Lesson 13: Volume of Prisms

Let's recall what volume means. Use the simulator linked here and on my website.

SETUP:

The dimensions of the prism are:
Width: 4, Depth: 5, Height: 3
Click on the orange, blue and red sections to partially close the rectangular prism.
Press "layer" to add a layer of cubes.

EXPLORE:

1) How many cubes are in the bottom layer? 20 cubes
2) How could we have predicted the number of cubes in the bottom layer? Multiply 4x5 (w x d, w x l)
3) How many layers will it take to fill up the prism? 3
4) How many cubes in all? 60

EXPLORE 2:

Change to the next prism by pressing the arrow on the right side.

List the dimensions here:
Width: 9 Depth: 8 Height: 6 (Everyone may have different dimensions).
BEFORE clicking on the layer button, predict how many cubes will be on the bottom layer. Then, click "layer" and check your prediction. 72

5) How many layers will it take to fill up this prism? 6
6) How many cubes in all? (What's the volume?) 432

72 x 6 = 432

CONCLUSIONS:

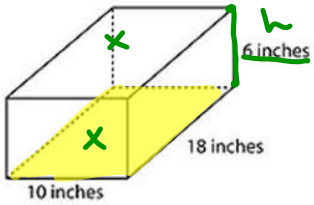
7) If you were to write a formula for volume using the patterns you found, what would the formula be? (You can write it in words or with variables)
Volume = V = wdh V = Lwh
8) What would change if the shape of the base changed?
a) What would be different it the base was a triangle? Lw won't make a Δ
b) What about a square? It can be the same
c) What about a circle? a circle can't do l·w
9) What would be the same even if the base changes? # of layers (height)

$V = Bh$

B: Area of the base
h: height (# of layers)

A = lw
$\frac{1}{2}bh$
πr^2

Examples:

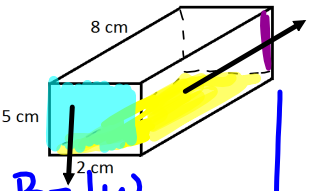


Base: Rectangle

$B = lw$
$B = 10 \cdot 18$
$B = 180 \text{ in}^2$

$V = Bh$
$V = 180(6)$
$V = 1{,}080 \text{ in}^3$

$180 \times 6 = 1080$

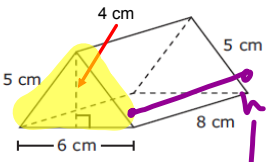


$B = lw$
$B = 5 \cdot 2$
$B = 10 \text{cm}^2$

$V = Bh$
$V = 10 \cdot 8$
$V = 80 \text{cm}^3$

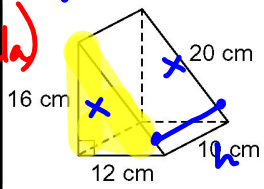
$B = lw$
$B = 2 \cdot 8$
$B = 16 \text{cm}^2$

$V = Bh$
$V = 16 \cdot 5$
$V = 80 \text{cm}^3$



$B = \frac{1}{2}bh$ (Δ Formula)
$B = \frac{1}{2}(6)(4)$
$B = 12 \text{cm}^2$

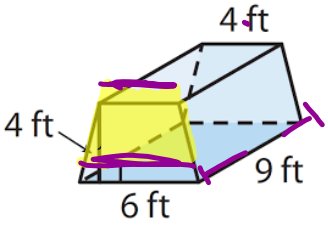
$V = Bh$
$V = 12(8)$
$V = 96 \text{ cm}^3$



Triangular Prism

$B = \frac{1}{2}bh$
$B = \frac{1}{2}(12)(16)$
$B = 96 \text{cm}^2$

$V = Bh$
$V = 96(10)$
$V = 960 \text{cm}^3$



$B = \frac{1}{2}(b_1 + b_2)h$
$B = \frac{1}{2}(4 + 6)(4)$
$B = \frac{1}{2}(10)(4)$
$B = 20 \text{ ft}^2$

$V = Bh$
$V = 20 \cdot 9$
$V = 180 \text{ ft}^3$