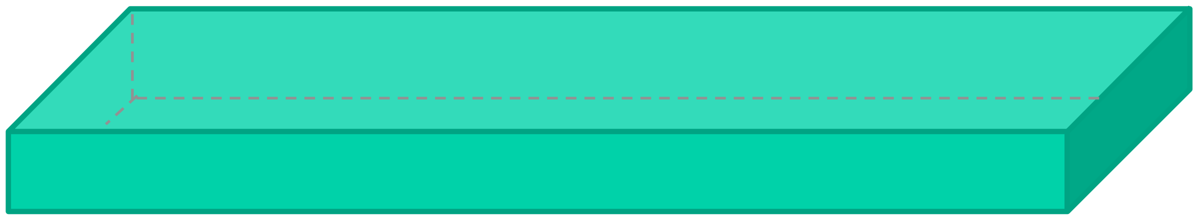
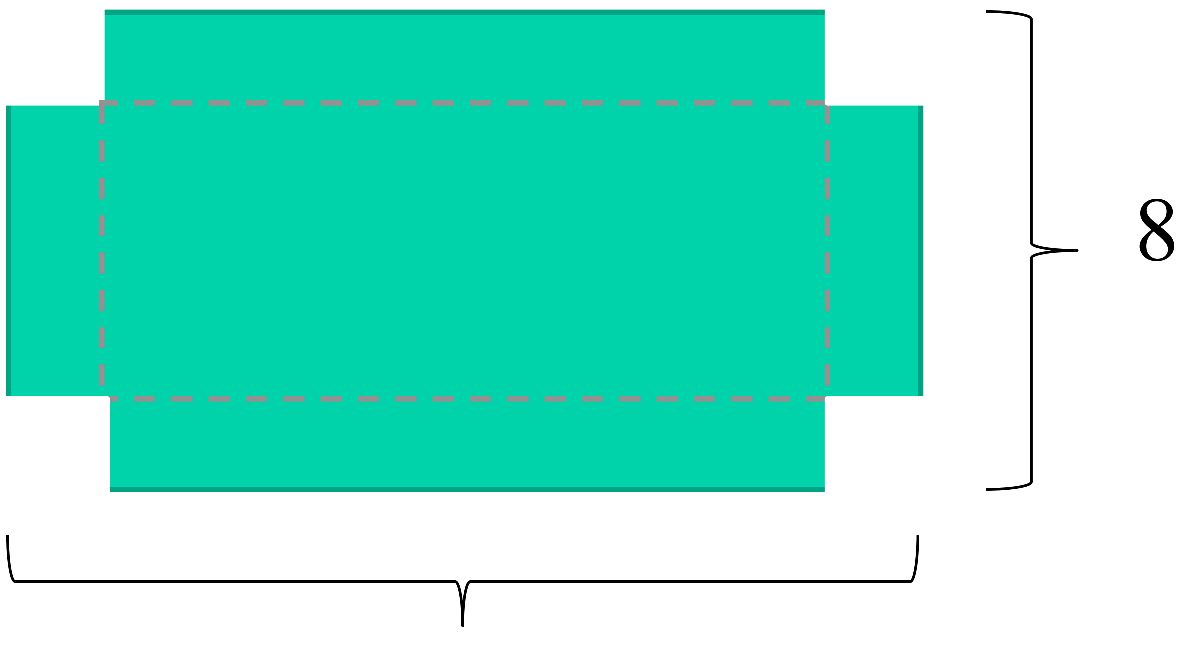
You are making an open top rectangular box



Find the dimensions of such a box with the largest volume.

from an 8 by 15 inch piece of cardboard

by cutting square pieces off of each corner and folding up the sides



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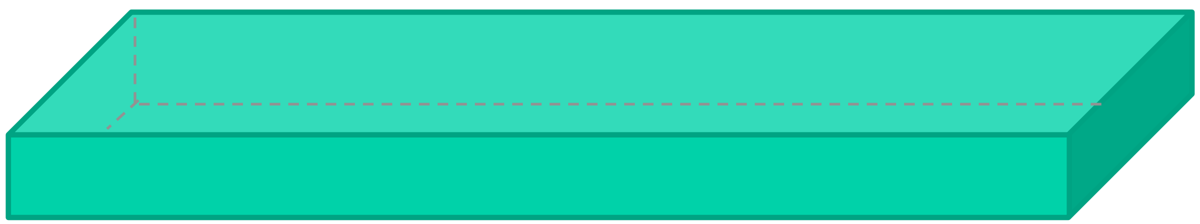


