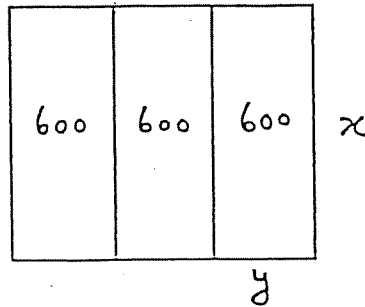


CALCULUS ... MCAOA1... MAXIMUM / MINIMUM QUESTIONS

1. A can is made in the shape of a cylinder from one rectangular sheet of tin and two square sheets of tin from which the circular ends are made. Neglecting any losses due to joining the three pieces into the cylinder find the minimum area of tin if the volume of the can must be 27 cubic inches. What is the ratio of height to the diameter?

2. Three separate and adjacent rectangular cattle pens each of area 600 square feet are to be formed as shown in the diagram. The farmer naturally wishes to use the least length of fence he can. What dimensions should he use for the individual pens and what length of fencing would he require.



3. A box has square ends, and the sides are congruent rectangles. The total area of the four sides and two ends is 96 square inches. What are the dimensions of the box if the volume is a maximum, and what is the maximum volume?

4. The base of a chest is a rectangle which is twice as long as it is wide. The top, front, and sides are made of oak, and the back and base are made of pine. The chest has a volume of 12.25 cubic metres. Oak costs \$30 per square metre and Pine costs \$10 per square metre. Find the dimensions of the box for which the lumber has the lowest cost. (Neglect any effects due to the thickness of the sides, top, or base.)

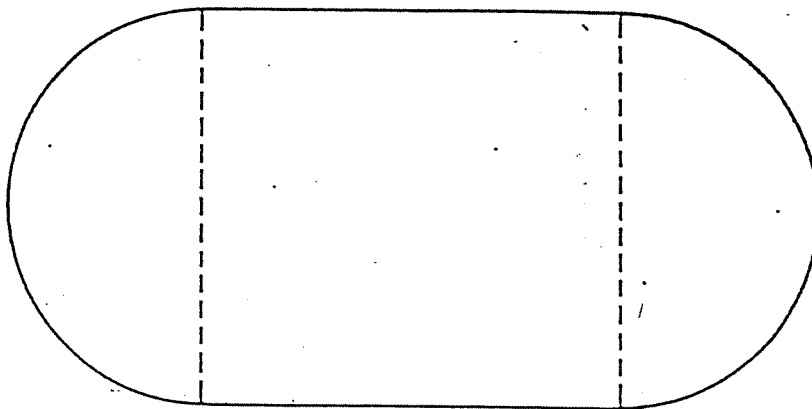
5. Find the maximum and the minimum values of the sum of the square of one number and the cube of another number if the 2 numbers are not negative and have sum of 8.

6. A cylindrical tin can holding 500 cc has a top seal of aluminum costing 5 cents per square cm. The sides and base are tin costing 2 cents per square cm. Find approximate values (correct to 2 decimals) of the diameter and height of the can which has the least expensive material.

7. Find the minimum value of the sum of a positive number and its reciprocal.

8. A 400 m track has the shape of two semi-circles at the ends of a rectangle. The straight sections of the track must be at least 100 m in length, and the radius of the semi-circles must be at least 20 m. Find the dimensions (~~to the nearest m~~) of the track that encloses ...

- a) the maximum area
- b) the minimum area



9. If a farmer digs up his crop of potatoes on July 1, his crop will be 120 bushels, which will sell as new potatoes at \$3.00 per bushel. If the crop is allowed to mature further, it will increase at 15 bushels per week. However, the price will drop at \$0.20 per bushel per week. When should the farmer dig the potatoes for the maximum cash return?

10. At 9:00 A.M. ship B was 65 nautical miles due east of another ship A. Ship B was then sailing due west at 10 knots and A was sailing due south at 15 knots. If they continue their respective courses, when will they be nearest one another and how near?

11. A rain gutter is to be made up from a long flat piece of tin by bending up strips vertically along two sides. If the piece of tin is 24 cm wide, how many centimetres should be turned up at each side to get the maximum carrying capacity?

ANSWERS!!!:

<p>1. $4 : \pi$</p> <p>2. 30 by 20, 240</p> <p>3. 4 inch cube, 64 cubic inches</p> <p>4. $7/4, 7/2, 2$</p> <p>5. 512, 44</p> <p>6. 7.14, 12.49</p> <p>7. 2</p>	<p style="text-align: right;">$\rightarrow 100, \frac{100}{\pi}$ and $200 - 20\pi, 20$</p> <p>8. 9549, 6743</p> <p>9. 3.5</p> <p>10. 11 A.M., 54.08</p> <p>11. 6</p>
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