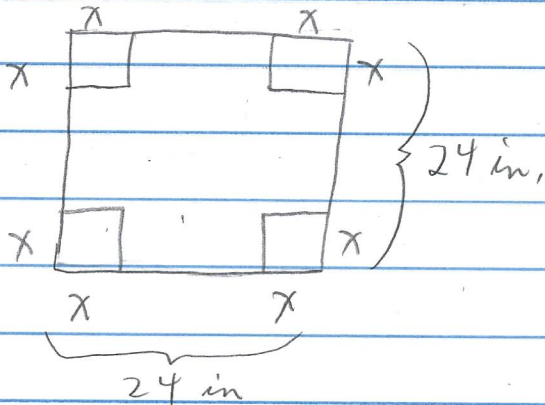


Exercise 2.6.25 An open box with a square base is to be made from a square piece of cardboard 24 inches on a side by cutting out a square from each corner and turning up the sides:



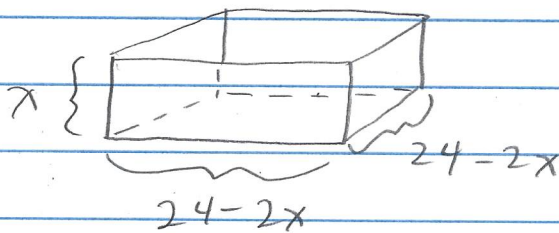
(a) Express the volume  $V$  of the box as a function of the length  $x$  of the side of the square cut from each corner.

(b) What is the volume if a 3-inch square is cut out?

(c) What is the volume if a 10-inch square is cut out?

Solution

Folding up the sides produces the box:



The volume of a box with dimensions  $w$ ,  $d$ ,  $h$  is  $V = wdh$

Here,  $w = 24 - 2x$ ,  $d = 24 - 2x$ , and  $h = x$  so that the volume of the box is  $V = (24 - 2x)^2 x$ .

(b) With  $x = 3$  in we have

$$V = (24 - 2(3))^2 (3) = (18)^2 (3) = 972 \text{ in}^3.$$

(c) With  $x = 10$  in we have

$$V = (24 - 2(10))^2 (10) = (4)^2 (10) = 160 \text{ in}^3.$$

□