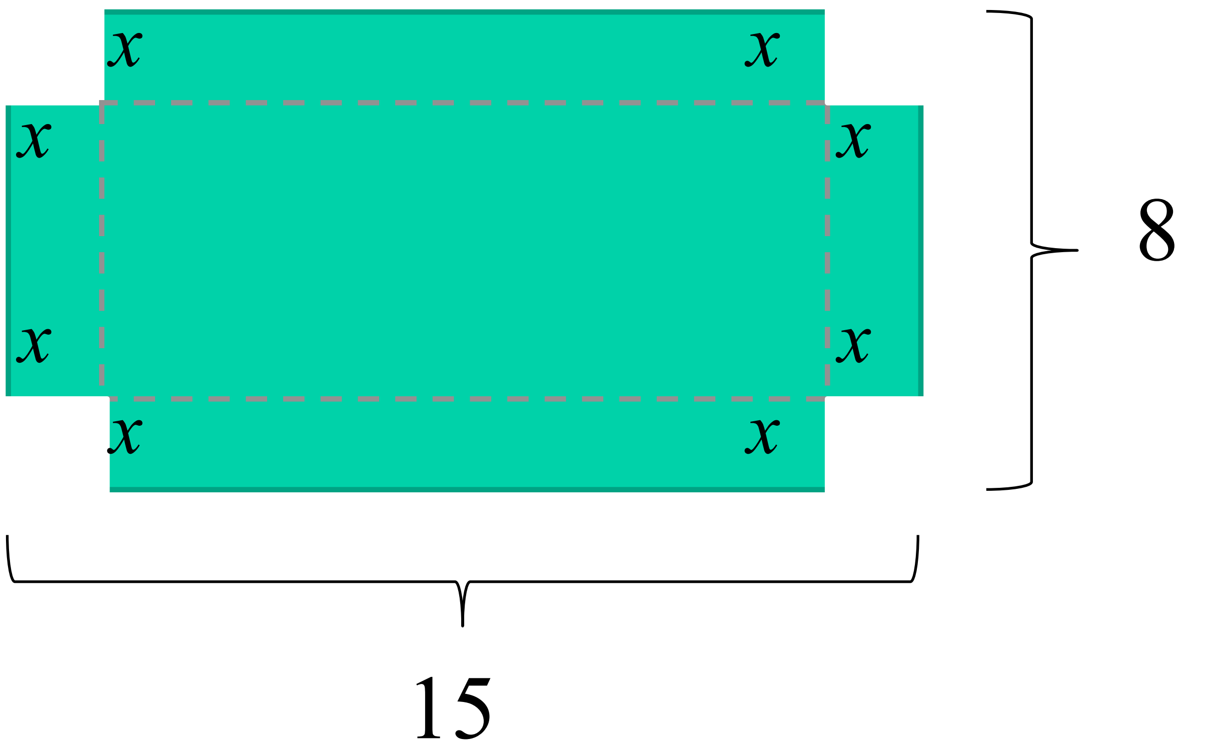
Find the dimensions of such a box with the largest volume.

from an 8 by 15 inch piece of cardboard

Each square that we cut off would have sides equal to x

$0 < x < 4$ Why?

