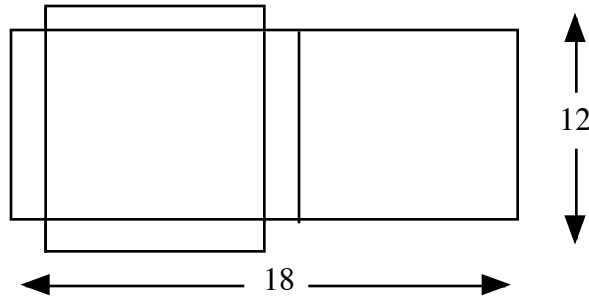


I. The **BOX WITH TOP** Problem

A box with a top is to be constructed out of a 12 by 18 inch piece of cardboard by cutting congruent squares from two of the four corners and rectangles from the other two corners, then folding up the sides (as shown below).



1. If the square in the upper left (and lower left) hand corners is **2 inches**, what is the length of the box? _____
 What is the width of the box? _____ What is the height of the box? _____ What is the volume of the box? _____

2. If the square in the upper left (and lower left) hand corners is **x inches**, write an expression for the length of the box? _____
 Write an expression for the width of the box? _____ Write an expression for the height of the box? _____
 Write a function $V(x)$ for the volume of the box?

3. Sketch a graph of $V(x)$.

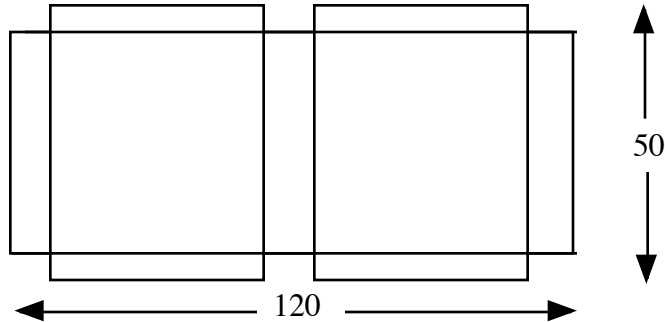
4. What values of x (the size of the cut out square) make sense to the problem? _____

5. Find how large the cut-out squares should be to maximize the volume of the box. _____ What is the maximum volume? _____

6. How large should the cut-out squares be to make the volume of the box 90 cubic inches? _____

II. The PIZZA BOX Problem

A pizza box is to be constructed out of a 50 by 120 cm piece of cardboard by cutting six equal-sized squares in the positions shown then folding up the sides (as shown below).



1. If the squares cut out of the six places of the cardboard measure **7 cm**, what is the length of the pizza box? _____ What is the width of the pizza box? _____ What is the height of the pizza box? _____ What is the volume of the pizza box? _____
2. If the squares cut out of the six places of the cardboard measure **20 cm**, what is the length of the pizza box? _____ What is the width of the pizza box? _____ What is the height of the pizza box? _____ What is the volume of the pizza box? _____
3. If the squares cut out of the six places of the cardboard measure **x cm**,
 - Write an expression for the length of the pizza box? _____
 - Write an expression for the width of the pizza box? _____
 - Write an expression for the height of the pizza box? _____
 - Write a function $V(x)$ for the volume of the pizza box? _____
4. Sketch a graph of $V(x)$.



5. What values of x (the size of the cut out squares) make sense to the problem? _____
6. What size should the cut-out squares be to make the volume 10,000 cubic cm? _____
7. Find how large the cut-out squares should be to maximize the volume of the pizza box. _____
 What is the maximum volume? _____ What is the width of the box? _____
 What is the length of the box? _____