1. **Two Problems Every Student Should Know.**

   Of all rectangles with a fixed perimeter P, which one has the maximum area?

   Of all rectangles of a fixed area A, which one has the minimum perimeter?

2. **Pen Problems.**

   (a) A rectangular pen is built with one side against a barn. Two hundred meters of fence are used for the other three sides of the pen. What dimensions maximize the area of the pen?

   (b) A rancher plans to make four identical and adjacent rectangular pens against a barn, each with an area of 100 m^2. What are the dimensions of each pen that minimize the amount of fence that must be use?

3. **Circle and Square.** A piece of wire of length 60 cm is cut, and the resulting tow pieces of wire are formed to make a circle and a square. Where should the wire be cut to (a) maximize and (b) minimize the combined area of the circle and square?