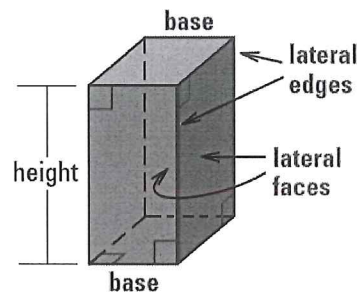


Key

Basic Surface Area and Volume of Prisms - Notes

A **prism** is a polyhedron with two congruent faces, called **bases**, that lie in parallel planes. The other faces, called **lateral faces**, are parallelograms formed by connecting the corresponding vertices of the bases. The segments connecting these vertices are *lateral edges*.

The *altitude* or *height* of a prism is the perpendicular distance between its bases. In a **right prism**, each lateral edge is perpendicular to both bases. Prisms that have lateral edges that are not perpendicular to the bases are **oblique prisms**. The length of the oblique lateral edges is the *slant height* of the prism.



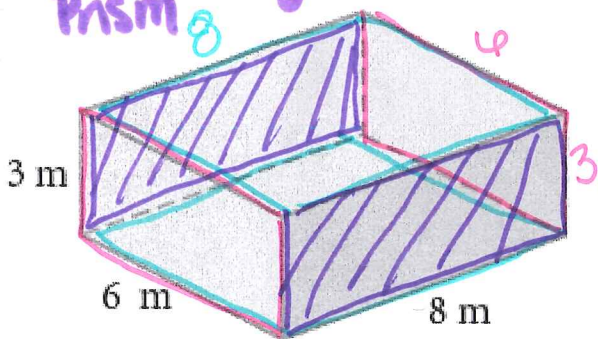
Right rectangular prism

| | | |
|---|---|---|
| <p><u>Surface Area:</u> Add up all of the faces and bases</p> | <p><u>Lateral Area:</u> Add up all of the faces but NOT bases</p> | <p><u>Volume:</u> V=BH B = AREA of BASE and H = Height connecting two bases.</p> |
|---|---|---|

Example 1:

Find the volume, surface area of the prism.

Rectangular Prism



Surface Area

$$+ 2(6 \times 3)$$

$$+ 2(8 \times 6)$$

$$+ 2(8 \times 3)$$

SA = 180m²

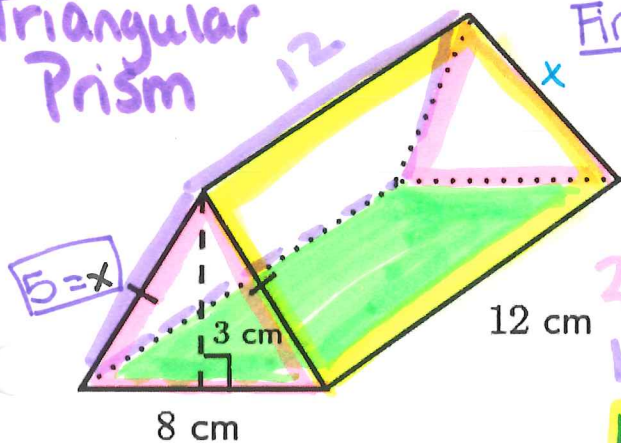
$V = B \cdot H$ ← area of Base connects the two bases!

$$V = (6 \times 8) \cdot 3$$

V = 144m³

2. Name the figure, then find the volume and surface area of the prism.

Triangular Prism



Find x 1st

$$3^2 + 4^2 = x^2$$

$$9 + 16 = x^2$$

$$25 = x^2$$

$$5 = x$$

$$2\left(\frac{1}{2} \cdot 8 \cdot 3\right)$$

$$12 \times 5$$

$$12 \times 5$$

$$12 \times 8$$

SA = 240cm²

$V = B \cdot H$ ← area of base height connecting bases!

