University of Waterloo
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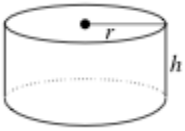
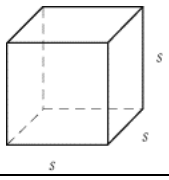
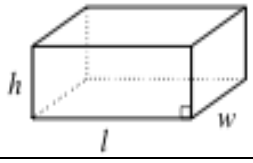
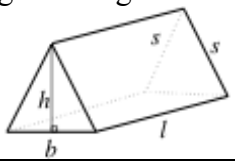
Centre for Education in
Mathematics and Computing
Faculty of Mathematics

Grade 9

Measurement: Surface Area and Volume

Play the **Volume and Surface Area** game first!
Click on *http://www.scholarnet.co.nz/member/courses/smol/data/site/flash_apps/Measurement.php*
You may go to *www.wiredmath.ca* for the link.

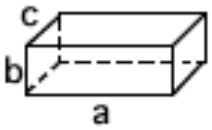
Formulas of Surface Area and Volume

Geometric Figure	Surface Area	Volume
Cylinder 	$SA = 2\pi r^2 + 2\pi rh$	$V = \pi r^2 h$
Cube 	$SA = 6s^2$	$V = s^3$
Rectangular Prism 	$SA = 2(wh + lw + lh)$	$V = lwh$
Right Triangular Prism 	$SA = bh + 2ls + lb$	$V = \frac{1}{2}bhl$

1. Determine the surface area and volume for each of the following. Round your answer to one decimal place. (use $\pi = 3.14$)
   a. A cube with side length 4.5 cm.
   b. A rectangular prism measures 1.5 m by 2 m by 3 m.
   c. A cylinder with radius 12.7 mm and height 35 mm.
   d. A right triangular prism with base 7.8 m, height 9.5 m, length 11.2 m and slant height 10.3 m.

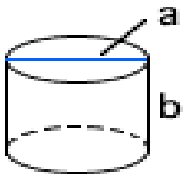
2. Find the surface area for each of the following solids. Round your answer to one decimal place. (use $\pi = 3.14$)

a.



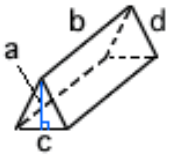
$a = 12$ cm
$b = 4$ cm
$c = 5$ cm

b.



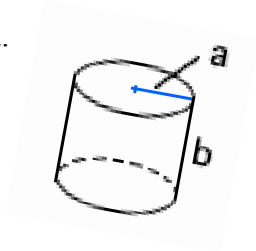
$a = 12.5$ cm
$b = 8.5$ cm

c.



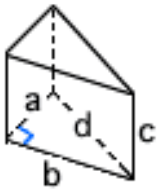
$a = 12$ m
$b = 23$ m
$c = 13$ m
$d = 13.6$ m

d.



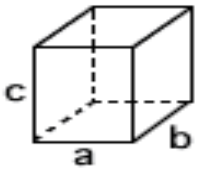
$a = 17.5$ mm
$b = 22$ mm

e.



$a = 2.5$ m
$b = 7$ m
$c = 3.5$ m
$d = 7.4$ m

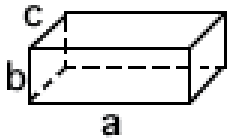
f.



$a = b = c = 7$ cm

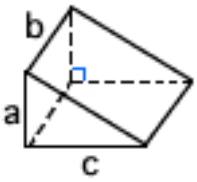
3. Find the volume for each of the following solids. Round your answer to one decimal place. (use $\pi = 3.14$)

a.



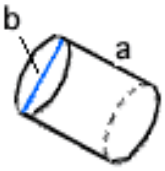
$a = 10$ cm
$b = 4.5$ cm
$c = 5.8$ cm

b.



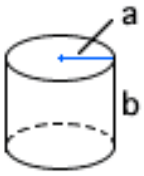
$a = 4.9$ mm
$b = 9$ mm
$c = 12$ mm

c.



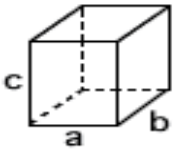
$a = 17$ m
$b = 6.2$ m

d.



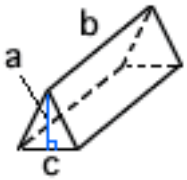
$a = 3$ cm
$b = 15.5$ cm

e.



$a = b = c = 2.25$ cm

f.



$a = 3.17$ m
$b = 15.5$ m
$c = 4$ m

Interesting Fact!

Given the weight and height, we can calculate the body surface area using the formula:

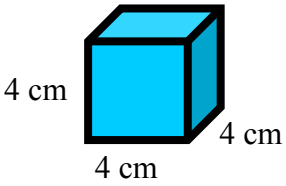
$$BSA = (W^{0.425} \times H^{0.725}) \times 0.007184$$

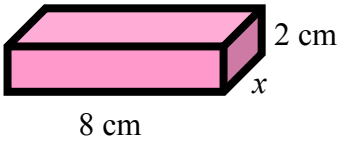
where the weight, W, is in kilograms and the height, H, is in centimetres.