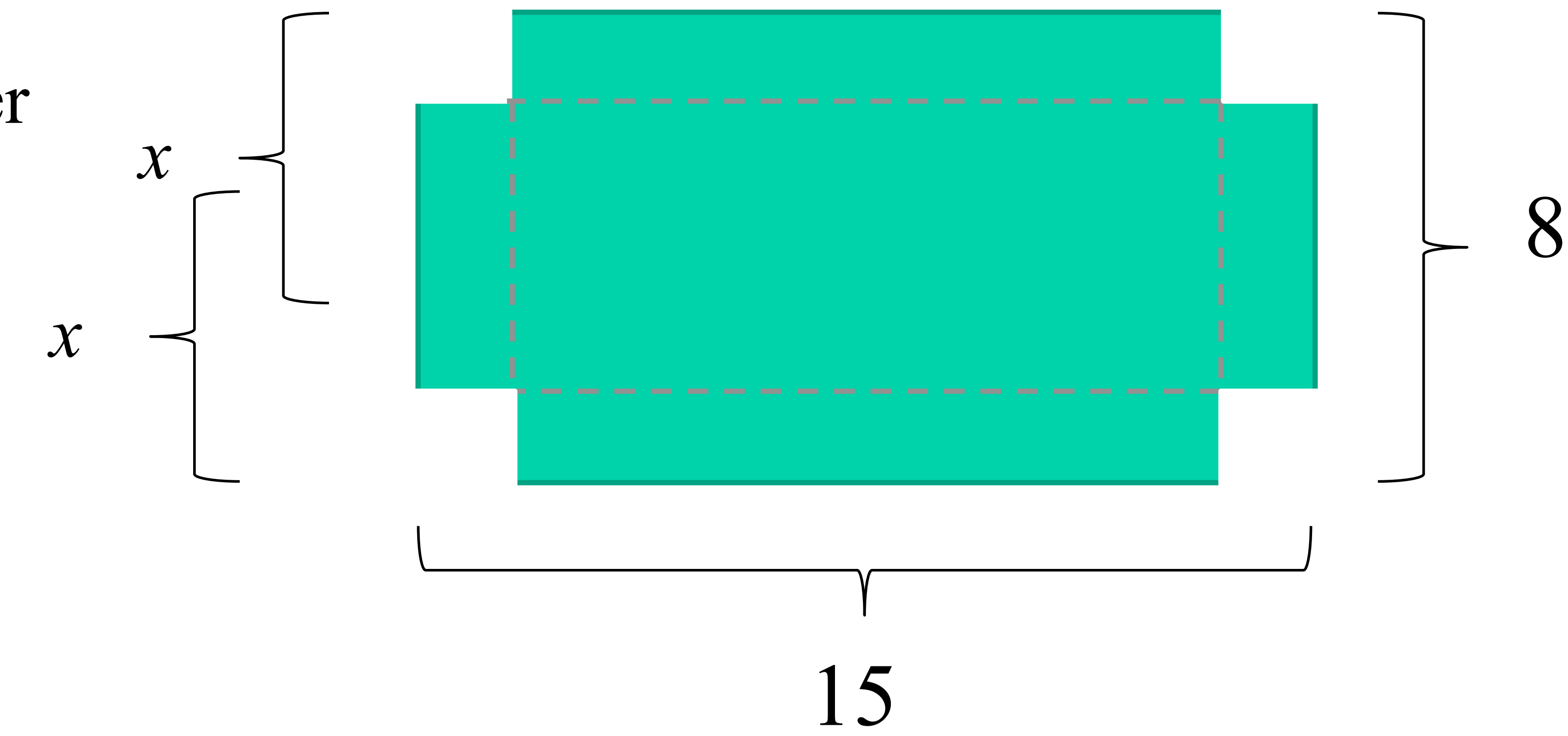
Do we have a limited domain for x values?



Each square that we cut off would have sides equal to x

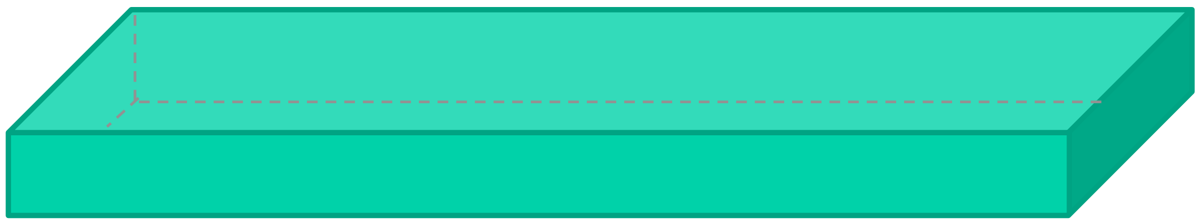
$0 < x < 4$ Why?

Suppose that x measures larger than 4 as shown to the right



It wouldn’t make sense for two squares to add up to 8 or more inches.

You are making an open top rectangular box



Find the dimensions of such a box with the largest volume.

