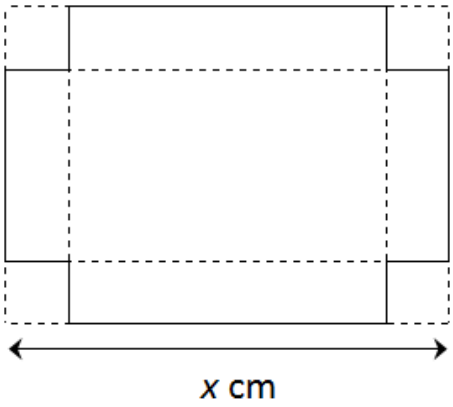
A Parabolic Investigation

Task: a rectangular sheet of card, with perimeter = 80 cm is made into an open-topped box, by folding in 2 cm x 2 cm squares from each corner. Investigate the relationship between x, the length of one side of the card and C, the capacity of the box.



1. Instead of making a model, or trying out a few values, use algebra to attempt this task. Translate the task into a series of equations that summarise the information given.
2. Give a general equation to describe the perimeter.
3. Give a general equation to describe the base area of the box.
4. Give a general equation to describe the capacity of the box.
5. Can the equations you've written be combined to give the capacity of the box in terms of only x?
6. What does your relationship between capacity and x tell you about the values x can be?
7. What does your relationship between capacity and x tell you about the maximum capacity of the box?

Extension:

1. Sketch and describe the features of the graph of capacity against x.
2. Discuss the limits of the values that x can take.
3. Use the symmetry of your graph to find the maximum capacity of the box.