nim: _____   san: _____

ANSWER KEY

Beaver just finished making a special drum. In order to protect the drum, Beaver decides to make a bentwood box out of cedar. Beaver knows that he can steam the cedar in order to bend it into the shape of the box.

First, Beaver must measure the drum. He found that the drum has a height of 6 inches and a radius of 13 inches.
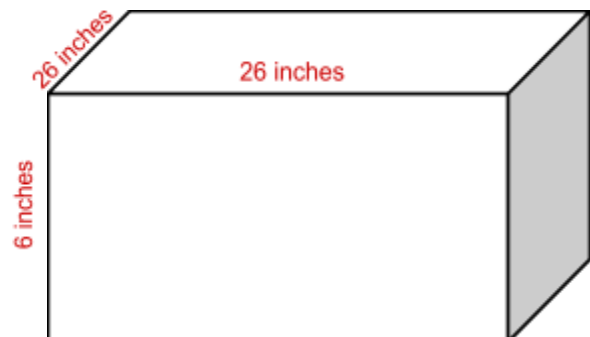

Members of the Chinook Indian Nation singing and drumming

13 inches

6 inches
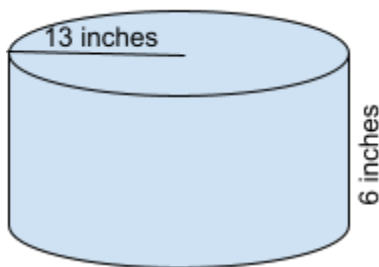
1. What is the volume of the smallest box Beaver could build to hold the drum? Show the steps you used to come to your conclusion. Label each part of the box, such as the top/bottom, and label each dimension with the unit of measure.

6 inches

26 inches

26 inches

26 inches

Volume = Base x Height
Volume = (26x26) x 6
Volume = 676 x 6
Volume = 4,056 in.³

26 inches

26 inches

6 inches

2. What is the surface area for this box? Show your work.

Surface Area = 2(wl+hl+hw)
Surface Area = 2 ((26x26) + (6x26) + (6x26))
Surface Area = 2 (676 + 156 + 156)
Surface Area = 2 (988)
Surface Area = 1,976 in.²

3. Beaver wants to make sure that the drum does not get damaged while being moved in the box. Beaver collected more cedar and made it into strands to fill the empty space of the box to protect the drum. Approximately how much extra space will need to be filled in the box? (*Hint: Volume of Box - Volume of Drum = Extra Space*)

Volume of Box = 4,056

Volume of Drum = $\pi r^2 h$
Volume of Drum = $\pi(13)^2(6)$
Volume of Drum = $\pi156$
Volume of Drum = 490.09

Volume of Box - Volume of Drum = Extra Space
4056-490.09 = **3,565.91 in.³ extra space**

Photo courtesy of Natosha Gobin & Theresa Sheldon, Tulalip Tribal members

4. If Beaver were to make a drum with twice the radius and the same height as the original drum, how would the volume of the drum change?

Radius = 26
Height = 6

Volume of Drum = $\pi r^2 h$
Volume of Drum = $\pi(26)^2(6)$
Volume of Drum = $\pi312$
Volume of Drum = 980.18

The volume of the drum would double

a. How would the larger drum affect the surface area of the bentwood box?

Surface Area = 2(wl+hl+hw)
Surface Area = 2 ((52x52) + (6x52) + (6x52))
Surface Area = 2 (2704 + 312 + 312)
Surface Area = 2 (3328)
Surface Area = 6,656 in.^{2}

The surface area of the new bentwood box increased by 4,680 in.^{2}, it is approximately 3.4 times larger than the original box.

b. How would the larger drum affect the volume of the bentwood box?

Volume = Base x Height
Volume = (52x52) x 6
Volume = 2704 x 6
Volume = 16,224 in.3

The volume of the new bentwood box is 4 times the volume of the original bentwood box.