Math 9 – Unit 4: Measurement Name: Ms. Jacob

Lesson 4.2: Rectangular and Triangular Prisms and Cylinders Date: Oct 20, 2025

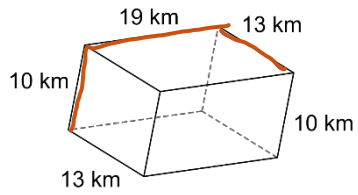
Learning Goal: We are learning to calculate the surface area and volume for common 3D shapes.

Surface Area: find the area of each 2D shape by itself, using yesterday's formulas, then add all of them together
Volume: always the "area of the base" × "the height"

A NET IS THE OUTSIDE OF A 3D SOLID.

For each new solid shape, draw the net, then calculate the surface area and the volume.

1.

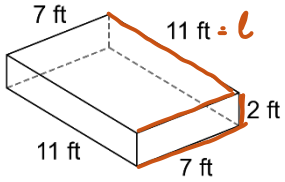


Given: $l = 19$ km
$w = 13$ km
$h = 10$ km

$SA = 2lw + 2wh + 2lh$
$= 2(19)(13) + 2(13)(10) + 2(19)(10)$
$= 494 + 260 + 380$
$= 1134 \text{ km}^2$

$V = lwh$
$= (19)(13)(10) = 2470 \text{ km}^3$

2.



Given: $l = 11$ ft
$w = 7$ ft
$h = 2$ ft

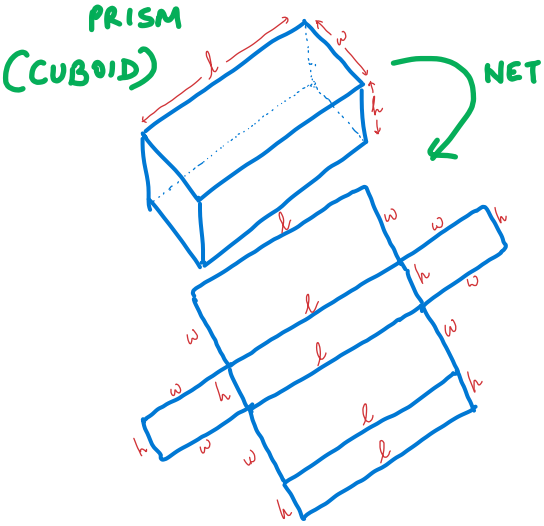
$SA = 2lw + 2wh + 2hl$
$= 2(11)(7) + 2(7)(2) + 2(2)(11)$
$= 154 + 28 + 44$
$= 226 \text{ ft}^2$

$V = lwh$
$= (11)(7)(2)$
$= 154 \text{ ft}^3$

$S.A. = 2lw + 2lh + 2wh$

$V = lwh$

RECTANGULAR PRISM (CUBOID) → It has 6 rectangular faces.



SURFACE AREA (S.A.)
(TOTAL AREA OF ALL 2D FACES THAT MAKE THE 3D SOLID)

$S.A. = lw + lh + lw + lh + hw + hw$

$S.A. = 2lw + 2lh + 2wh$

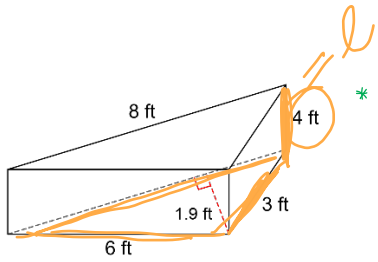
$S.A. = 2(lw + lh + wh)$

VOLUME (V)
(THE SPACE INSIDE THE OUTSIDE COVER OF THE SOLID)

V = (Area of Rectangular base) height

$V = (lw)h = lwh$

3.



* REFER TO THE NET ON THE RIGHT TO VISUALIZE

SA: $2\Delta + 3\square$

$ar(\Delta) = \frac{bh}{2}$ $(b = 8ft, h = 1.9ft)$

$ar(\square) = lw$ (8 × 4, 4 × 3, 6 × 4)

$2\Delta = \frac{(8)(1.9)}{2} \times 2 = \frac{(8)(1.9)}{2} + \frac{(8)(1.9)}{2} = 15.2$

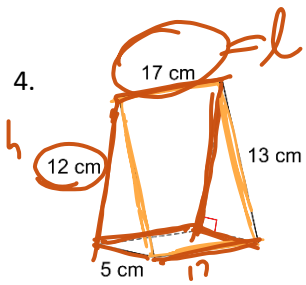
$3\square = 32 + 12 + 24 = 68$

$\therefore SA = 15.2 + 68 = 83.2\ ft^2$

$V = \frac{bhl}{2}$ $(b = 8ft, h = 1.9ft, l = 4ft)$

$\therefore V = \frac{(8)(1.9)(4)}{2} = 30.4\ ft^3$

4.