from an 8 by 15 inch piece of cardboard

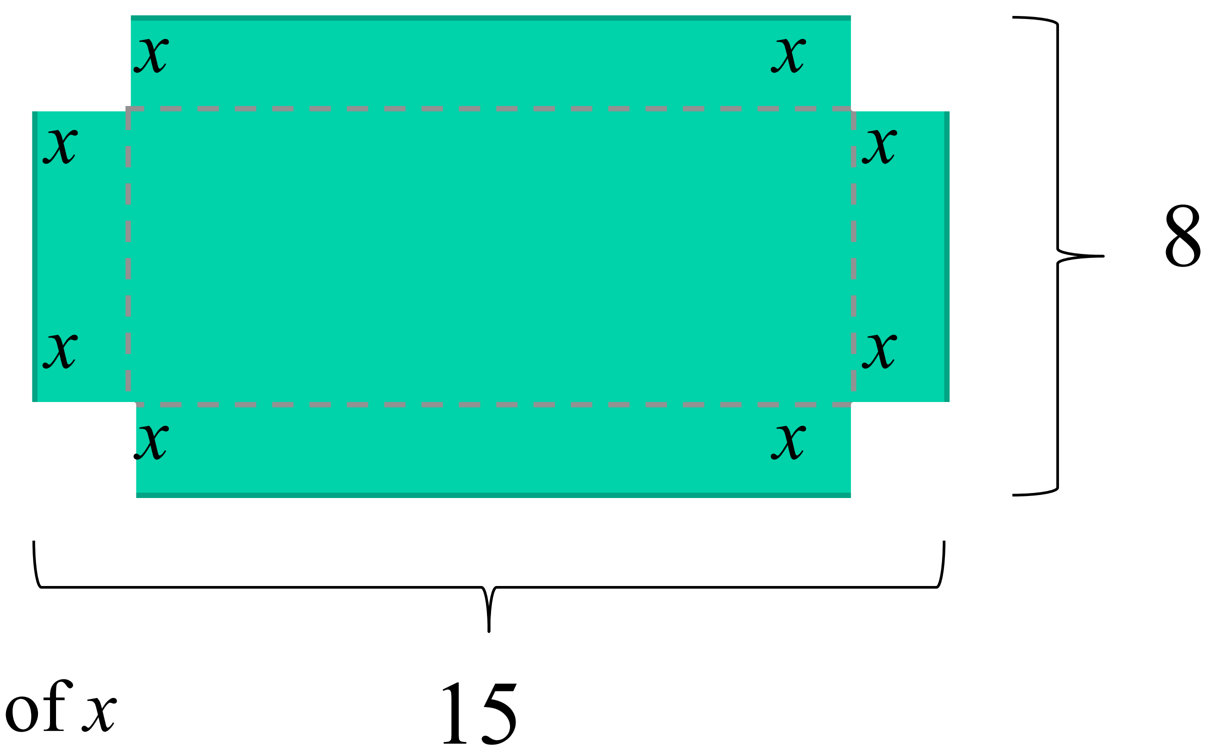
Each square that we cut off would have sides equal to x

$$0 < x < 4$$

Why?

