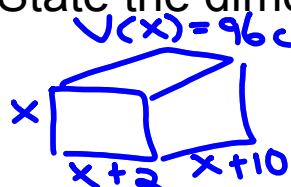


## Polynomial Word Problems

A box in the shape of a rectangular prism has side lengths  $x$ ,  $x + 2$ , and  $x + 10$ . Write a function  $V(x)$  to express the volume of the box in terms of  $x$ . Find all possible values of  $x$ , given that the volume of the box is  $96 \text{ cm}^3$ .

State the dimensions of the box.  $V = LWH$



$$V(x) = (x)(x+2)(x+10)$$

$$96 = (x^2 + 2x)(x+10)$$

$$0 = x^3 + 12x^2 + 20x - 96$$

$$0 = (2)^3 + 12(2)^2 + 20(2) - 96$$

$$0 = 8 + 48 + 40 - 96 \quad \checkmark$$

$$\begin{array}{r|rrrr} 2 & 1 & 12 & 20 & -96 \\ & \downarrow & & & \\ & & 2 & 28 & 96 \\ \hline & 1 & 14 & 48 & 0 \end{array}$$

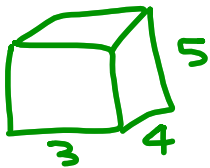
$$V(x) = (x^2 + 14x + 48)(x - 2)$$

$$0 = (x+6)(x+8)(x-2)$$

$$x = \cancel{-6}, \cancel{-8}, 2$$

Dimensions: 2cm, 4cm, 12cm

Bill is preparing to make an ice sculpture. He has a block of ice that is 3 ft wide, 4 ft high, and 5 ft long. Bill wants to reduce the size of the block by removing the same amount of ice from each side. He wants to reduce the volume of the ice block to  $24 \text{ ft}^3$ . How much should he remove from each dimension?



$$V = LWH$$

$$24 = (3-x)(4-x)(5-x)$$

$$24 = (12 - 7x + x^2)(5-x)$$

$$0 = x^3 - 12x^2 + 47x - 36$$

$$\begin{array}{r|rrrr} 1 & 1 & -12 & 47 & -36 \\ & \downarrow & & & \\ & 1 & -11 & 36 & \\ \hline & 1 & -11 & 36 & 0 \end{array}$$

$$\begin{aligned} V(1) &= (1)^3 - 12(1)^2 + 47(1) - 36 \\ &= 1 - 12 + 47 - 36 \\ &= 0 \end{aligned}$$

$$V(x) = (x-1)(x^2 - 11x + 36)$$

$$0 = (x-1)(x^2 - 11x + 36)$$

$$x = 1$$

He should remove 1 foot.

~~$$x = \frac{11 \pm \sqrt{(-11)^2 - 4(1)(36)}}{2(1)}$$~~

discriminant  
is negative