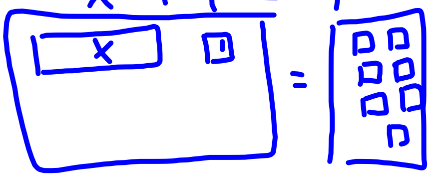
Questions on 3.3?

We will be taking our content mastery quiz shortly!

$x + 1 = 7$



Correct groupings

BEL

OVX

CGSU

AFIJM

KNRQ

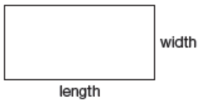
DHPTW

3.4 Water Under the Bridge
Modeling with Functions

NOT IN YOUR BOOK

perimeter

1. Mr. Jones wants to fence in a rectangular field for his horse using the 600 feet of fence he has stored in his barn. He wants to maximize the area of the field in order to give his horse the most pasture possible. Help Mr. Jones design his field to achieve the maximum area.



$P = 2l + 2w$

$A = lw$

a. Complete the table to show the length of the field for each given width.

Width (feet)	0	50	100	150	200	250	300
Length (feet)							

b. Define the function $\ell(w)$ to represent the length of the field as a function of the width. Explain your reasoning.

$600 = 2l + 2w$

$-2w \quad -2w$

$\frac{600 - 2w}{2} = \frac{2l}{2}$

$300 - w = l$

$l(w) = 300 - w$

c. Define the function $A(w)$ to represent the area of the field as a function of the width. Explain your reasoning.

$A(w) = lw$

$A(w) = (300 - w)w$

$A(w) = 300w - w^2$

$A(w) = -w^2 + 300w$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = -1 \quad c = 0$

$b = 300$

d. Determine the maximum area of the field as well as the length and width that will result in the maximum area. Explain your reasoning.

Vertex: (150, 22500)

maximum area: 22,500

width: 150

length: 150

General: $\left(-\frac{b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$-\frac{b}{2a} = -\frac{300}{2(-1)} = 150$

$f(150)$

$A(150) = -(150)^2 + 300(150)$

$A(150) = -22500 + 45000$

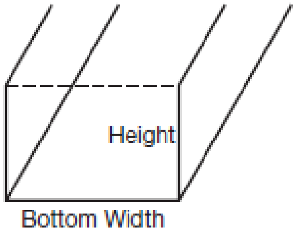
$A(150) = 22500$

Sep 22-8:36 AM

SKIP PROBLEM 1 #1 ON PG.158 IN YOUR BOOK

A nearby town hired a civil engineer to rebuild their storm drainage system. The drains in this town are open at the top to allow water to flow directly into them. While designing the drains, the engineer must keep in mind the height and the width of the drain. She needs to consider the height because the water cannot rise above the drain or it will flood the town and cause major destruction. However the drain must also be wide enough that it will not get clogged by debris.

The civil engineer will use rectangular sheets of metal to build the drains. These sheets are bent up on both sides to represent the height of the drain. An end view of the drain is shown.

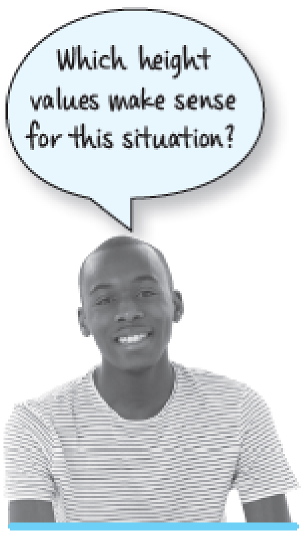


PG.158-9 IN YOUR BOOK

The sheets of metal being used to create the drain are 8.5 feet wide. The engineer wants to identify possible heights and bottom width measurements she could use to construct the drains.

2. Determine the bottom width for each given height. Then complete the table by choosing different heights and calculating the bottom widths for those heights. If necessary, construct models of each drain.

Height of the Drain (feet)	Bottom Width of the Drain (feet)
0	
1.5	
3	



Oct 9-8:12 AM

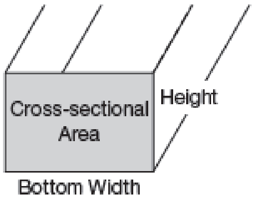
PG.159-60 IN YOUR BOOK

3. Describe how to calculate the bottom width for any height.

4. Define a function *w*(*h*) for the bottom width given a height of *h* feet.

5. The engineer needs to identify the measurements that allow the most water to flow through the drain. What does the engineer need to calculate? What does she need to consider?

In order to determine the drain dimensions that allows the most water to flow through, the engineer must calculate the cross-sectional area. The cross-sectional area of a drain is shown.



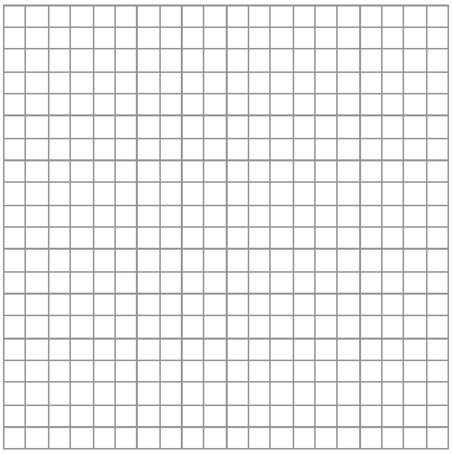
6. Describe how to determine the cross-sectional area of any drain.

7. Predict and describe the drain with the maximum cross-sectional area.

PG.160-61 IN YOUR BOOK

8. Define a function $A(h)$ for the cross-sectional area of the drain with a height of h feet.

9. Use a graphing calculator to graph the function $A(h)$. Label your axes.



10. Analyze your graph.

a. What is the maximum cross-sectional area for the drain pipe? Explain your reasoning.

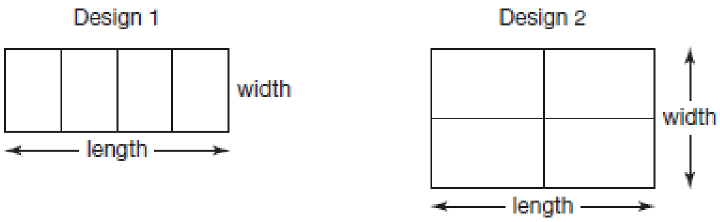
b. Identify the intercepts of $A(h)$. What does each mean in terms of this problem situation? Label each intercept on the graph.

c. Identify the equation of the axis of symmetry. Then label the axis of symmetry on the graph. Finally, describe the relationship between the axis of symmetry and the maximum cross-sectional area.

Oct 9-8:17 AM

NOT IN YOUR BOOK

2. Mrs. Williams wants to fence in a rectangular area of her field using the 1200 feet of fence she has. She wants the area to have four congruent sections. She is trying to decide which of the two designs shown will give her animals the maximum fenced area.



Determine the design and the dimensions of the design that will give Mrs. Williams the maximum fenced area. Show your work and explain your reasoning.

Classwork/Homework

Finish lesson 3.4