**Building Fences**

1. Suppose you have 80 feet of fence and you want to enclose a rectangular yard. Think about the various ways you can do this. Recall that the perimeter of a rectangle is equal to twice the width plus twice the length (*p = 2l + 2w*).
2. Suppose the width is 8 feet. Then

 *p =* 2*l +* 2*w*

80 *=* 2*l +* 2(8*)*

 Solve this equation for *l*.

1. For part (a) one student found the length by subtracting 8 from 40. Does this method work? Explain.
2. Fill in this table with some possible values of the width and the corresponding areas.

|  |  |  |
| --- | --- | --- |
| **Width** | **Length** | **Area = Length x Width** |
| 8 feet |  |  |
| 12 feet |  |  |
| 16 feet |  |  |
| *x* feet |  |  |

1. Suppose the area of the yard is 375 ft2. Let’s find the width:

 **Step 1:** $375=x(40-x)$

 **Step 2:**  $375=40x-x^{2}$

 **Step 3:**  $x^{2}-40x+375=0$

 **Step 4:** $\left(x-15\right)\left(x-25\right)=0$

 Explain steps 1 through 4 and complete the solution of the equation.

1. In part (d) you found two values of *x*. Now interpret what they mean.

 If the width is 15 feet, then the length is \_\_\_\_\_\_\_\_\_ feet.

 If the width is 25 feet, then the length is \_\_\_\_\_\_\_\_\_ feet.

 In either case, the dimensions of the rectangle are \_\_\_\_\_\_\_ feet by \_\_\_\_\_ feet.

1. Suppose the area of the yard is 319 ft2. Find the width using a quadratic equation.

 (Hint: $319=11×29$.)

1. Suppose the area of the yard is 300 ft2. Find the width using a quadratic equation.

 (Hint: there are nine possible factor pairs for 300.)

1. Find the dimensions for the largest possible area. (Hint: think about how to find the vertex of a quadratic function.)
2. Now suppose you have only 60 feet of fence but you can use a building to enclose one side of the rectangle.
3. Let *x* be the width of the rectangle as shown.

Write an expression for the length of the

rectangle, *y*.

1. Suppose the area of the enclosure is 400 ft2. Use a quadratic equation to find two possible values of *x*.
2. Find the dimensions of the largest possible rectangle that can be made with 60 feet of fence along the side of a house. Use a quadratic function to solve this problem.