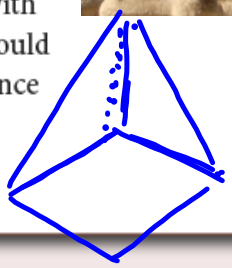
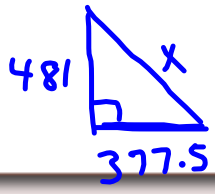
4.3 - Surface Area

Make Connections

The ancient pyramids at Giza, Egypt, were built about 4500 years ago.

This pyramid has a square base with a side length of 755 feet. The original height of the pyramid was 481 feet. Archeologists believe that the pyramid was once covered with a white limestone casing. How could you calculate the area that was once covered with limestone?





$A = \frac{bh}{2} \times 4$

$= \frac{755(611)}{2} \times 4$

$= 922610\ ft^2$

$x^2 = 481^2 + 377.5^2$

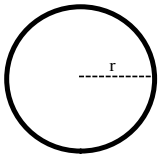
$x = 611\ ft$

AREA Formulas...

Rectangle or Square

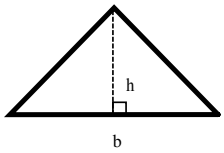
$A = bh$

Circle



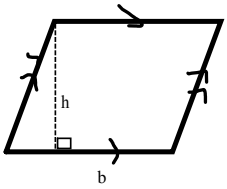
$A = \pi r^2$

Triangle



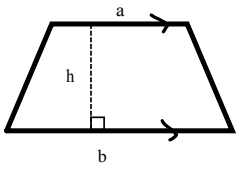
$A = \frac{1}{2} bh$

Parallelogram or Rhombus



$A = bh$

Trapezoid



$A = \frac{1}{2} h(a + b)$

$A = bh$

$= \frac{(a+b)}{2} h$

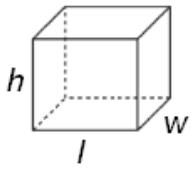
Surface Area

Surface area is the total area of all of the faces of the object.

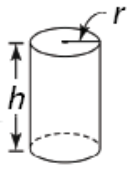
Steps need to find Surface area are:

1. **Draw all of the faces with dimensions displayed on them.**
2. **Find the area of each face.**
3. **Then add up the areas of all of the faces.**

Activate Prior Learning:
Surface Areas of Right Prisms and Cylinders

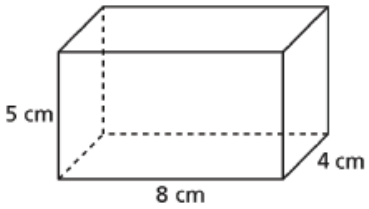


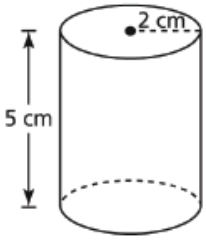
$SA = 2wl + 2hl + 2hw$



$SA = 2\pi r^2 + 2\pi rh$

Which object below has the greater surface area?





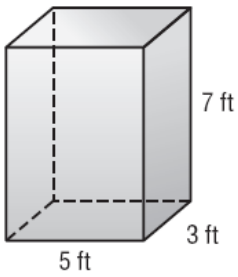
1.4 Surface Areas of Right Pyramids and Right Cones

$SA = 2wl + 2hl + 2wh$
$= 2(4)(8) + 2(5)(8) + 2(4)(5)$
$= 64 + 80 + 40$
$= 184\ cm^2$

$SA = 2\pi r^2 + 2\pi rh$
$= 2\pi(2)^2 + 2\pi(2)(5)$
$= 8\pi + 20\pi$
$= 28\pi$
$= 87.96\ cm^2$

The surface area of a prism is equal to the sum of the areas of its faces. For a rectangular prism with length ℓ, width w, and height h, the surface area is $S = 2\ell w + 2\ell h + 2wh$.

EXAMPLE 1 **Find the surface area of the rectangular prism.**



$S = 2\ell w + 2\ell h + 2wh$ Surface area of a prism

$S = 2(3)(5) + 2(3)(7) \cdot$ $\ell = 3$, $w = 5$, $h = 7$

$S = 142$ Simplify.

The surface area is .

The surface area S of

SOLUTION
(Erase to reveal)

$SA = 2wl + 2\ell h + 2wh$

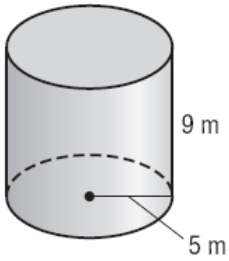
$= 2(5)(3) + 2(3)(7) + 2(5)(7)$

$= 30 + 42 + 70$

$= 142\ ft^2$

The surface area S of a cylinder with height h and radius r is the area of the two bases plus the area of the curved surface, or $S = 2\pi r^2 + 2\pi rh$.

EXAMPLE 2 **Find the surface area of the cylinder. Round to the nearest tenth.**



$S = 2\pi r^2 + 2\pi rh$ Surface area of a cylinder
$S = 2\pi(5)^2 + 2\pi(5)(9)$ $r = 5$, $h = 9$
$S \approx 439.8$ Simplify.

The surface

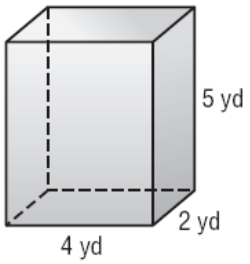
SOLUTION
(Erase to reveal)

$SA. = 2\pi r^2 + 2\pi rh$
$= 2\pi(5)^2 + 2\pi(5)(9)$
$= 50\pi + 90\pi$
$= 140\pi$
$\approx 439.8 m^2$

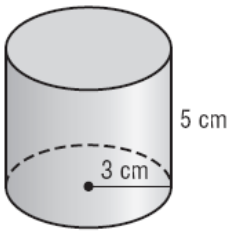
EXERCISES

Find the surface area of each solid. Round to the nearest tenth if necessary.

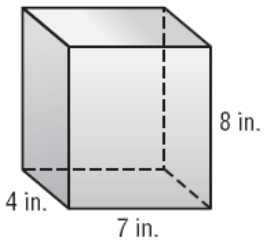
1.



2.



3.



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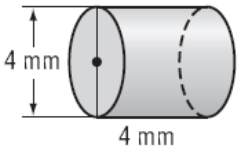

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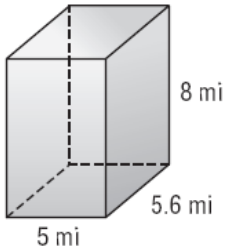
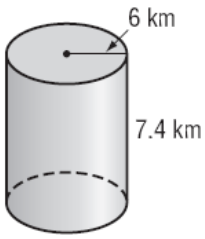


6.



7. rectangular prism: length, 2.3 in.; width, 7 in.; height, 8 in.

8. cylinder: radius, 4 cm; height, 8.2 cm

Solutions...

1) 76 yd^2 **2) 150.8 cm^2** **3) 232 in^2** **4) 75.4 mm^2**
5) 225.6 mi^2 **6) 505.2 km^2** **7) 181 in^2** **8) 306.6 cm^2**

Attachments

Worksheet - Surface Area of Prisms and Cylinders.pdf

Worksheet - Surface Area of Pyramids and Cones.pdf