

What's Going On?

Checking In

Minds on

Rectangle Review

Action!

Square-Based Prisms

Consolidation

Layin' Down the Laws

Learning Goal - I will understand how to optimize the surface area and volume of square-based prisms.

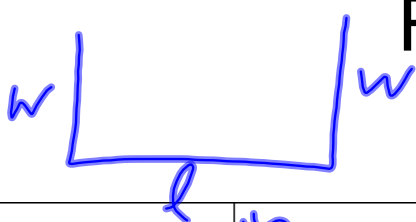
Minds on

Review Table

Shape of Interest	Optimal Values Occur When	How to Find Dimension
Rectangle (all four sides)	Fixed Perimeter $P = 4s$	width = length = $s = \frac{P}{4}$
Rectangle (all four sides)	Fixed Area $A = s^2$	width = length = $s = \sqrt{A}$

Minds on

Review Table

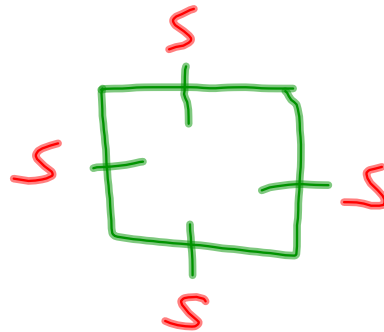


<p>Rectangle (3 sides only)</p>	<p>"Perimeter"</p>	<p>width = $\frac{l}{2}$ or $\frac{P}{4}$</p> <p>length = $\frac{P}{2}$</p>
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Minds on

An area of 400 m^2 is to be enclosed. What is the perimeter of the area if the maximum possible area is achieved?

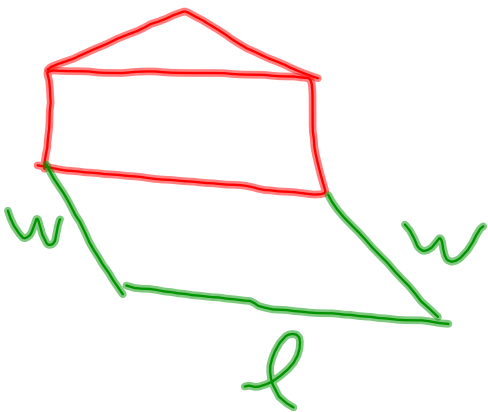
$$A = s^2$$
$$\sqrt{400} = \sqrt{s^2}$$
$$s = 20$$



$$P = 4s$$
$$= 4 \times 20$$
$$= 80$$

Minds on

A fence is being built with prefabricated sections that are 2.8 m in length. If an existing wall is to be used as one of the boundaries, what is the maximum area you can enclose with 40 pieces?



$$40 \times 2.8 = 112 \text{ m}$$

$$l = \frac{112}{2} = 56$$

$$w = \frac{56}{2} = 28$$

$$A = 56 \times 28 = \underline{\hspace{2cm}}$$

Action!

Prisms

When have you seen rectangular prisms in every day life?

- bus
- phone
- box of waffles
- fridge
- cheese
- cereal
- buildings

Action!

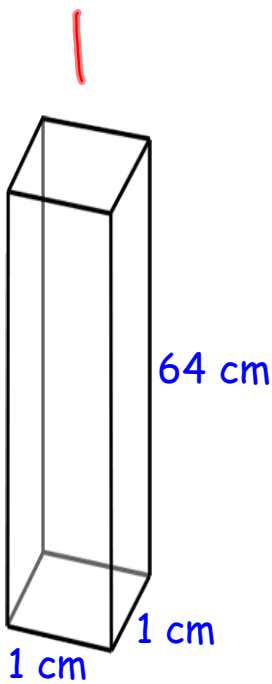
Prisms

1. When we have a **Fixed Volume** we would want to minimize **surface area**.
2. When we have a **Fixed Surface Area** we would want to maximize **volume**.

Action!

