

3.

3. There are 3 sides to fence, two sides with length b and one side with length a :

$$a+b+b=1963 \Rightarrow a=1963-2b$$

Now solve for the area:

$$\text{area}=a \times b = (1-2b) b = 1963 b - 2 b^2$$

Notice the Parabolic equation, solve for the vertex:

$$\text{vertex} = \left(\frac{1963}{4} \text{ yards}, \frac{3853369}{8} \text{ yards}^2 \right)$$

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