2.

$$A = LW \qquad P = 2L + 2W$$

$$81 = LW$$

$$\frac{81}{W} = L$$

MINIMIZE PERIMETER

$$P = 2L + 2W$$

$$P = 2\left(\frac{81}{W}\right) + 2W$$

$$P = \frac{162}{W} + 2W$$

$$P = 162W^{-1} + 2W$$

$$\frac{dP}{dW} = 162(-1)W^{-2} + 2$$

$$= \frac{-162}{W^2} + \frac{2}{1}$$

$$= \frac{-162}{W^2} + \frac{2W^2}{W^2}$$

$$= \frac{2W^2 - 162}{W^2}$$

$$2W^2 - 162 = 0 \qquad\qquad W^2 = 0$$

$$2W^2 = 162 \qquad\qquad \cancel{W = 0}$$

$$\frac{2W^2}{2} = \frac{162}{2}$$

$$W^2 = 81$$

$$W = \pm\sqrt{81}$$

$$W = \pm 9$$

$$\cancel{W = -9} \qquad W = 9$$

$$W = 9$$

TIC.

PLUG INTO
DERIV.

$$\frac{2W^2 - 162}{W^2}$$

$$W = 1$$
$$\frac{2(1)^2 - 162}{+}$$

$$W = 10$$
$$\frac{2(10)^2 - 162}{+}$$

MIN

MIN AT $W = 9$

$$L = \frac{81}{W} = \frac{81}{9} = 9$$

$$\boxed{\begin{array}{c} W = 9 \\ L = 9 \end{array}}$$