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| **Topic 5: Calculus** | **Optimization** | | |
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| 1. Erica works for a company that produces metal tins. The tins are created from a metal sheet 6 in. by 6 in. Erica’s job is to operate a machine that removes a square, with side length  in., from each corner. See picture below, not drawn to scale.     The remaining metal sheet is sent to a machine that folds up the sides to form a tray. See picture below, not drawn to scale. | | | |
| * 1. Find the length and width of the tray, in terms of   2. Show that the volume, in³, of the tray is   3. Find   4. Using your answer from part (c), find the value of that maximizes the volume of the tin.   5. Find the maximum volume of the tin | | | (2 marks)  (2 marks)   (3 marks)  (3 marks)   (2 marks) |
| Mark scheme:   1. Length: Width:   5. in³ | | (A1) (A1)  (M1) ft Correct substitution of their length and width into the volume of a rectangular prism formula (A1) ft Correct multiplication of the three polynomials  (A1)(A1)(A1)  (1) Setting their part (c) = 0   (1) Solving for x (A1) Knowing that 3 cannot work and that 1 is the solution  (1) ft Correct substitution of their solution from part (d) (1) ft | |