Of all numbers whose sum is 58, find the two that have the maximum product.

That is, maximize Q = xy where x + y = 58.

$x + y = 58 \Rightarrow y = 58 - x$

$f(x, y) = xy$

$= x(58 - x)$

$f(x) = 58x - x^2$

$f'(x) = 58 - 2x$ | $f''(x) = -2$

$58 - 2x = 0 \Rightarrow -2x = -58$

$\Rightarrow x = 29$

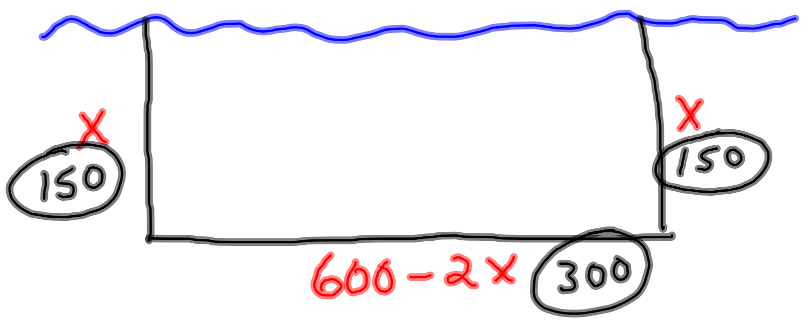
$y = 29$

Max product is

$(29)(29) = 841$

A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. With 600 m of wire at your disposal, what is the largest area you can enclose, and what are its dimensions?

$$A = (150)(300)$$
$$= 45{,}000 \text{ m}^2$$



$$A'' = -4$$

$$A = \text{Area} = x(600 - 2x) = 600x - 2x^2$$

$$A'(x) = 600 - 4x$$

$$600 - 4x = 0$$
$$-4x = -600$$
$$x = 150$$

A university is trying to determine what price to charge for tickets to football games. At a price of \$16 per ticket, attendance averages 40,000 people per game. Every decrease of \$4 adds 10,000 people to the average number. Every person at the game spends an average of \$4.00 on concessions. What price per ticket should be charged in order to maximize revenue? How many people will attend at that price?

x = decrease in ticket price

$$N(x) = mx + b = \frac{10000}{4}x + 40000$$

$$N(x) = 2500x + 40,000$$

$$p(x) = 16 - x$$

concessions = $4 \cdot N(x)$

$$R(x) = p(x)N(x) + 4N(x)$$

$$= (16-x)\underbrace{(2500x + 40000)}_{GCF} + 4(2500x + 40000)$$

$$R(x) = (2500x + 40,000)\boxed{(16-x) + 4}$$

$$= (2500x + 40,000)(20 - x)$$

$$= 50000x - 2500x^2 + 800,000 - 40000x$$

$$= -2500x^2 + 10000x + 800,000$$

$$R'(x) = -5000x + 10000$$

$-5000x + 10000 = 0 \Rightarrow x = 2$

$$R''(x) = -5000$$

$p(x) = 16 - x \Rightarrow$ to max revenue, sell tickets at $16 - 2 = \$14$

45,000 would attend

$$R(2) = \$810,000$$