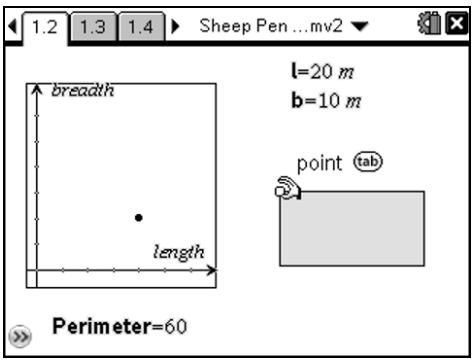
The Sheep Pen Problem
Worksheet

There are two problems contained in this document, both of which link dynamic geometry to graphs and provide the opportunity to construct (and check) an algebraic expression for the functions involved.

Basic Problem



A farmer has 60m of fencing material and wishes to create a rectangular pen for his sheep. On Page 1.2, grab and move the open dot corner of the shaded 'pen' on the right hand side of the page. Note that although the length and breadth of the rectangle change, the perimeter remains fixed at 60m.

On the left-hand side of the page the point (length, breadth) is plotted. As you grab and move the corner of the pen, what sort of path is traced by the plotted point (linear, quadratic, other; positive or negative)?

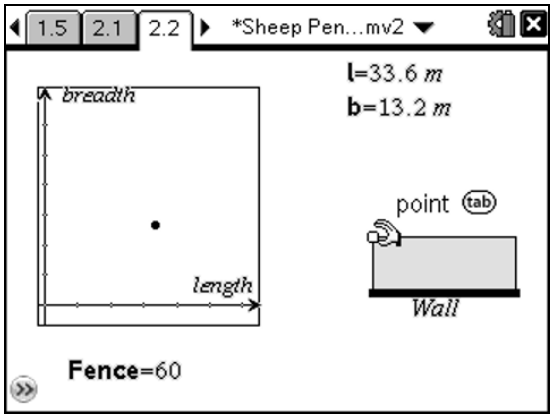
Can you find an expression for breadth in terms of length (ie. the path traced by the plotted point)? You may want to record some of the (length, breadth) pairs to help you see the pattern. You can use ctrl . to gather data which will be stored in Page 1.3. Check your answer using ctrl G to show the entry line, enter your equation, use ctrl G to hide the entry line and then move the corner point of the pen again.

Gather data manually from Page 1.2 to store in Page 1.3 using ctrl . . Create a column of values for area by entering a formula below the column name. A scatterplot of area against length will be plotted on Page 1.4.

What sort of a graph has been plotted on Page 1.4 (linear, quadratic, other; positive or negative)? Can you construct an expression for area in terms of length (remember to include the multiplication sign)? Check your answer using ctrl G to show the entry line, enter your equation and then use ctrl G to hide the entry line.

To find the maximum area of the rectangle, start by using Graph Trace: press menu 5 1. Use the Trackpad to move along your graph until the maximum value is identified. Press esc to exit Graph Trace mode.

Extended Problem



A farmer has 60m of fencing material and wishes to create a rectangular pen for his sheep, but he decides to use a wall as one of the sides of the pen and so he only needs to use his fencing material for 3 sides of the rectangle.

As before, on Page 2.2, grab and move the corner of the shaded 'pen' on the right hand side of the page. Note that although the length and breadth of the rectangle change, the length of the three sides remains fixed at 60m.

On the left-hand side of the page the point (length, breadth) is plotted. As you grab and move the corner of the pen, what sort of path is traced by the plotted point (linear, quadratic, other; positive or negative)?

Can you find an expression for breadth in terms of length (ie. the path traced by the plotted point)? You may want to record some of the (length, breadth) pairs to help you see the pattern. You can use (ctrl)(.) to gather data which will be stored in Page 2.3. Check your answer using (ctrl)[G] to show the entry line, enter your equation, use (ctrl)[G] to hide the entry line and then move the corner point of the pen again.

Gather data manually from Page 2.2 to store in Page 2.3 using (ctrl)(.). Create a column of values for area by entering a formula below the column name. A scatterplot of area against length will be plotted on Page 2.4.

What sort of a graph has been plotted on Page 2.4 (linear, quadratic, other; positive or negative)? Can you construct an expression for area in terms of length (remember to include the multiplication sign)? Check your answer using (ctrl)[G] to show the entry line, enter your equation and then use (ctrl)[G] to hide the entry line.

To find the maximum area of the rectangle, start by using Graph Trace: press (menu)(5)(1). Use the Trackpad to move along your graph until the maximum value is identified. Press (esc) to exit Graph Trace mode.

