

Problems of Optimization

- 1) Find out the dimensions of the rectangle that has minimum perimeter if its area is fixed to 3721 cm^2 .
- 2) A piece of wire 79 cm long is cut into two pieces. One piece is bent into a square, the other into a circle. How should the wire be cut so that the total area enclosed is a minimum?
- 3) A box with an open top is constructed by a square cardboard of 60 ft on each side. The box is made by cutting a small square from each corner and folding up the sides. Find out the length of the small square that maximize the volume of the box.
- 4) A rectangular window holds a fixed area of 135 m^2 . The material used for the sides of the window costs $5 \text{ \$/m}$, and the material for the top and bottom costs $3 \text{ \$/m}$. Calculate the dimensions of the window that has minimum cost.
- 5) We have 1080 yd of fencing with which we plan to enclose a rectangular pasture adjacent to a long existing wall. Calculate the dimensions of the rectangle that maximize its area.
- 6) In a cone, the addition of the radius (r) and the height (h) is 99 cm . Find out these dimensions for which the volume of the cone is maximum.
- 7) A box with a square base and closed top have a volume fixed to 1331 m^3 . Calculate the dimensions of the box that minimize the amount of material used.
- 8) A box with a square base and open top must have a volume of 256 m^3 . Find out the dimensions of the box that minimize the amount of material used.
- 9) The top and bottom margins of a poster are each 1 cm . The side margins are each 2 cm . If the area of the printed material is fixed at 98 cm^2 , find the dimensions of the poster with the smallest area.
- 10) Find out the dimensions of the rectangle of largest area which can be inscribed in an isosceles triangle if a side of the rectangle lies on the base of the triangle (unequal side) and the other two vertices of the rectangle lie on the equal sides of the triangle. The triangle has a base of 72 cm and a height of 40 cm .
- 11) Calculate the length of the sides of an isosceles triangle that has maximum area if its perimeter is fixed to 165 cm .

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Answers:

- 1) 61 cm × 61 cm.
- 2) $\frac{316}{\pi + 4}$ cm (square), $\frac{79\pi}{\pi + 4}$ cm (circle).
- 3) 10 ft.
- 4) 15 m × 9 m.
- 5) 540 yd × 270 yd.
- 6) $r = 66$ cm, $h = 33$ cm.
- 7) 11 m × 11 m × 11 m.
- 8) 8 m × 8 m × 4 m.
- 9) 18 cm × 9 cm.
- 10) 36 cm × 20 cm.
- 11) 55 cm, 55 cm, 55 cm.