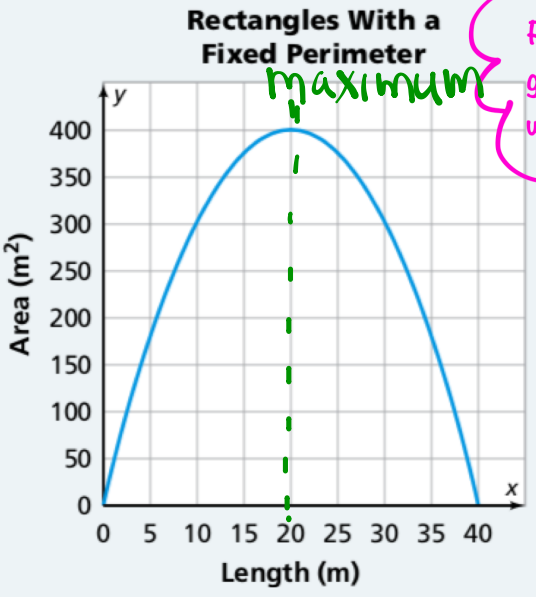
Problem 1.2 Recap

Problem 1.2

A The graph shows length and area data for rectangles with a fixed perimeter.



Remember, each point on the graph represents a rectangle with different length and width.

(x, y)

Length of the rectangle

Area of the rectangle

$A = L \cdot W$

$\frac{400}{20} = \frac{20 \cdot W}{20}$

$20 = W$

1. Describe the shape of the graph and any special features you see.

Things you can talk about:
*what the curve looks like
*is there symmetry?
*what is happening to the value of y as x increases?

- parabola opening down
- highest point L = 20
- Line of symmetry
- as x-increases, y-increases then decreases

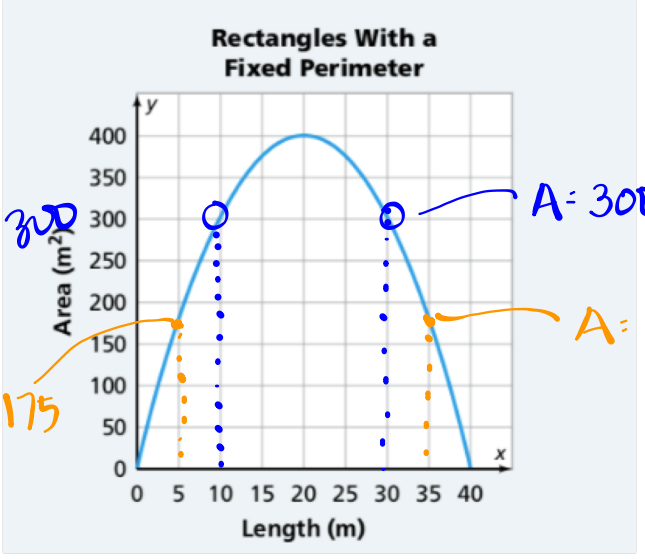
2. What is the greatest area possible for a rectangle with this perimeter? What are the dimensions of this rectangle?

$400\ m^2$

Dimensions are 20×20

Use the graph to find the point that represents the rectangle with the greatest area (the point will also tell you the length of that rectangle!)

Now, you just need to find the width.



A = 300

A = 300

A = 175

A = 175

The graph has all your answers! 😀

3. What is the area of the rectangle whose length is 10 meters? What is the area of the rectangle whose length is 30 meters? How are these rectangles related?

$A = 300\ m^2$

10 x 30 rectangle 30 x 10 rectangle

the same!

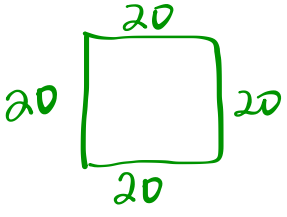
4. What are the dimensions of the rectangle with an area of 175 square meters?

Dimensions 5 x 35

5. What is the fixed perimeter for the rectangles represented by the graph? Explain how you found the perimeter.

20 + 20 + 20 + 20 = 80m

Remember:
Perimeter = 2L + 2W



Problem 1.2 continued

B Use the table to answer parts (1)–(5).

Rectangles With a Fixed Perimeter

width

Length (m)	Area (m^2)
0	0
1	11
2	20
3	27
4	32
5	35
6	36
7	35
8	32
9	27
10	20
11	11
12	0

increasing y-value

decreasing y-value

Line of symmetry

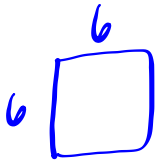
Max area: $30m^2$

When you have to find the fixed perimeter from a table of data, it sometimes helps to create an additional column for width.

