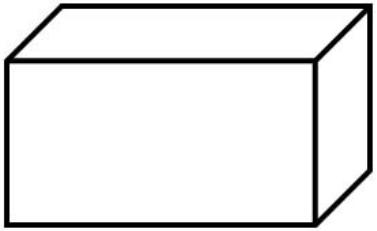
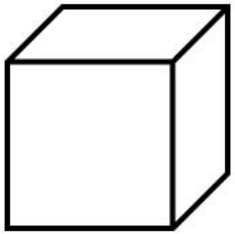
Objective: Find Surface Area of Prisms

Concept



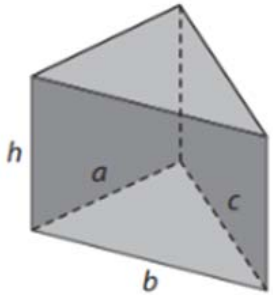
Rectangular Prism

Bases and Sides are Rectangles



Cube

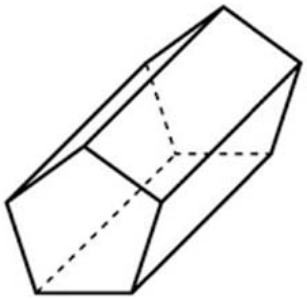
Bases and Sides are Squares



Triangular Prism

Bases are Triangles

Sides are Rectangles



Pentagonal Prism

Bases are Pentagons

Sides are Rectangles

Objective: Find Surface Area of Prisms

Concept

Surface area is the total area of all the faces and curved surfaces of a three-dimensional figure.

Two Ways to Find Surface Area

1. **Using a Formula**
   Use if you are good at remembering formulas.
   Use if you are finding the total surface area of a figure.

2. **Using a Net (calculate each area and then add together)**
   Use if you can't remember the formula.
   Use if you are finding the areas of only some of the surfaces of a figure.

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Concept

The surface area of a prism can be described as the sum of the lateral area, L, (area of the rectangular sides) and the area of the congruent bases, $2B$.

Formula for Surface Area of a Prism

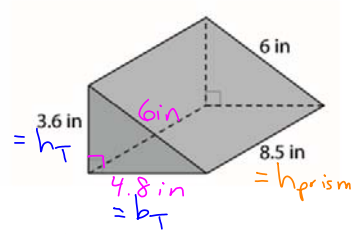
where P is the perimeter of a base, h is the prism's height, and B is the base area

$$S = L + 2B \text{ or } S = Ph + 2B$$

Objective: Find Surface Area of Prisms

Ex) Find the total amount of wrapping paper needed to wrap the box, not counting overlap.

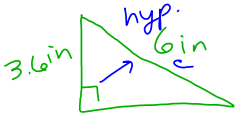
surface area



* triangular prism

triangles are the bases

① find the third side of a triangular base



$a^2 + b^2 = c^2$

$3.6^2 + b^2 = 6^2$

$-3.6^2 \quad -3.6^2$

$b^2 = 6^2 - 3.6^2$

$\sqrt{b^2} = \sqrt{6^2 - 3.6^2}$

$b = \sqrt{6^2 - 3.6^2}$

$b = 4.8$ in

② surface area: $S = P \cdot h + 2B$ → area of a triangle $\frac{b_T \cdot h_T}{2}$

$S = (3.6\text{in} + 4.8\text{in} + 6\text{in}) \cdot 8.5\text{in} + 2\left(\frac{4.8\text{in} \cdot 3.6\text{in}}{2}\right)$

(Perimeter of triangular base; height of the prism)

$= (14.4\text{in})(8.5\text{in}) + 2(8.64\ \text{in}^2)$

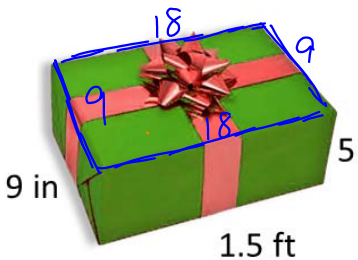
$= 122.4\ \text{in}^2 + 17.28\ \text{in}^2$

$= 139.68\ \text{in}^2$

③ Without overlap, 139.68 square inches of wrapping paper will be needed.

Objective: Find Surface Area of Prisms

Ex) Find the total amount of wrapping paper, in square inches, needed to wrap the gift box, not counting overlap.



