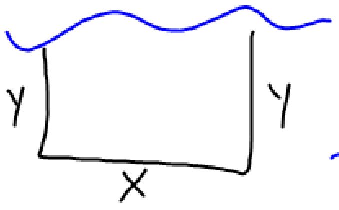
19 Area

$$180{,}000 = xy \quad (S.E.)$$

$$y = \frac{180{,}000}{x}$$




Primary: Peri.

$$P = 2y + x$$

$$P = 2\left(\frac{180{,}000}{x}\right) + x$$

$$P = 360{,}000x^{-1} + x$$

$$P' = -360{,}000x^{-2} + 1$$

$$P' = -\frac{360{,}000}{x^2} + 1$$

$$\frac{360{,}000}{x^2} = 1$$

$$360{,}000 = x^2$$

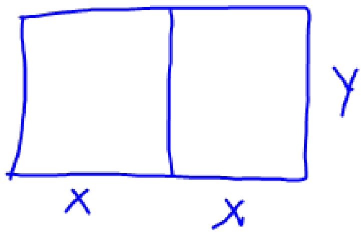
$$x = 600$$

$$P''(x) = 720{,}000x^{-3}$$

$$P''(600) > 0$$

$$\boxed{P \text{ is a minimum when } x = 600 \text{ and } y = 300}$$

20




$$P = 200$$

$$200 = 3y + 4x$$

$$\frac{200 - 3y}{4} = x$$

$$A = 2xy$$

$$A = 2\left(50 - \frac{3}{4}y\right)y$$

$$A = 100y - \frac{3}{2}y^2$$

$$A' = 100 - 3y$$

$$0 = 100 - 3y$$

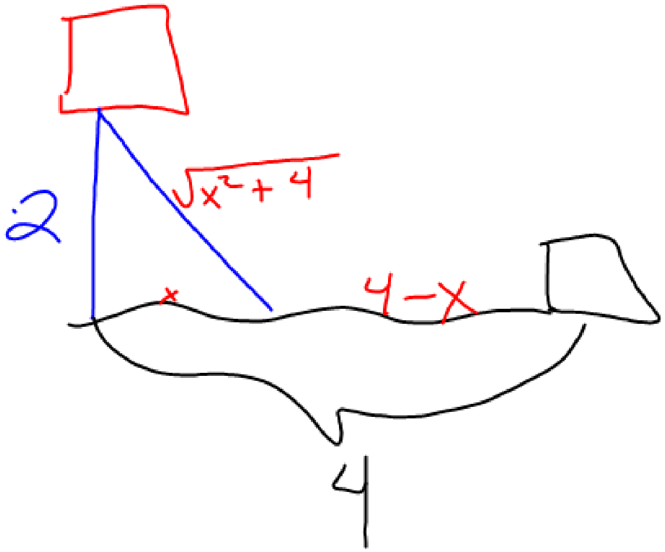
$$-100 = -3y$$

$$y = \frac{100}{3}$$

$$A'' = -3$$

$$A'' < 0$$

A is a maximum since $A'' < 0$ when




Primary:

$$C(x) = 2k\left(\sqrt{x^2+4}\right) + k(4-x)$$

$$C'(x) = \frac{2xk}{\sqrt{x^2+4}} - k$$

$$0 = \frac{2xk - k\sqrt{x^2+4}}{\sqrt{x^2+4}}$$

$$0 = 2xk - k\sqrt{x^2+4}$$

$$\left(k\sqrt{x^2+4}\right)^2 = (2xk)^2$$

$$k^2(x^2+4) = 4x^2k^2$$

$$x^2+4 = 4x^2$$

243/244

71 $D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

72

54

33 - 39 odds