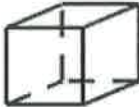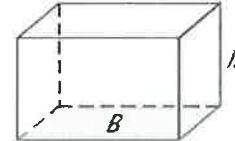We have been progressing our measurements through different dimensions. As we progress through the dimensions, our units of measurement change.

Number of dimensions	What we measure	Example
1	Lengths of segments, perimeters, distances, and circumferences	‾‾‾‾ 1 unit
2	Area, which is the number of square units within a shape	1 unit^2
3	Volume, which is the number of unit cubes that fill the space within a shape	1 unit^3

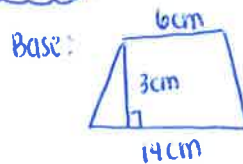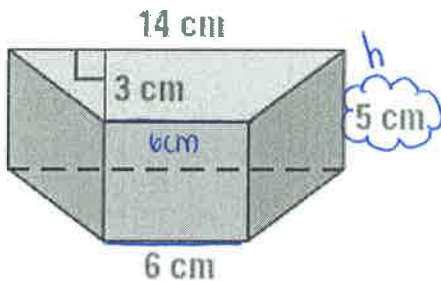## Volume of Prisms

The volume (V) of a Prism is ___$V = Bh$___ .

Where B = __area of the base__ , h = __height of the prism__

$V = Bh$

Example 1: Find the volume of the right trapezoidal prism

14 cm
3 cm
6cm
h
5 cm
6 cm

← use area of trapezoid formula

Base:
6cm
3cm
14cm

$B = \frac{1}{2}h(b_1 + b_2)$

$= \frac{1}{2}(3)(6+14)$
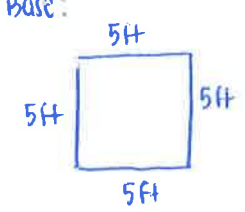
$= \frac{1}{2}(3)(20)$

$B = 30$

$h = 5cm$

$V = Bh$

$V = (30)(5)$

$V = 150 \, cm^3$ ← units in volume are cubed

Example 2: Find the volume of a square prism that has a base edge length of 5 ft and a height of 12 ft.

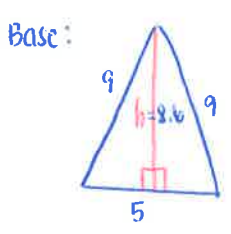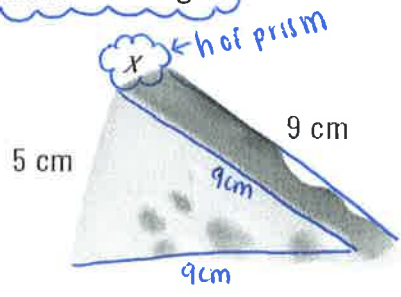Base:

5ft
5ft   5ft
5ft

$B = s^2$
$= (5)^2$
$B = 25$

$h = 12$

$V = Bh$
$V = (25)(12)$
$V = 300 \, ft^3$

Example 3: The volume of the wedge of cheese is 45 cm³. Find the value of x. Assume the base is an isosceles triangle.

← h of prism
x

9 cm

5 cm

9cm

9cm

Base:

$h = 8.6$ 9   9

5

$B = \frac{1}{2}bh$
$= \frac{1}{2}(5)(8.6)$
$B = 21.5$ $h = x$

→ plug into volume formula:
$V = Bh$
$45 = 21.5 x$
$\frac{45}{21.5} = \frac{21.5 x}{21.5}$

$x = 2.1 \, cm$

Find height of Δ base:

h 9
2.5

$h^2 + 2.5^2 = 9^2$
$h^2 + 6.25 = 81$
$h^2 = 74.75$
$h = 8.6$

Volume of Cylinders

The volume (V) of a Cylinder is __$V = Bh$__ __bases are both circles__.
$V = \pi r^2 h$

$B = \pi r^2$
h
B
r

$V = Bh = \pi r^2 h$

---

h=18

Example 4: The volume of a right cylinder is $684\pi \, in^3$ and the height is 18 in. Find the radius.
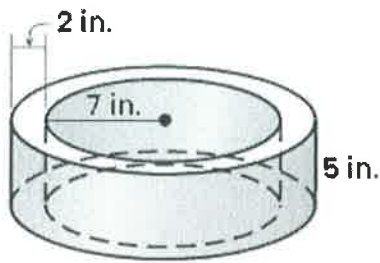
$V = \pi r^2 h$

$684\pi = \pi (r^2)(18)$

$\frac{684\pi}{18\pi} = \frac{18\pi r^2}{18\pi}$ ← rearranged the terms so 18π was before r^2
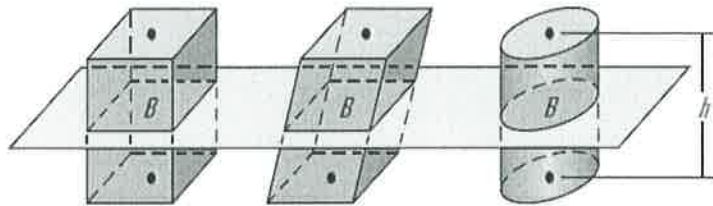
$\sqrt{38} = \sqrt{r^2}$

$r = 6.2 \, in$

Example 5: In machining, a drill hollows out the center of the cylinder. What is the volume of the object below?

2 in.

7 in.

5 in.

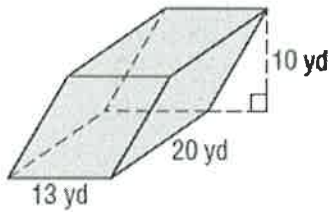
Cavalieri's Principle

If two solids have the same height and the same cross-sectional area at every level, then they have the same volume.

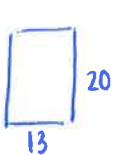* use the same volume formulas that we used in above examples; the volume doesn't change

Example 6: Find the volume of the following.

a) Oblique Prism

10 yd

20 yd

13 yd

$V = Bh$

Base> $B = (13)(20)$

$B = 260$

$h = 10$

20
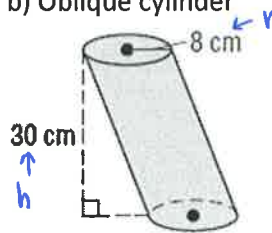
13

$V = Bh$

$V = (260)(10)$

$V = 2600 \text{ yd}^3$

b) Oblique cylinder

← r

-8 cm

30 cm

h

$V = \pi r^2 h$

$V = \pi (8)^2 (30)$

$= \pi (64)(30)$

$V = 6028.8 \text{ cm}^3$