Activity 34
Surface Area of Prisms and Cylinders

The surface area of a solid is the sum of the areas of the faces of the solid. The lateral surface area includes the areas of all of the faces except for the base(s).

Surface Area of Prisms

Total surface area = $Ph+2B$

Lateral surface area = Ph

P = Perimeter of the base

h = height of the prism

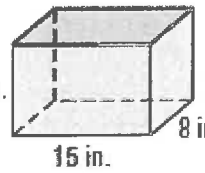
B = area of the base

The "B" is replaced by the appropriate area formula that corresponds to the shape of the base. The height of the prism is the perpendicular distance between the bases.

These formulas apply to all prisms, such as triangular prisms, rectangular prisms, rhombic prisms, pentagonal prisms, hexagonal prisms, trapezoidal prisms, etc.

Examples: Find the total surface area and the lateral area of each prism.

1)

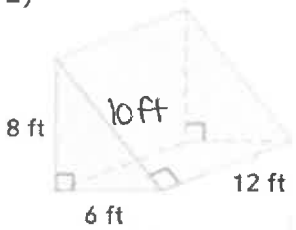


$P = 46$ in
$h = 10$ in.
$B = 120$ in^2

$S = Ph+2B$
$S = (46)(10)+2(120)$
$S = 700$ in^2

$LA = Ph$
$LA = (46)(10)$
$LA = 460$ in^2

2)

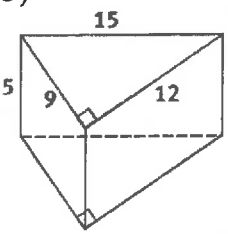


$S = Ph+2B$
$S = (24)(12)+2(24)$
$S = 336$ ft^2

$P = 24$ ft
$h = 12$ ft
$B = \frac{1}{2}(6)(8)$
$B = 24$ ft^2

$LA = Ph$
$LA = (24)(12)$
$LA = 288$ ft^2

3)

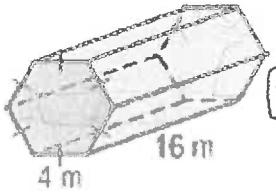


$P = 36$ un.
$h = 5$ un.
$B = 54$ un^2

$S = Ph+2B$
$S = (36)(5)+2(54)$
$S = 288$ un^2

$LA = Ph$
$LA = (36)(5)$
$LA = 180$ un^2

4)

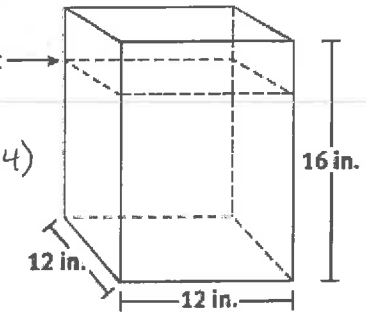


$S = Ph+2B$
$S = (24)(16)+2(24\sqrt{3})$
$S = 384+48\sqrt{3}$ m^2

$P = 24$ m
$h = 16$ m
$B = \frac{1}{2}aP$
$B = \frac{1}{2}(2\sqrt{3})(24)$
$B = 24\sqrt{3}$ m^2

$LA = Ph$
$LA = (24)(16)$
$LA = 384$ m^2

5) A company that manufactures GPS devices ships the product to their customers using the shipping container shown. To cash in on a rebate, the customer needs to cut 2 inches off of the top of the container and mail it back to the manufacturer.



a) What is the surface area of the original shipping container?

a) $S = Ph+2B$
$S = (48)(16)+2(144)$
$S = 1056$ in^2

b) What is the (exterior) surface area of the shipping container after the cut is made?

b) $S = Ph+B$
$S = (48)(14)+144$
$S = 816$ in^2

$P = 48$ in.
$B = 144$ in^2

Activity 34
Surface Area of Prisms and Cylinders

Surface Area of Cylinders

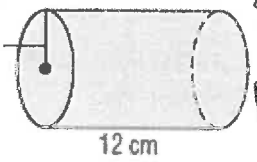
Total surface area = $2\pi rh + 2\pi r^2$ OR $2\pi r(h+r)$

Lateral surface area = $2\pi rh$

Examples: Find the total surface area and the lateral area of each cylinder.

1)

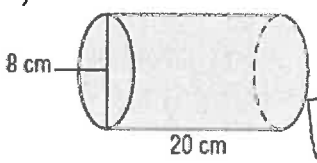
$r = 4$ cm
$h = 12$ cm



$S = 2\pi r(h+r)$
$S = 2\pi(4)(12+4)$
$S = 128\pi$ cm^2

$LA = 2\pi rh$
$LA = 2\pi(4)(12)$
$LA = 96\pi$ cm^2

2)



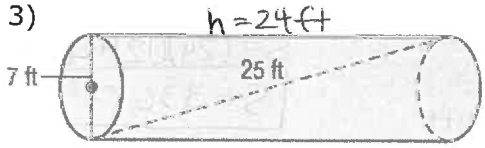
$S = 2\pi r(h+r)$
$S = 2\pi(4)(20+4)$
$S = 192\pi$ cm^2

$r = 4$ cm
$h = 20$ cm

$LA = 2\pi rh$
$LA = 2\pi(4)(20)$
$LA = 160\pi$ cm^2

3)

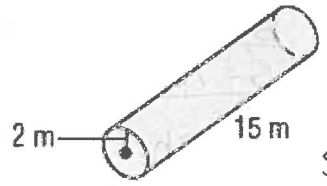
$r = 3.5$ ft
$h = 24$ ft



$S = 2\pi r(h+r)$
$S = 2\pi(3.5)(24+3.5)$
$S = 192.5\pi$ ft^2

$LA = 2\pi rh$
$LA = 2\pi(3.5)(24)$
$LA = 168\pi$ ft^2

4)



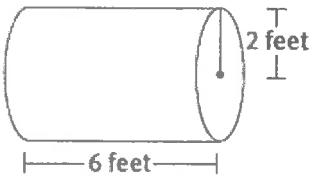
$r = 2$ m
$h = 15$ m

$S = 2\pi r(h+r)$
$S = 2\pi(2)(15+2)$
$S = 68\pi$ m^2

$LA = 2\pi rh$
$LA = 2\pi(2)(15)$
$LA = 60\pi$ m^2

5) The pipe shown is ~~open on each end~~. What is the surface area in terms of π?

(lateral surface area)



$r = 2$ ft
$h = 6$ ft

$LA = 2\pi rh$
$LA = 2\pi(2)(6)$
$LA = 24\pi$ ft^2