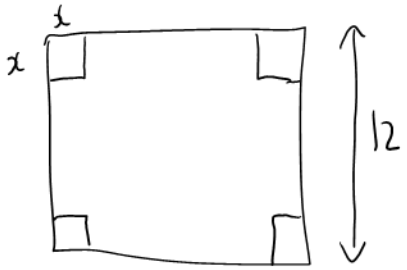
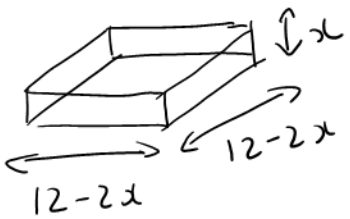
Name:_____

We are cutting the corners from a 12 cm x 12 cm metal sheet to form a box with no top. Find the height of the box that maximizes the box's volume.





Maximize $V = (12-2x)^2 x$

$$V' = (12-2x)^2(1) + x\left[2(12-2x)(-2)\right]$$
$$= (12-2x)(12-2x-4x)$$
$$= (12-2x)(12-6x)$$

Set $V' = 0$:

$$(12-2x)(12-6x) = 0$$

$x = 6$: REL MIN (Volume = 0)

$x = 2$: REL MAX

$\boxed{x = 2 \text{ cm}}$

Alternatively:

$$V = (12-2x)^2 x$$
$$= (144 - 48x + 4x^2)x$$
$$= 144x - 48x^2 + 4x^3$$
$$V' = 144 - 96x + 12x^2$$

→

$$V' = 144 - 96x + 12x^2$$

Set $V' = 0$:

$$144 - 96x + 12x^2 = 0$$

$$12 - 8x + x^2 = 0$$

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

$x = 6$
REL
MIN
(Volume = 0)

$x = 2$
REL
MAX

$$\boxed{x = 2\text{cm}}$$