$$V = l \cdot w \cdot h$$

length width height



Now we just need a volume formula in terms of x

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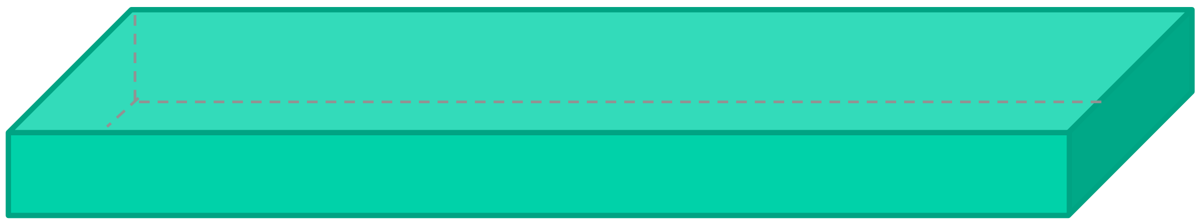
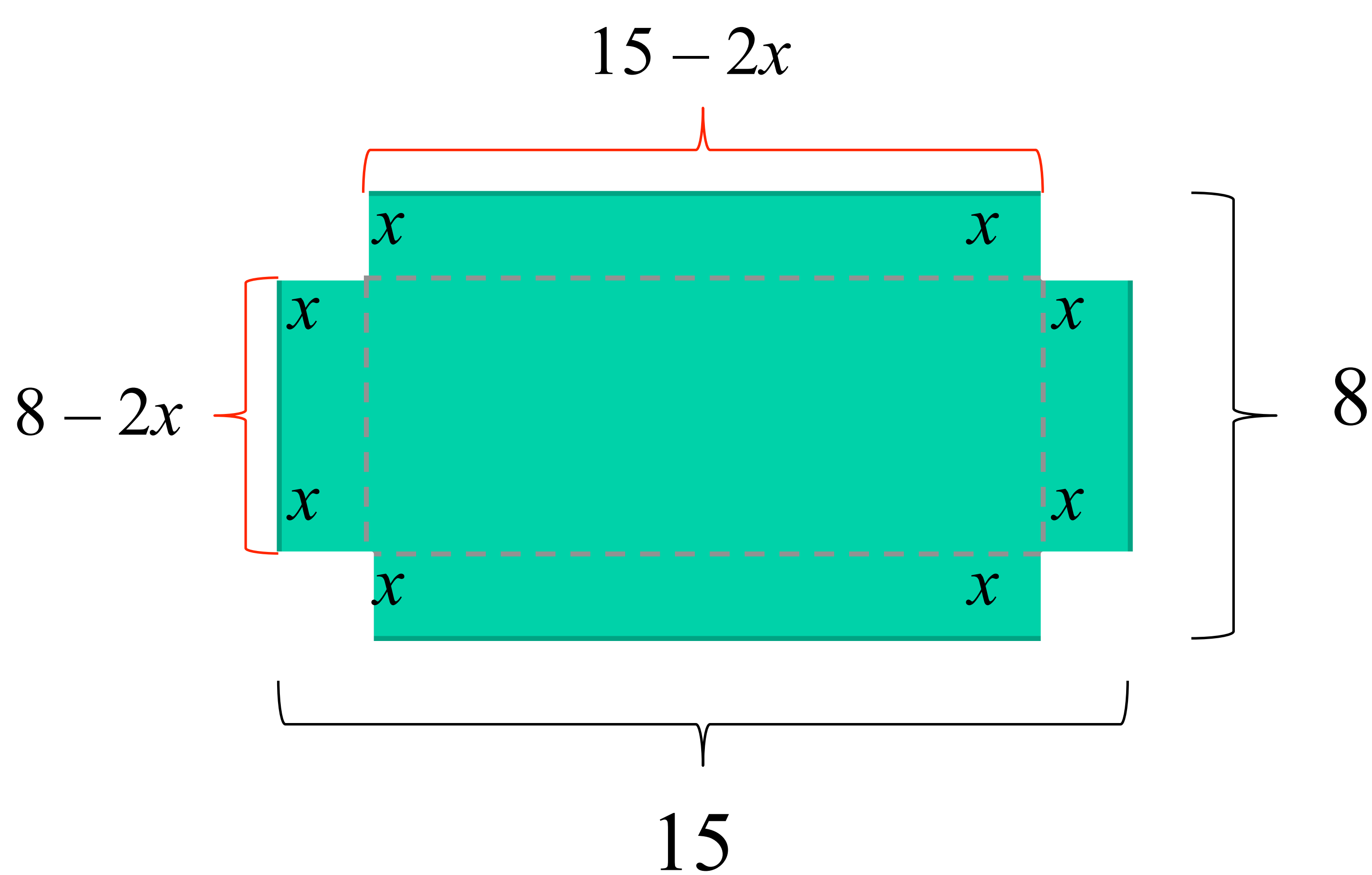


Find the dimensions of such a box with the largest volume.

from an 8 by 15 inch piece of cardboard

$$V = l \cdot w \cdot h$$

$l \rightarrow 8 - 2x$, $w \rightarrow 15 - 2x$, $h \rightarrow x$



$$V = (8 - 2x)(15 - 2x)x$$

$$V = (8-2x)(15-2x)x$$

$$V = 120x - 46x^2 + 4x^3$$

To maximize the volume, we can find any critical points and use them to find the maximum.

$$V' = 120 - 92x + 12x^2 = 0$$

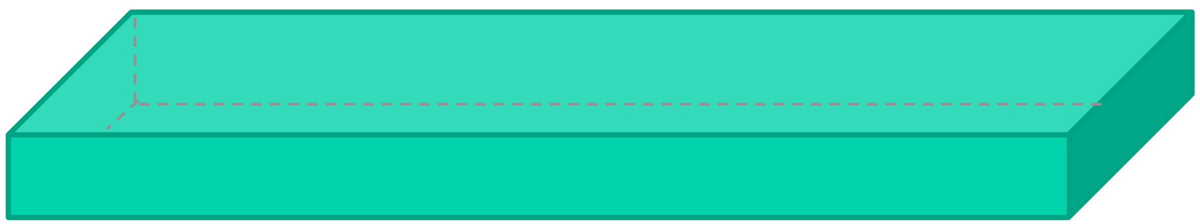
A little factoring produces $x = \frac{5}{3}, 6$

But we know that 6 is not in the domain for x and both endpoints of x give us a volume of 0

V'	0	+	0	−	
r	0		$\frac{5}{3}$		4

The sign pattern of V' confirms that $\frac{5}{3}$ is the x coordinate of a maximum value for $V(x)$.

You are making an open top rectangular box



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So our dimensions are:

$$l = 8 - 2 \cdot \frac{5}{3} = \frac{14}{3}$$

$$w = 15 - 2 \cdot \frac{5}{3} = \frac{35}{3}$$

$$h = \frac{5}{3}$$

$$V\left(\frac{5}{3}\right) \approx 90.74 \text{ inches}^3$$