



Minimize $A = xy$

Area of the printing
 $= (x-4)(y-12) = 12$

$$y-12 = \frac{12}{x-4}$$

$$y = \frac{12}{x-4} + 12$$

$$y = \frac{12 + 12x - 48}{x-4}$$

$$= \frac{12x - 36}{x-4}$$

$$A = xy$$

$$= x \left(\frac{12x - 36}{x-4} \right)$$

$$= \frac{12x^2 - 36x}{x-4}$$

$$A' = \frac{(x-4) \frac{d}{dx} (12x^2 - 36x) - (12x^2 - 36x) \frac{d}{dx} (x-4)}{(x-4)^2}$$

$$= \frac{(x-4)(24x - 36) - (12x^2 - 36x)}{(x-4)^2}$$

$$= \frac{12[(x-4)(2x-3) - (x^2 - 3x)]}{(x-4)^2}$$

$$= \frac{12[2x^2 - 11x + 12 - x^2 + 3x]}{(x-4)^2} = \frac{12(x^2 - 8x + 12)}{(x-4)^2}$$

$$A' = 0 \Rightarrow \frac{12(x^2 - 8x + 12)}{(x-4)^2} = 0 \Rightarrow x^2 - 8x + 12 = 0$$

$$\Rightarrow (x-6)(x-2) = 0 \Rightarrow x = 2, 6$$

$$y = \text{negative}, 18$$

A' is undefined at $x = 4$

x	A
2	negative
6	108
4	undefined y is undefined

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 The dimensions have to be 18 in by 6 in and the area is 108 in²