

1.

1. Since the fences enclose a rectangular plot without one side, two sides have length b and one side has length a :

$$a+b+b=4187 \implies a=4187-2b$$

the area:

$$\text{area}=a \times b = (4187-2b)b = 4187b - 2b^2$$

Note that the equation is for parabola. Now compute the vertex:

$$\text{vertex} = \left(\frac{4187}{4} \text{ ft}, \frac{17\,530\,969}{8} \text{ ft}^2 \right)$$

Square the unit for vertex's vertical coordinate since it is a quadratic.