Investigation 1 Additional Practice

1. **a.** 60 meters and 10,800 square meters; Let $\ell = 180$, then $240 - \ell = 60$ meters and thus $A = \ell(240 - \ell) = 180 \times 60 = 10{,}800 \text{ m}^2$.

   b. 120 meters by 120 meters; The greatest possible area is $14{,}400 \text{ m}^2$, which corresponds to a square with side lengths of 120 meters.

   c. 40 meters and 200 meters; The dimensions of a rectangle with an area of 8,000 square meters are 40 meters and 200 meters since $(40 + 200) = 240$ and $40(200) = 8{,}000$.

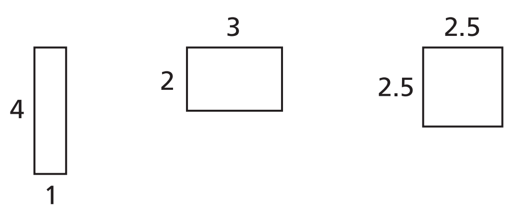
   d. 480 meters; Possible explanation: Since for part (a), one rectangle with this fixed perimeter and area defined by the equation $A = \ell(240 - \ell)$ had dimensions 60 meters and 180 meters. Substitute these dimensions into the equation $P = 2\ell + 2w$ thus giving a perimeter of $(2 \times 180 \text{ meters}) + (2 \times 60 \text{ meters}) = 480$ meters.

2. **a.** 2 meters and 4 meters

   b. 1 meter and 5 meters

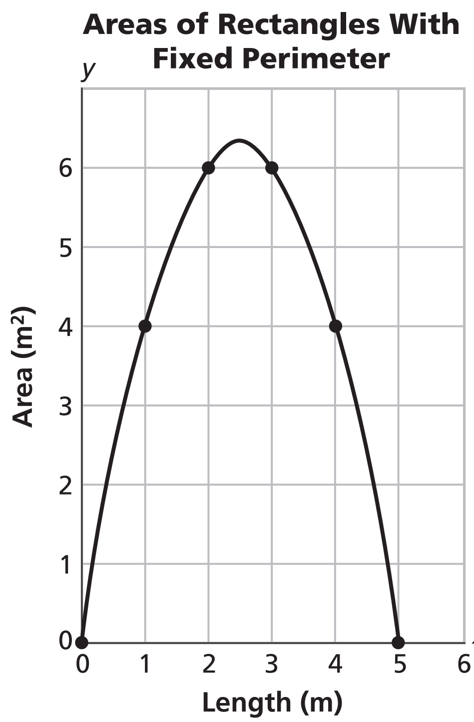
   c. The greatest area possible is 9 square meters, which corresponds to a square with side lengths of 3 meters.

3. The maximum area for a rectangle with a perimeter of 10 meters is $2.5 \times 2.5 = 6.25$ square meters. Here are some examples of rectangles students may sketch:

