Math 9 – Unit 5: Measurement

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Lesson #2: Rectangular and Triangular Prisms

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

Some Strategies

- When looking at surface area
  - Draw the net or label each side of the shape with letters (so you don't forget any!)
  - Find the area of each 2D shape by itself, using yesterday's formulas, then add all of them together
- When looking at volume
  - Be careful what you pick as the base
  - Divide composite objects into smaller simple 3D shapes and find the volume of each, then add all of them together.

Important Formulas

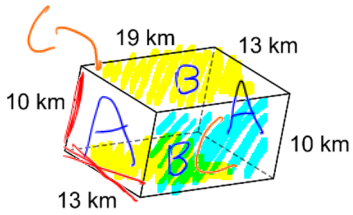
Volume is always the "area of the base" × "the height"

Volume of a rectangular prism: $V = lwh$

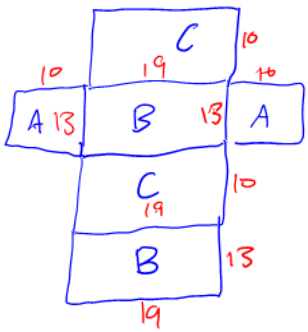
Volume of a triangular prism: $A = \frac{1}{2}bhl$ OR $A = \frac{bhl}{2}$

For each figure, draw the net, then calculate the surface area and the volume.

1.



Net:



Surface Area:

$SA = 2A + 2B + 2C$ (lw)

$SA = 2(10 \times 13) + 2(13 \times 19) + 2(10 \times 19)$

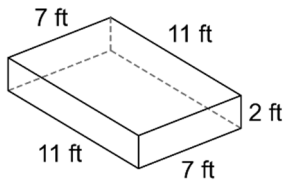
$SA = 260 + 494 + 380$

$SA = 1134\ km^2$

Volume: $V = lwh = (13)(19)(10)$

$= 2470\ km^3$

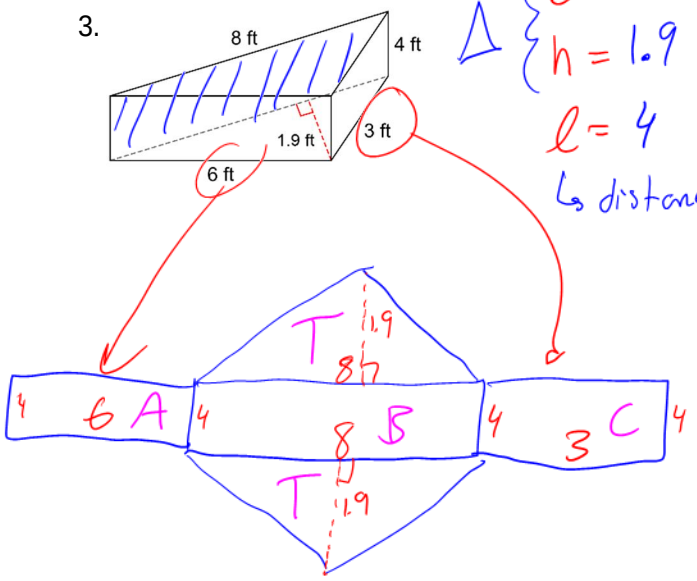
2.



$$SA = 2A + 2B + 2C$$
$$= 2(2\times7) + 2(2\times11) + 2(7\times11)$$
$$= 28 + 44 + 154$$
$$SA = 226\,ft^2$$

$$V = lwh$$
$$V = (2)(7)(11)$$
$$V = 154\,ft^3$$

3.



Δ $\begin{cases} b = 8 \\ h = 1.9 \end{cases}$

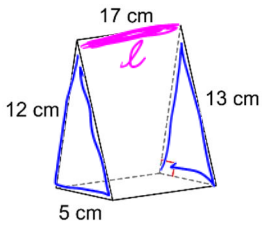
$l = 4$

l = distance between the triangles

$$SA = 2T + A + B + C$$
$$SA = 2\left(\frac{8\times1.9}{2}\right) + (6\times4) + (8\times4) + (3\times4)$$
$$SA = 15.2 + 24 + 32 + 12$$
$$SA = 83.2\,ft^2$$

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

4.



$b = 5$

$h = 12$

$\ell = 17$

$SA = 2T + A + B + C$

$SA = 2\left(\frac{5 \times 12}{2}\right) + (5 \times 17) + (12 \times 17) + (13 \times 17)$

$SA = 60 + 85 + 204 + 221$

$SA = 570 cm^2$

$V = \frac{bh\ell}{2}$

$V = \frac{(5)(12)(17)}{2} = \frac{1020}{2} = 510 cm^3$

Use the appropriate formula to solve for the missing measurement.

5. 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?

V h ℓ

$V = \ell w h$

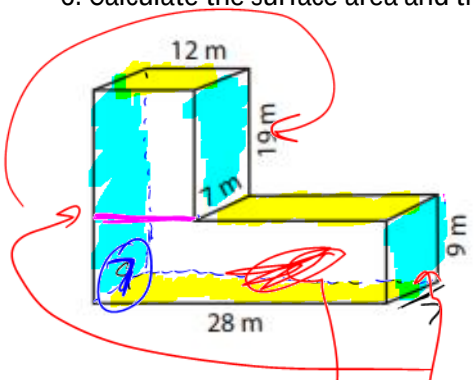
$5940 = (33)w(15)$

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

$12 = w$

∴ the width is $12\ cm$

6. Calculate the surface area and the volume of the composite figure.



Volume: $A = lwh$

$A = (12)(7)(28)$

$A = 2{,}352\ m^3$

$B = lwh$

$B = (16)(7)(9)$

$B = 1008\ m^3$

$\therefore V = 3360\ m^3$

Surface Area

Top + Bottom:

$A = 2(lw)$

$A = 2(28 \times 7)$

$A = 392\ m^2$

2 sides

$A = 2(lw)$

$A = 2(28 \times 7)$

$A = 392\ m^2$

Bottom Front and Back

$A = 2(lw)$

$A = 2(28 \times 9)$

$A = 504\ m^2$

Top F + B:

$A = 2(lw)$

$A = 2(12 \times 9)$

$A = 456\ m^2$

The total Surface Area is $1794\ m^2$

Success Criteria:

- I can find the surface area of prisms by adding up the areas of each side
- I can find the volume of prisms by using the appropriate formula (area of the base × height)
- I can find the surface area of composite figures by breaking it down into smaller parts and finding the surface area of each part
- I can find the volume of composite figures by breaking it down into smaller parts and finding the volume of each part