1. What patterns do you observe in the table? Compare these patterns with those you observed in the graph in Question A.

Line of symmetry

2. What is the fixed perimeter for the rectangles represented by this table? Explain.



Perimeter: 24

6+6+6+6

Rectangles With a Fixed Perimeter

Length (m)	Area (m^2)
0	0
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2	20
3	27
4	32
5	35
6	36
7	35
8	32
9	27
10	20
11	11
12	0

← $16\ m^2$

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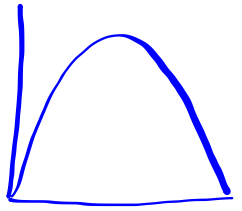

3. What is the greatest area possible for a rectangle with this perimeter? What are the dimensions of this rectangle?

$6 \cdot 6 = 36$

4. Estimate the dimensions of a rectangle with this fixed perimeter and an area of 16 square meters.

$\sim 1.5 \cdot 10.5$

5. Suppose a rectangle with this perimeter has an area of 35.5 square meters. What are its dimensions?

C Based on Questions A and B, describe the change in area as the length increases by 1. Compare this pattern of change to those for linear and exponential functions

Rectangles With a Fixed Perimeter

Length (m)	Area (m^2)
0	0
1	11
2	20
3	27
4	32
5	35
6	36
7	35
8	32
9	27
10	20
11	11
12	0

Width

11 10 9

+1 +1 +1 +1

+11 +9 +7 +5 +3 +1 -1 -3 -5 -7

Find the change in y. How does it compare to the change in y for a linear or exponential relationship?

Classwork

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3. The graph shows the length and area of rectangles with a fixed perimeter. Use the graph for parts (a)–(e).

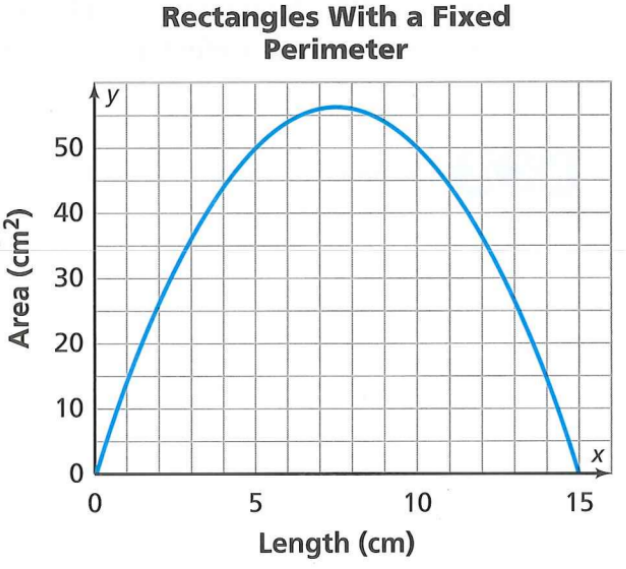
a. Describe the shape of the graph and any special features.

b. What is the maximum area for a rectangle with this fixed perimeter? What are the dimensions of this rectangle?

c. Is there a rectangle with the least possible area? Explain.

d. What is the area of a rectangle with a length of 3 centimeters?

e. Describe two ways to find the fixed perimeter for the rectangles represented by the graph.



5. The lifeguards at a beach want to place a rectangular boundary around the swimming area that can be used for water basketball. They have a fixed amount of rope to make the boundary. They use the table at the right to look at possible arrangements.

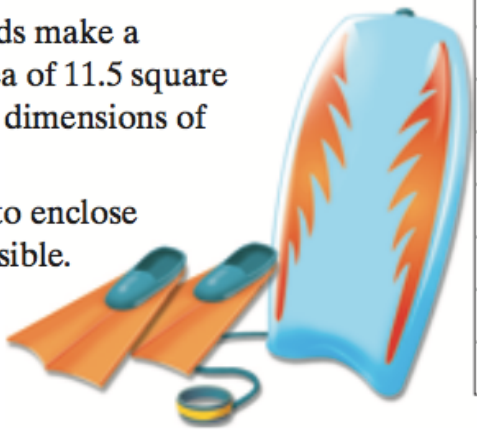
a. What patterns do you observe in the table?

b. What is the fixed perimeter for the possible swimming areas?

c. Sketch a graph of the (*length, area*) data. Describe the shape of the graph.

d. Suppose the lifeguards make a rectangle with an area of 11.5 square meters. What are the dimensions of the rectangle?

e. The lifeguards want to enclose the greatest area possible. What should be the dimensions of the swimming area?



Rectangular Swimming Area

Length (m)	Area (m^2)
1	15
2	28
3	39
4	48
5	55
6	60
7	63
8	64
9	63
10	60
11	55
12	48
13	39
14	28
15	15

6. The lifeguards at a beach want to place a rectangular boundary around the swimming area that can be used for water basketball. They have a fixed amount of rope to make the boundary. They use the table at the right to look at possible arrangements.

a. What patterns do you observe in the table?

b. What is the fixed perimeter for the possible swimming areas?

c. Sketch a graph of the data (*length, area*). Describe the shape of the graph.

d. Suppose the lifeguards make a rectangle with an area of 11.5 square meters. What are the dimensions of the rectangle?

e. The lifeguards want to enclose the greatest area possible. What should be the dimensions of the swimming area?

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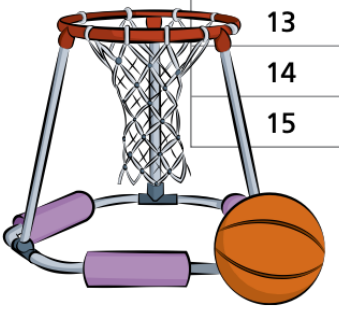
10	60
11	55
12	48
13	39
14	28
15	15



Homework

Finish classwork