Surface Area of Right Prisms

Let's work with surface area and volume in context.

13.1 Multifaceted

Your teacher will show you a prism.

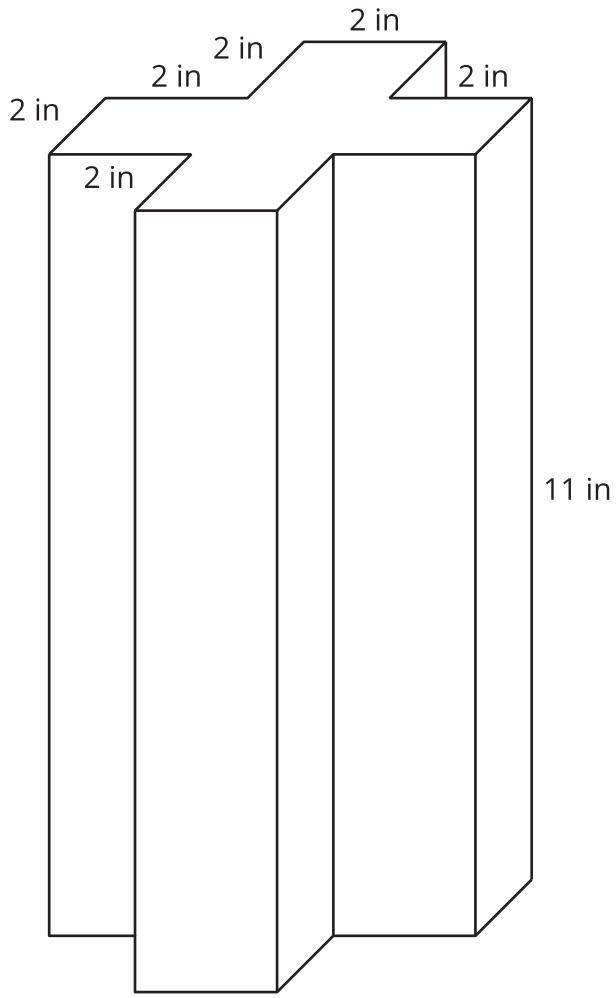
1. What are some things you could measure about the object?

2. What units would you use for these measurements?

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13.2 So Many Faces

Here is a picture of your teacher's prism:



Three students are trying to calculate the **surface area** of this prism.

- Noah says, "This is going to be a lot of work. We have to find the areas of 14 different faces and add them up."
- Elena says, "It's not so bad. All 12 rectangles are identical copies, so we can find the area for one of them, multiply that by 12, and then add on the areas of the 2 bases."
- Andre says, "Wait, I see another way! Imagine unfolding the prism into a net. We can use 1 large rectangle instead of 12 smaller ones."

1. Do you agree with any of them? Explain your reasoning.

2. How big is the "1 large rectangle" that Andre is talking about? Explain or show your reasoning. If you get stuck, consider drawing a net for the prism.

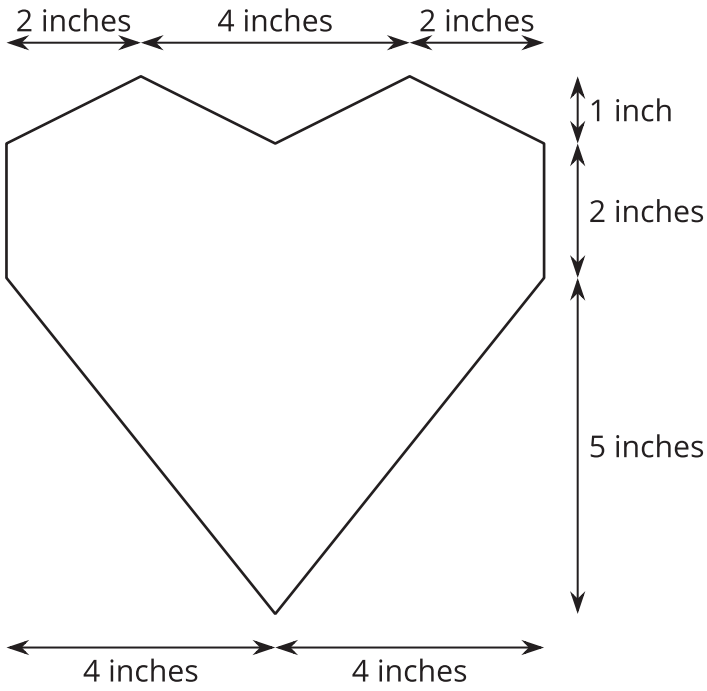
3. Will Noah's method always work for finding the surface area of any prism? Elena's method? Andre's method? Be prepared to explain your reasoning.

4. Which method do you prefer? Why?

13.3 Revisiting the Box of Chocolates

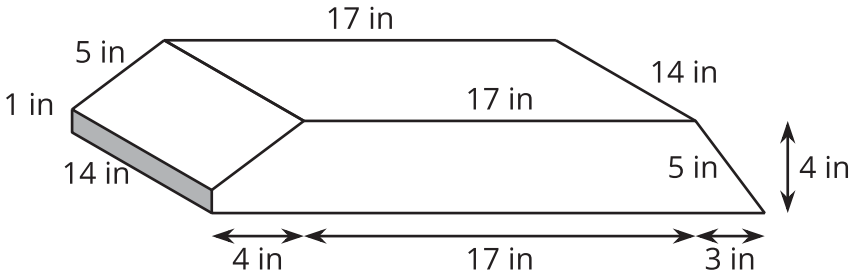
In an earlier activity, you calculated the volume of this heart-shaped box.

The depth of the box is 2 inches. How much cardboard is needed to create the box?



13.4 Building a Bat House

Han wants to build a home for bats to nest in. The plans to build the bat house look like this:





The 1 inch by 14 inch rectangle is left open for the bats to fly into.

1. How much wood does it take to build this bat house?

2. Bat colonies need 4 cubic inches of space per bat. What is the largest number of bats that can fit in this bat house?

Lesson 13 Summary

Sometimes we need to find the volume of a prism, and sometimes we need to find the surface area.

Here are some examples of quantities related to volume:

- How much water a container can hold
- How much material it took to build a solid object

Volume is measured in cubic units, like in^3 or m^3.

Here are some examples of quantities related to surface area:

- How much fabric is needed to cover a surface
- How much of an object needs to be painted

Surface area is measured in square units, like in^2 or m^2.

To find the **surface area** of a three-dimensional figure whose faces are made up of polygons, we can find the area of each face, and add them up!

Sometimes there are ways to simplify our work. For example, all of the faces of a cube with side length s are the same. We can find the area of one face, and multiply by 6. Since the area of one face of a cube is s^2, the surface area of a cube is $6s^2$.

We can use this technique to make it faster to find the surface area of any figure that has faces that are the same.

For prisms, there is another way. We can treat the prism as having three parts: two identical bases, and one long rectangle that has been taped along the edges of the bases. The rectangle has the same height as the prism, and its length is the perimeter of the base. To find the surface area, add the area of this rectangle to the areas of the two bases.