$$\frac{-350(N+1)}{-2N} = x^2$$

$$x^2 = 175 \cdot \frac{N+1}{N}$$

$x_{crit} = \pm\sqrt{175 \cdot \frac{N+1}{N}}$, discard neg. root

Must verify that this gives a min.!
Easiest way is by 2nd deriv. test:

$W''(x) = 0 + 700(N+1)x^{-3} > 0$ since $x > 0$

Since W'' is positive for any x in the domain,

$W''(x_{crit}) > 0$ also.

∴ x_{crit} gives a local min., and since there are no other crit. pts. or endpts., x_{crit} gives a global min. as well

When $N = 6$, $x_{crit} = \sqrt{175 \cdot \frac{7}{6}} \approx 14.289$

$y = \frac{350}{x_{crit}} = \frac{350}{\sqrt{175 \cdot \frac{7}{6}}} \approx 24.495$

14.289 ft by 24.495 ft, the latter being the common wall

(b) When $N = 10$, $x_{crit} = \sqrt{175 \cdot \frac{11}{10}} \approx 13.874$

$y = \frac{350}{\sqrt{175 \cdot \frac{11}{10}}} \approx 25.226$

13.874 ft by 25.226 ft, " " " " " "

When $N = 3$, $x_{crit} = \sqrt{175 \cdot \frac{4}{3}} \approx 15.275$

$y = \frac{350}{\sqrt{175 \cdot \frac{4}{3}}} \approx 22.913$

15.275 ft by 22.913 ft, " " " " " "

Question: How much explanation is needed in these optimization problems?

Answer: About as much as is shown here, minus the square-bracketed comments. You need to demonstrate knowledge of the calculus. Reasoning from a graph alone is <u>not</u> <u>allowed</u> on free-response AP problems.