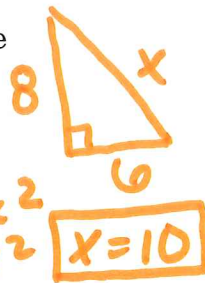
$$V = \left(\frac{1}{2} \cdot 8 \cdot 3\right) \cdot 12$$

V = 144cm³

↑ not always 144 this is just a fluke

3. Name the figure, then find the volume, lateral area and surface area of the prism. Hint: find the missing edge 1st.

Triangular prism!

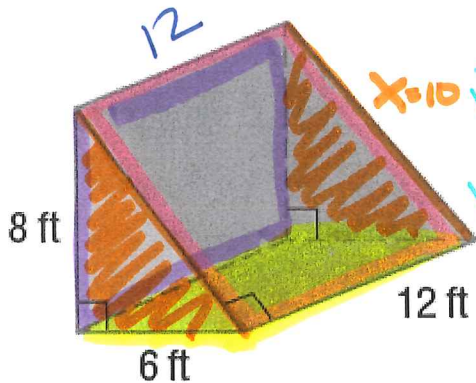


Find x

$$8^2 + 6^2 = x^2$$

$$100 = x^2$$

$$x = 10$$



Volume = area of triangle base \cdot H

$$V = B \cdot H$$

$$V = \left(\frac{1}{2} \cdot 6 \cdot 8\right) 12$$

$$V = 288 \text{ ft}^3$$

SA

$$2\left(\frac{1}{2} \cdot 6 \cdot 8\right) + 6 \times 12 + 8 \times 12 + 10 \times 12$$

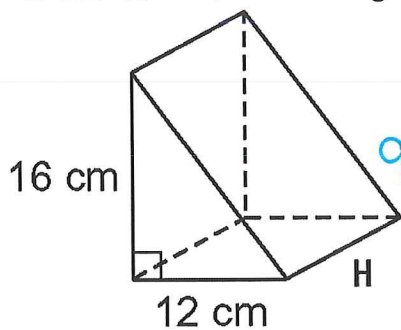
$$SA = 336 \text{ ft}^2$$

L A all faces except for bases! (Ds)

$$6 \times 12 + 8 \times 12 + 10 \times 12$$

$$LA = 288 \text{ ft}^2$$

4. The volume of a triangular prism is 960 cm^3 . Find the height of the prism.



$$V = B \cdot H$$

$$960 = \frac{1}{2} \cdot 12 \cdot 16 \cdot H$$

$$960 = 96 \cdot H$$

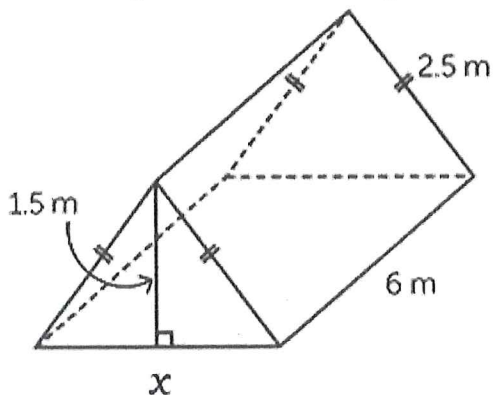
$$10 \text{ cm} = H$$

$$B = \frac{1}{2} b \cdot h$$

area of base!

$$B = \frac{1}{2} 12 \cdot 16$$

5. The surface area of a triangular prism is 60 m^2 . Find the missing length of the triangular base of the prism.



SA = add up all faces!

