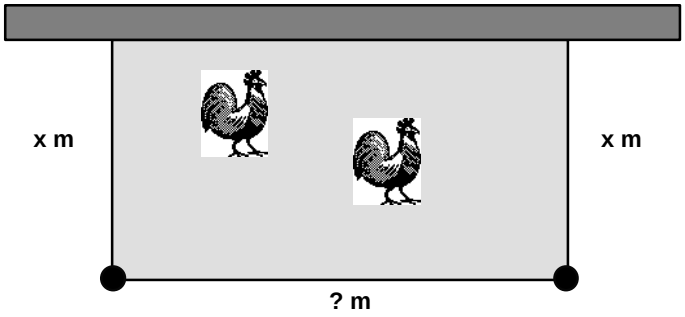
12. Extending the Fencing Problem (MM1/2) (KP:2.2;5.3;7.1;9.1;9.3;9.4)

Imagine that you have to construct a 'run' for your friend's chickens. You have 20 metres of wire netting with which to construct 3 sides of this rectangular 'run' (see diagram right), and the 4th side will be the fence line of the property. The depth of the run is x metres.



1. Investigate different possible dimensions for this run, and construct a table of the dimensions and area A m^2 enclosed by each of these possibilities. Make an initial estimate of the maximum area that the netting might enclose.

Depth x (m)	*2*				
Width (m)	*16*				
Area A (m^2)	*32*				

2. Write an expression for the width of the run in terms of x, and hence construct an expression for A in terms of x.

3. On your graphics calculator, draw a graph of how the area of the run depends on x, and use the graph to find the maximum area. Verify your answer by an analytic method.

4. Using a variation of the above function, find the maximum area that could be enclosed if you had the following amounts of wire netting available:

(i) 30 metres; (ii) 40 metres; (iii) 50 metres; (iv) 60 metres.

5. Construct a table of your answers to question 4.

Wire Netting available (m)	*20*	*30*	*40*	*50*	*60*
Depth x (m) for maximum area					
Width (m) for maximum area					
Maximum Area A (m^2)					

6. Plot the graphs of the Area functions (in Y1 to Y5) for each of the wire netting lengths listed in the table above. Find a suitable viewing window to view the maximum values for each scenario.

7. Plot each of the maximum points. Using the table, the graph, or by other means, find a relationship between the maximum areas and the corresponding depths.

8. Create a rule for the maximum area that can be enclosed for a given length of wire netting. Verify your answer by an analytic method.

Note: This is an old problem in a new guise. Using the graphics calculator, students solve the problem of maximum area, but verify their answer analytically. A feature of the extension is to use a curve-fitting approach to generalise their solution to the original problem.