Activity description

In this activity students consider some maximisation/minimisation problems and then devise some of their own.

The slideshow serves as an introduction, looking first at finding the maximum volume of a cardboard box with cut-out corners. The method for doing this is followed through, using the first and second derivatives.

The second problem looks at the minimum amount of material needed to make a can (two variables). In this case one variable has to be eliminated by substituting an appropriate expression from the other information available before calculus can be used.

Suitability

Level 3 (Advanced)

Time

45 minutes, increasing to 2–3 hours if students devise their own problems

Resources

Slideshow

Key mathematical language

Derivative, function, variable, minimisation, maximisation

During the activity

The slideshow demonstrates the methods needed to solve maximisation and minimisation problems.

Encourage the students to take an active part by considering the questions in the 'Think about' boxes. Sometimes a question will be asked before the solution is shown. At other times students will be asked why a statement has been made.

The idea is that answers to these questions will be discussed at relevant points in the slideshow.

After the slideshow, students can work independently or collaboratively if you wish. They could start by producing a flow chart of the procedure described in the last two slides. This would help them keep track of progress when working individually.

Points for discussion

The slideshow provides questions to aid discussion.

This activity should be carried out after students have developed the core skills required to differentiate and evaluate maximum/minimum quantities.

This will enable students to contribute their own ideas of how to solve problems.

The context means that some of the solutions to the equations solved are invalid. Ask the students to identify which ones do not work and why.

Extensions

Once a student has decided on a problem, and before using calculus, he or she could obtain an estimated value of the maximum/minimum required using numerical methods. Then the two answers could be compared and percentage errors evaluated.

Some good ideas for further work can be found on the internet at

http://www.math.ucdavis.edu/~kouba/CalcOneDIRECTORY/maxmindirectory/MaxMin.html#PROBLEM%2010