$$2 \cdot \frac{1}{2} x \cdot 1.5 + x \cdot 6 + 2(2.5 \cdot 6) = 60$$

$$1.5x + 6x + 30 = 60$$

$$7.5x + 30 = 60$$

$$7.5x = 30$$

$$x = 4 \text{ m}$$

6. Name and find the volume of the prism: Regular hexagonal Prism

Find the Area of the Base

B = area of hexagon



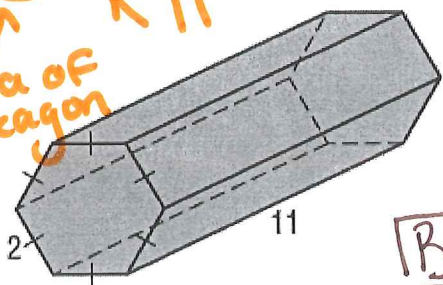
$$\cos(60) = \frac{1}{r} \quad r = 2$$

$$B = 6 \cdot \frac{1}{2} \cdot 2 \cdot 2 \sin(60)$$

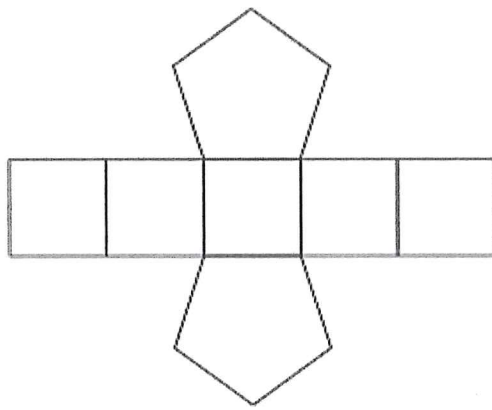
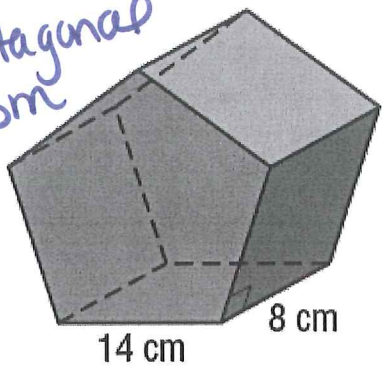
$$V = 6 \cdot \frac{1}{2} \cdot 2 \cdot 2 \sin(60) \cdot 11$$

$$V \approx 114.3 \text{ units}^3$$

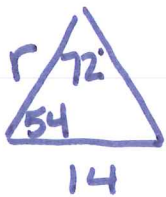
$V = B \cdot H$
↑
area of hexagon



7. Name and find the surface area of the prism.



Find area of hexagon.



$$\cos(54) = \frac{7}{r}$$

$$r = 11.9 \text{ cm}$$

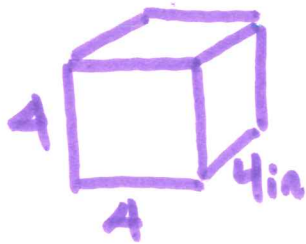
hexagon: $5 \frac{1}{2} 11.9 \times 11.9 \sin(72)$

$$SA = 2 (5 \frac{1}{2} 11.9 \times 11.9 \times \sin(72)) + 5(8 \times 14)$$

← 2 hexag.

$$SA \approx 1233.4 \text{ cm}^2$$

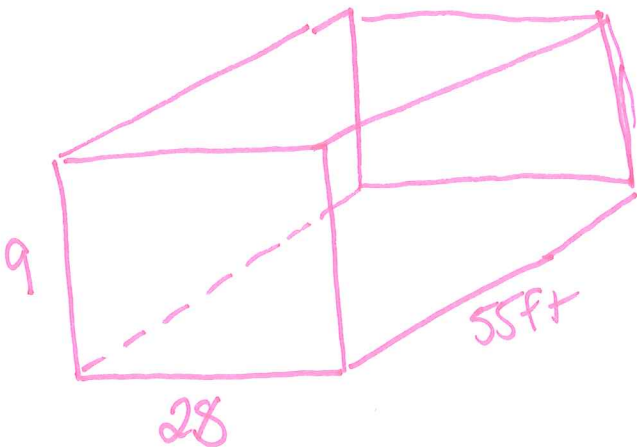
8. Elena wants to paint her jewelry box blue. The jewelry box is in the shape of a cube and has an edge length of 4 in. How much blue paint will Elena need?



Surface Area

$$6(4 \times 4) = 96 \text{ in}^2$$

9. Reynaldo builds a pool in his backyard. The pool measures 55 feet long, 28 feet wide, and 9 feet deep. How much water will fit in the pool?



$$V = 9 \times 28 \times 55$$

$$V = 13860 \text{ ft}^3$$