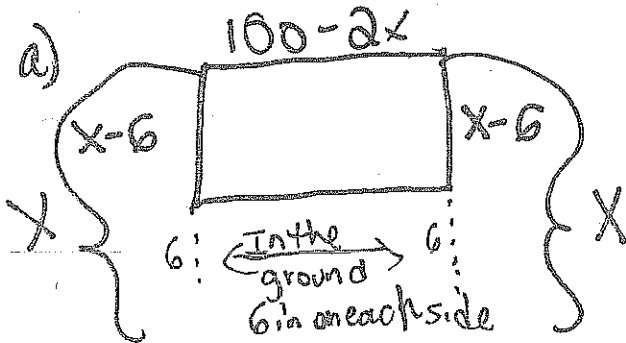


Mr. Menke is having a yard sale before he moves into his new home. To make a sign holder, he bends a 100-inch long steel wire  $x$  inches from each end to form two right angles. To use the sign holder, he inserted each end 6 inches into the ground. The finished sign is shown below.



- Write expressions to show the length and width of the yard sale sign holder. Then build a quadratic equation to find the rectangular area  $A$  enclosed by the sign holder in terms of  $x$ .
- Solve the quadratic to determine the value of  $x$  that maximizes the rectangular area enclosed by the sign holder.
- Discuss accuracy of the solving within the real-life situation.
- Justify whether your solution(s) makes sense in the context of the real-life scenario.



Let  $x$  be the width (including under grass)

Length =  $100 - 2x$

$$A = lw$$

$$A = (x - 6)(100 - 2x)$$

b) When is the area zero?  
(What dimensions)

$$0 = (x - 6)(100 - 2x)$$

$$x = 6 \text{ in and } 100 = 2x$$

$$x = 50 \text{ in}$$

Realism  $x = 50$

$$A = (50 - 6)(100 - 2(50))$$

$$A = (44)(0) = 0 \text{ in}^2$$

No room  
50 // 50 for the  
sign!

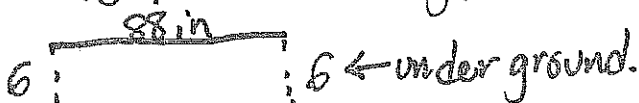
44 inches on  
each side above  
ground.

$$x = 6$$

$$A = (6 - 6)(100 - 2(6))$$

$$A = (0)(88)$$

88 inches flat on the ground!  
No room for sign.



b) Continued Finding max area:

$$\frac{6+50}{2} = \frac{56}{2} = 28 \text{ inches}$$

$$A = (28-6)(100-2(28))$$

$$A = (22)(100-56)$$

Ideal measurements:  $22 \times 44$   $A = 22 \cdot 44$

$$A = 968 \text{ in}^2$$

Realism  $968 \text{ in}^2$  is about  $6\frac{3}{4} \text{ ft}^2$

$$1 \text{ ft}^2 = (12 \text{ in})(12 \text{ in})$$

$$1 \text{ ft}^2 = 144 \text{ in}^2$$

$$\frac{968}{144} \approx 6.72 \text{ ft}^2$$

\* This area seems realistic for a rectangular sign in someone's front yard. The dimensions could be around 3 ft by  $2\frac{1}{4}$  foot to show an area of  $6.72 \text{ ft}^2$ . This sign seems big enough for people in cars (or bikes) to see there is a yard sale at Mr. Menke's house.

\* Another aspect to consider is that Home Depot and other hardware stores have signs you can purchase that might be cheaper than the metal steel.

### Accuracy

\* The precise measurements of 22 in by 44 in would be hard to create with a steel wire considering human error. This could produce more cost (more wire needed) or affect how much area is actually used for the sign.

\* Most hardware stores could cut the wire to reduce error.

\* The mathematical solution was exact until I had to round when converting inches<sup>2</sup> to square feet.