Key Idea
We can find the areas of polygons to find surface area.

Vocabulary
- surface area

Materials
- grid paper

TEST TALK

Think It Through
- I can **get information from the picture.**
- I can **use logical reasoning** to find the formula for surface area.

Surface Area

WARM UP

Find the area of each rectangle with length ℓ and width w.

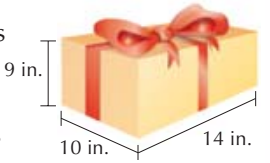
1. ℓ: 8 m and w: 16 m **128 m²**
2. ℓ: 6 ft and w: 10 ft **60 ft²**

LEARN

Activity

How can you find a formula for the surface area of a rectangular prism?

The **surface area (SA)** of a rectangular prism is the sum of the areas of all its faces. The box at the right is a rectangular prism.



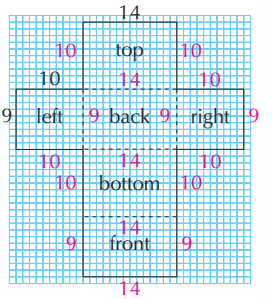
The diagram at the right below is a net for this box. The amount of wrapping paper you need for a package depends on the surface area.

Step 1 Copy this diagram. Label all the lengths and widths of the rectangles.

Step 2 Use the measurements to find the areas of the six rectangles. What is their sum? **712 square units**

a. Which pairs of faces are congruent? **See above right.**

a. Top and bottom; Left and right; Front and back



b. Explain why the expression below gives the surface area of the box. Use the expression to find the area of the box.

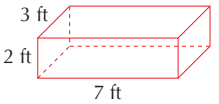
2 × (area of **front**) + 2 × (area of **top**) + 2 × (area of **left**)

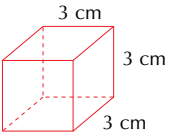
See margin.

c. Write a formula for surface area *(SA)* of a rectangular prism with length ℓ, width w, and height h.

$SA = 2 \times (\ell \times w) + 2 \times (\ell \times h) + 2 \times (w \times h)$

d. Use the formula to find the surface area of the prisms below.





Note that 2 × (2 × 7) can be written as 2(2 × 7).

front *top* *left*

$2(2 \times 7) + 2(3 \times 7) + 2(2 \times 3) = \underline{?}$ **82**

The surface area is $\underline{?}$ **82** ft².

front *top* *left*

$2(\underline{?}) + 2(\underline{?}) + 2(\underline{?}) = \underline{?}$

3 × 3 **3 × 3** **3 × 3** **54**

The surface area is $\underline{?}$ cm².

e. Find the surface area of a cube with each edge 9 ft. **486 ft²**

f. Reasoning Which box needs more wrapping paper? Show your work. **See margin.**