4. The volumes of the cube and the rectangular prism are equal.

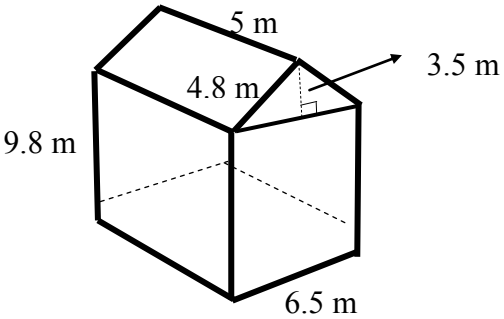
   a. Determine the surface areas of the cube and the rectangular prism.

   b. Determine the difference between the two surface areas.

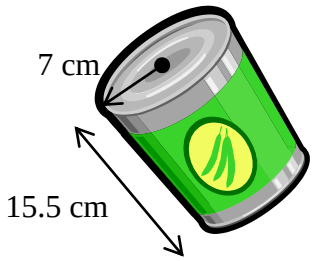




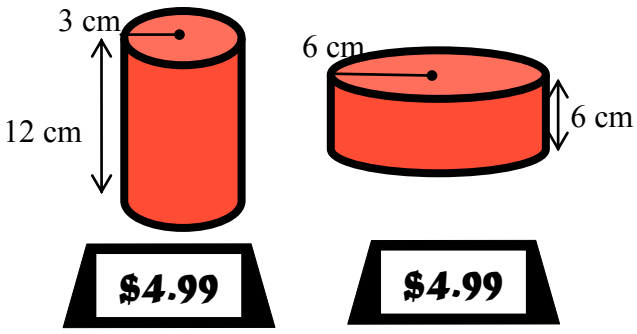
5. Determine the surface area of the house. (Do not include the bottom)



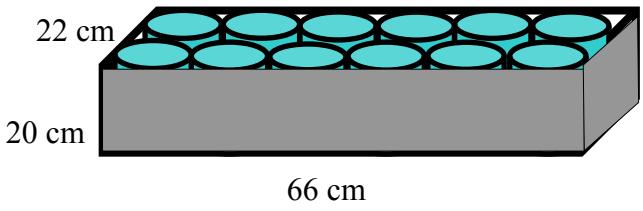
6. Determine the volume of the can. (use $\pi = 3.14$)



7. Which container of ketchup is a better buy? (use $\pi = 3.14$)

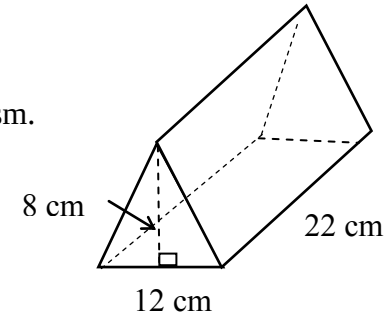


8. Twelve identical cylindrical pop cans are placed in a box. If sand fills the space between the pop cans and the sides of the box, what volume of sand is needed? (use $\pi = 3.14$)



CHALLENGE YOURSELF

9. Determine the surface area and the volume of the isosceles triangular prism.

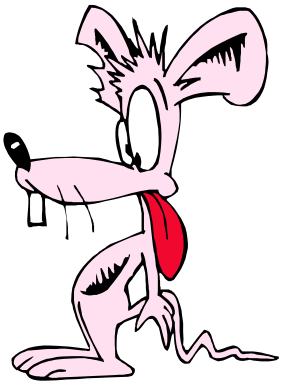


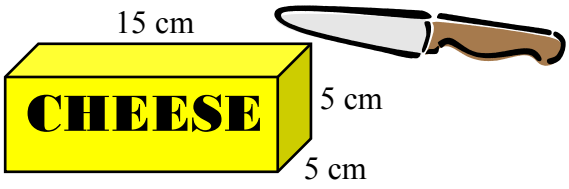
10. Cynthia bought a piece of rectangular cheese from supermarket.

a. What is the possible minimum area of the paper wax?

b. What is the volume of the cheese?

c. If the rectangular cheese is cut into two isosceles triangular prisms, what is the minimum area of the paper wax required to wrap the cheese?

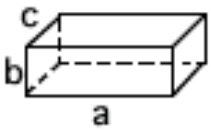




EXTENSION

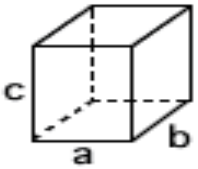
11. Determine the surface area (in cm^2) and volume (in cm^3) for each of the following solids. Round your answer to two decimal places. (use $\pi = 3.14$)

a.



$a = 11.5$ cm
$b = 3.8$ cm
$c = 4.6$ cm

b.

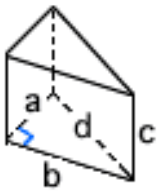


$a = b = c = 7.5$ mm

c.

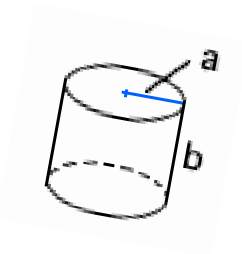
$a = 18.5$ m
$b = 20.3$ m

d.



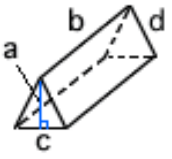
$a = 3.5$ m
$b = 8$ m
$c = 5$ m
$d = 8.7$ m

e.



$a = 9.8$ mm
$b = 20.2$ mm

f.



$a = 3$ m
$b = 12.5$ m
$c = 8$ m