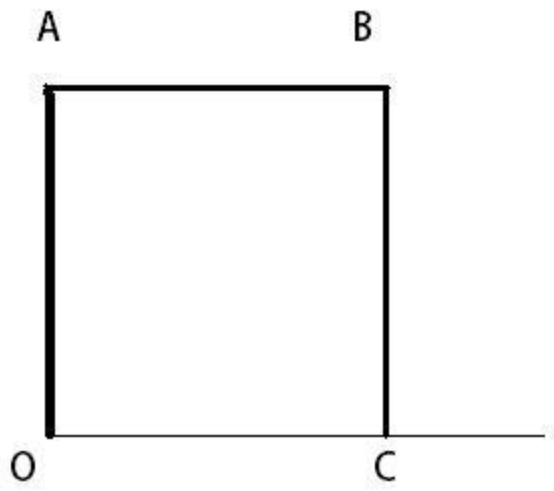
Answer on Question #44371 – Math - Calculus

The client wants to maximise the volume of a materials store to be constructed next to a 3 metre high stone wall (shown as OA in the cross section in the diagram). The roof (AB) and front (BC) are to be constructed from corrugated metal sheeting. Only 6 metre length sheets are available. Each of them is to be cut into two parts such that one part is used for the roof and the other is used for the front. Find the dimensions x and y of the store that will maximise the cross-sectional area and therefore the volume. Hence determine the maximum cross-sectional area.



Answer.

Let x be the length of a roof (i.e. AB) and y be the height of the front (i.e. BC).So

$x + y = 6$ **and cross-sectional area equals** $S = x * y = x(6 - x) = 6x - x^2 =$

$= -(x - 3)^2 + 9$. **Therefore, the maximum cross-sectional area equals** $S_{max} = 9$ **when**

$x = 3\ m, y = 6 - 3 = 3\ m$. **This length equals the height.**