$\Delta = \frac{bh}{2}$ $b = 5cm, h = 12cm$

$\square = 17 \times 13 + 17 \times 12 + 17 \times 5$

$2\Delta = \frac{(5)(12)}{2} \times 2 = 60\ cm^2$

$3\square = 221 + 204 + 85 = 510\ cm^2$

$S.A = 2\Delta + 3\square = 60 + 510 = 570\ cm^2$

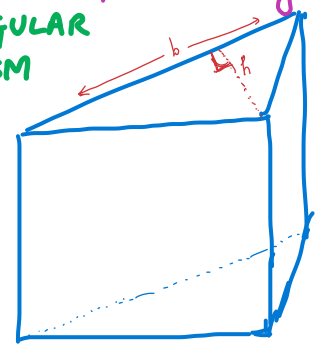
$V = \frac{bh}{2} l = \frac{(5)(12)}{2}(17) = 510\ cm^3$

$S.A. = 3\square + 2\Delta$

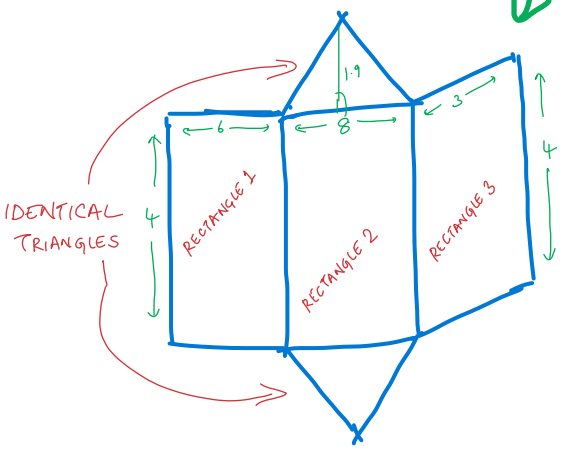
$V = \frac{lbh}{2}$

TRIANGULAR PRISM

It has 2 identical triangular faces and 3 rectangular faces.



NET



SURFACE AREA

= AREA (RECTANGLE 1) + AREA (RECTANGLE 2) + AREA (RECTANGLE 3) + 2 (AREA OF THE TRIANGLE)

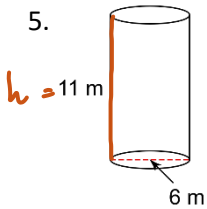
S.A. = AREA of $3\square$ + AREA of 2 identical Δ

VOLUME

= (AREA of Δ BASE) (LENGTH OF PRISM (or height))

$V = \left(\frac{bh}{2}\right) l = \frac{lbh}{2}$

5.



$\therefore r = \frac{6}{2} = 3\text{m}.$

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

$= 2(3.14)(3)(3) + 2(3.14)(3)(11)$

$= 56.52 + 207.24$

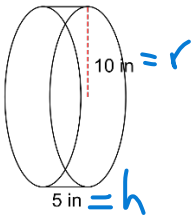
$SA = 263.76\text{m}^2$

$V = \pi r^2 h$

$= (3.14)(3)(3)(11)$

$V = 310.86\text{m}^3$

6.

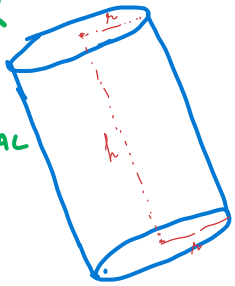


$S.A. = 2\pi r^2 + 2\pi rh$

$V = \pi r^2 h$

CYLINDER

(VISUALIZE AS A CIRCULAR PRISM WITH TWO IDENTICAL CIRCLE BASES)



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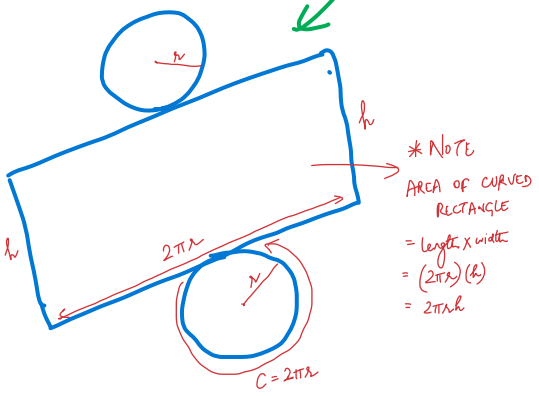

SURFACE AREA

= AREA OF 2 IDENTICAL CIRCLES + AREA OF THE RECTANGLE (which is the curved surface)

$S.A. = 2(\pi r^2) + (2\pi r)h$

$S.A. = 2\pi r^2 + 2\pi rh$

$S.A. = 2\pi r(r + h)$

VOLUME = (AREA OF CIRCULAR BASE)(LENGTH (or height) of CYLINDER)

$V = (\pi r^2)h = \pi r^2 h$

Use the appropriate formula to solve for the missing measurement.

7. A rectangular prism has a volume of 5940cm^2 with a height of 15cm and a length of 33cm. What is the width of the box?

Given: $V = 5940\,cm^2$, $h = 15cm$, $l = 33cm$; $w = ?$

$V = lwh$

$5940 = (33)(w)(15)$

$\frac{5940}{495} = \frac{495w}{495}$

$12 = w$

$\therefore$ width of box $= 12\,cm$

8. A cylinder has a surface area of 439.82 cm^2 with a diameter of 10cm. Determine the height of the cylinder.

Given: $SA = 439.82\,cm^2$; $d = 10cm$ $\therefore r = 5cm$; $h = ?$

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

$439.82 = 2(3.14)(5)(5) + 2(3.14)(5)h$

$439.82 = +157 + 31.4h$

$439.82 - 157 = 31.4h$

$\frac{282.82}{31.4} = \frac{31.4h}{31.4}$

$9.007 = h$

$\therefore$ height of cylinder $\approx 9\,cm$.

Success Criteria:

- I can find the surface area of prisms and cylinders by adding up the areas of each side
- I can find the volume of prisms and cylinders by using the appropriate formula (area of the base × height)