= 18 in

① convert feet to inches

$$\frac{1.5\,\text{ft}}{1} \cdot \frac{12\,\text{in}}{1\,\text{ft}} = 18\,\text{in}$$

* rectangular prism
* top/bottom bases

② surface area

$S = P \cdot h_{Prism} + 2B$ (area of a rect. $l \cdot w$)

$S = (18\,\text{in} + 18\,\text{in} + 9\,\text{in} + 9\,\text{in}) \cdot 5\,\text{in} + 2(9\,\text{in} \cdot 18\,\text{in})$

$= (54\,\text{in})(5\,\text{in}) + 2(162\,\text{in}^2)$

$= 270\,\text{in}^2 + 324\,\text{in}^2$

$= 594\,\text{in}^2$

③ without overlap, 594 square inches of wrapping paper will be needed.

Objective: Find Surface Area of Prisms

Ex) Craig wants to stain all surfaces except the bottom of an old trunk. If a can of walnut stain covers 30 square feet, is one can enough to complete the project? Explain your reasoning.

$= 1.5$ ft

* rectangular prism
* top/bottom bases

① convert inches to feet

$$\frac{18\text{ in}}{1} \cdot \frac{1\text{ ft}}{12\text{ in}} = 1.5\text{ ft}$$

② surface area except the bottom

$S = P \cdot h + B$ ← area of a rect. $l \cdot w$
(sides) (top)

$S = (4\text{ft} + 4\text{ft} + 1.5\text{ft} + 1.5\text{ft}) \cdot 2\text{ft} + (4\text{ft} \cdot 1.5\text{ft})$

$= (11\text{ft})(2\text{ft}) + 6\text{ ft}^2$

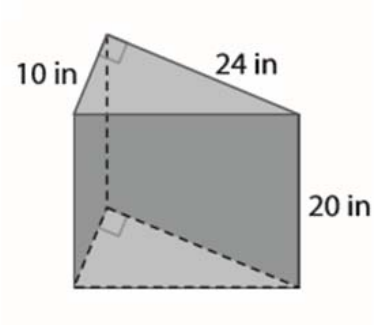
$= 22\text{ ft}^2 + 6\text{ ft}^2$

$= 28\text{ ft}^2$

③ One can of walnut stain is enough because the area to be covered is 28 ft^2 which is less than 30 ft^2.

Objective: Find Surface Area of Prisms

Practice) Find the total amount of wrapping paper needed to wrap the gift box, not counting overlap.



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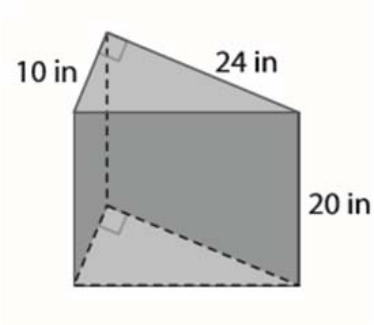

1. Find the third side of the triangular base.

$10^2 + 24^2 = c^2$

$676 = c^2$

$c = 26\,in$

2. Find surface area.

$S = Ph + 2B$

$$S = (10 + 24 + 26) \cdot 20 + 2 \cdot \left(\frac{1}{2} \cdot 24 \cdot 10 \right) = 1200\,in^2 + 240\,in^2 = 1440\,in^2$$

The amount of wrapping paper needed to wrap the box is 1440 square inches.

Objective: Find Surface Area of Prisms

Practice) Amanda is going to paint all surfaces of the trunk. Find the area to be painted in square feet.

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Practice) Amanda is going to paint all surfaces of the trunk. Find the area to be painted in square feet.

1. convert inches to feet

$$\frac{33\text{ in}}{1}\cdot\frac{1\,ft}{12\,in}=2.75\,ft$$

2. perimeter of base (bottom)

$$P=(1\,ft+1\,ft+2.75\,ft+2.75\,ft)=7.5\,ft$$

3. height of trunk

$$h=2\,ft$$

4. area of base (bottom)

$$B=1\,ft\cdot 2.75\,ft=2.75\,ft^2$$

5. surface area

$S=Ph+2B$ becomes

$$S=(7.5\,ft)(2\,ft)+2(2.75\,ft^2)=20.5\,ft^2$$

The area to be painted is 20.5 square feet.