= 134.0\ cm^3$

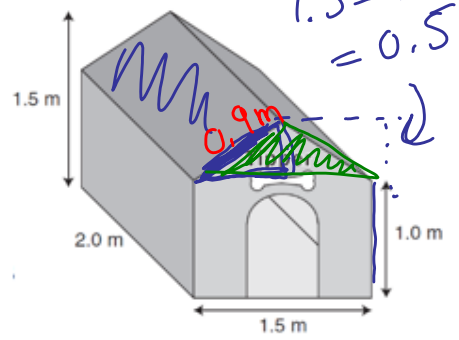
$V_{Final} = 512\ cm^3 - 134.0\ cm^3$
$= 378\ cm^3$

∴ The volume of metal is $378\ cm^3$

Name: _____ Date: _____

Calculating Surface Area of a Composite Figure

1. Calculate the surface of each "face" that makes up the composite object
2. Add the areas together

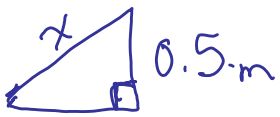


1.5 − 1.0 = 0.5

EXAMPLE

3. John is making a doghouse for his dog, Tipper.
a) What is the surface area of the exterior of the doghouse before the doorway is cut? Include the floor.

Face	Shape	Qty	Formula	Area of each face
Roof panels	Rectangle	2	$A = lw$	$A = 2.0m \times 0.9m = 1.8m^2$
Triangular panels	Triangle	2	$A = \frac{bh}{2}$	$A = \frac{1.5m \times 0.5m}{2} = 0.375m^2$
Front/Back	Rectangle	2	$A = lw$	$A = 1.5m \times 1.0m = 1.5m^2$
Sides	Rectangle	2	$A = lw$	$A = 2.0m \times 1.0m = 2.0m^2$
Floor	Rectangle	1	$A = lw$	$A = 1.5m \times 2.0m = 3.0m^2$



(1.5 ÷ 2)

$0.5^2 + 0.75^2 = x^2$

$0.8125 = x^2$

$\sqrt{0.8125} = x$

$0.9 = x$

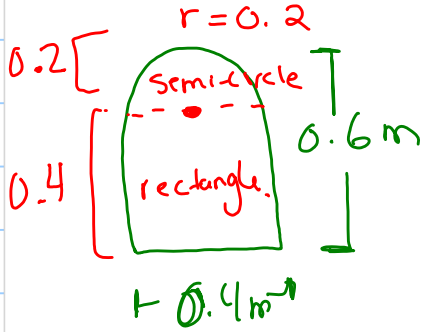
$S.A. = 2(1.8) + 2(0.375) + 2(1.5) + 2(2.0) + 1(3.0)$

$= 3.6 + 0.75 + 3 + 4 + 3$

$= 14.35\ m^2$

∴ The surface area is $14.35m^2$

b) The exterior walls and roof of Fido's house are to be painted. A 40-cm wide doorway has been cut as shown. The doorway is 60 cm at its highest point. What is the area to be painted?



$60cm \times \frac{1m}{100cm} = 0.60$

$40cm \times \frac{1}{100cm} = 0.40$

$A_{door} = A_{rectangle} + A_{semicircle}$

$= (0.4)(0.4) + \frac{\pi (0.2)^2}{2}$

$= 0.16 + 0.0628$

$= 0.2228\ m^2$

Area to paint = Total − Floor − Door

$= 14.35m^2 - 3.0m^2 - 0.2228m^2$

$= 11.13m^2$