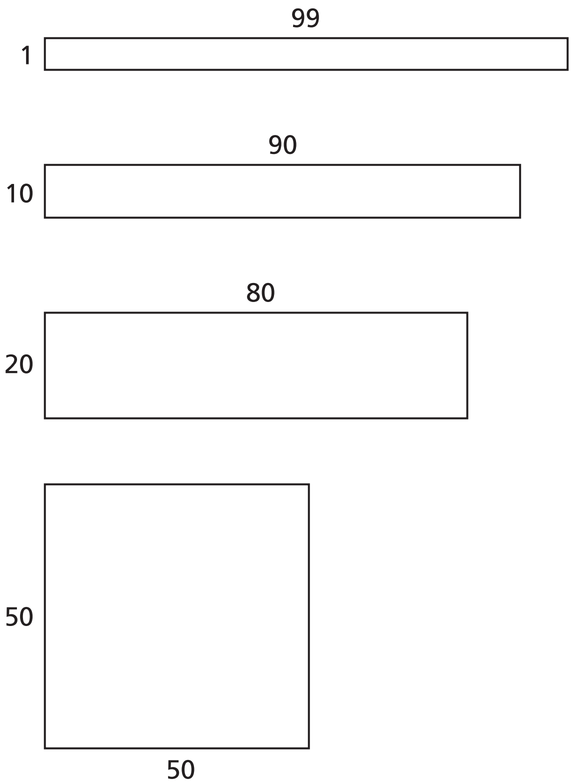


The rectangle with maximum area is the rectangle that is 2.5 meters by 2.5 meters. Table of lengths from 0 to 5 and areas of rectangles with fixed areas determined by taking length ℓ and multiplying by the other dimension, and having the sum of $\ell + w = 5$.

ℓ	A
0	0
1	4
2	6
3	6
4	4
5	0



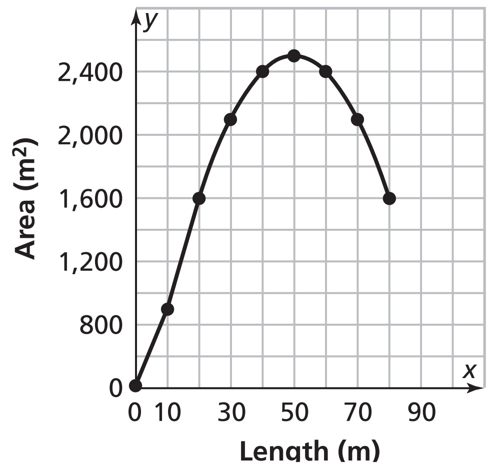
4. The maximum area for a rectangle with a perimeter of 200 meters is $50 \times 50 =$ 2,500 square meters. Here are some examples of rectangles students may sketch:



The rectangle with maximum area is the rectangle that is $50 \times 50 = 2{,}500$ square meters. Table of lengths from 0 to 5 and areas of rectangles with fixed areas determined by taking length ℓ and multiplying by the other dimension, and having the sum of $\ell + w = 100$.

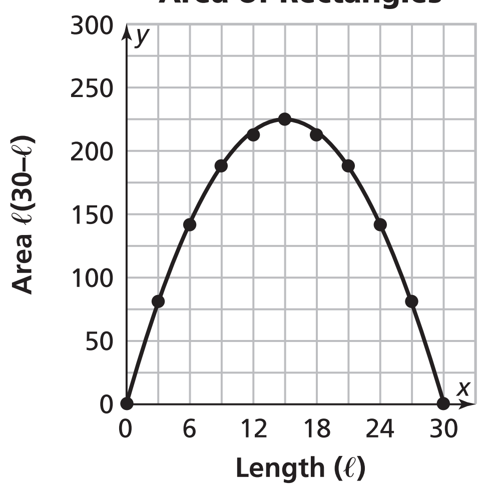
ℓ	A
0	5
10	900
20	1,600
30	2,100
40	2,400
50	2,500
60	2,400
70	2,100
80	1,600

Areas of Rectangles With Fixed Perimeter



5. a. $A = \ell(30 - \ell)$

Area of Rectangles



b. $A = 10(20) = 200$ square meters; find the y-value on the graph of the parabola corresponding to the value of 10 on the x-axis.

c. Find the A-value in the table corresponding to the ℓ-value of 10.

d. The maximum area is for a square with sides of 15 meters ($60 \div 4 = 15$); area is 225 square meters.

6. a. A square with side length s, each of which is $\frac{1}{4}$ the length of the perimeter.
   b. 25 by 25 with area of 625 square meters
   c. 2.5 by 2.5 with area of 6.25 square meters
   d. 0.25 by 0.25 with area of 0.0625 square meters
   e. 0.025 by 0.025 with area of 0.000625 square meters
7. $A = (\ell)(150 - \ell)$
8. a. 16
   b. 2 by 6
   c. 4 by 4; 16