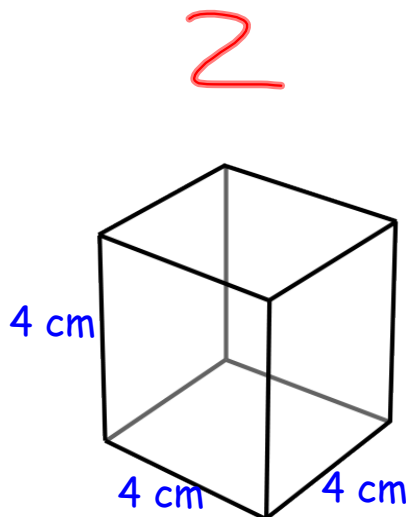
Square-Based Prisms

Calculate the Surface Area and Volume



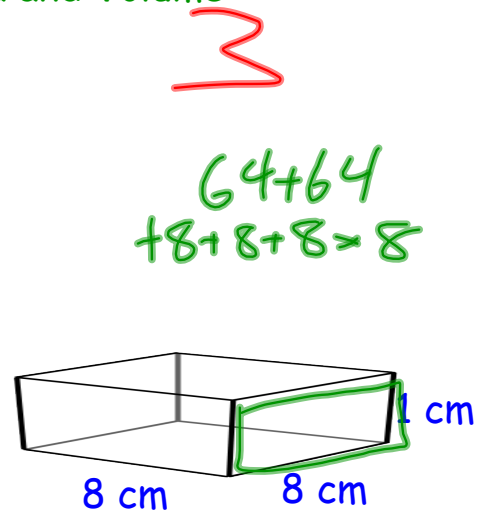
$$SA = 258 \text{ cm}^2$$

$$V = \underline{64 \text{ cm}^3}$$



$$SA = 96 \text{ cm}^2$$

$$V = \underline{64 \text{ cm}^3}$$



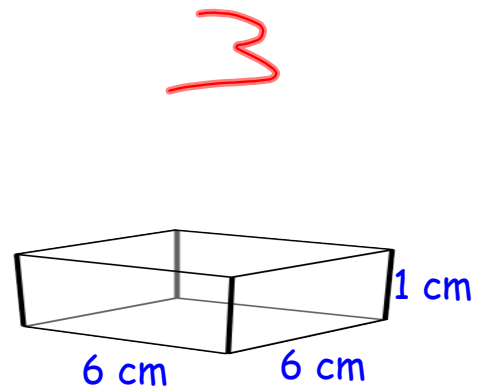
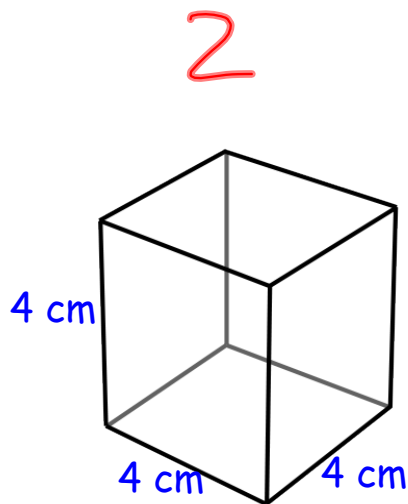
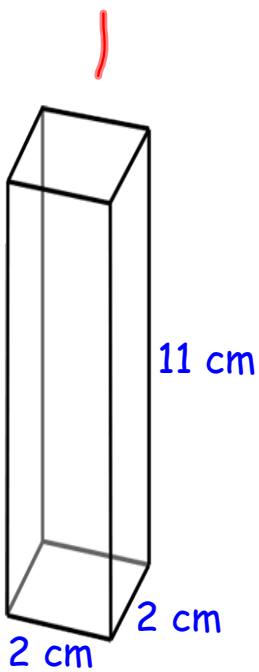
$$SA = 160 \text{ cm}^2$$

$$V = \underline{64 \text{ cm}^3}$$

Action!

Square-Based Prisms

Calculate the Surface Area and Volume



$$SA = \underline{96\text{cm}^2} \quad SA = \underline{96\text{cm}^2} \quad SA = \underline{96\text{cm}^2}$$

$$V = 44\text{cm}^3 \quad V = \underline{64\text{cm}^3} \quad V = 36\text{cm}^3$$

Consolidation

Layin' Down the Laws

1. When we have a **Fixed Volume**, the square-based prism that **minimizes the surface area** is a *cube!*

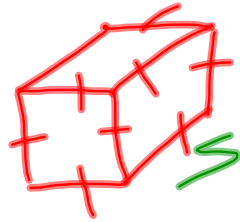
Consolidation

Layin' Down the Laws

2. When we have a Fixed Surface Area, the square-based prism that minimizes the volume is a *cube!*



<p>Square-Based Prism</p>	<p>Fixed Surface Area</p> $SA = 6s^2$	<p>side length =</p> <p>↑ same!</p> <p>height = "s"</p> $s = \sqrt{\frac{SA}{6}}$
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<p>Square-Based Prism</p>	<p>Fixed Volume</p> $V = s \times s \times s$ $V = s^3$	<p>side length =</p> <p>↑ same!</p> <p>height =</p> <p>"s"</p> $s = \sqrt[3]{V}$
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what's s ? $V = 216$

Consolidation

Homework

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