

Calculus 3 Project

Shuo Liu

Student ID 103311500

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Introduction:

The subcontractor we had working on the design of the gutters for the roofs of building has pulled out and our design constraints require that it be manufactured from a 12 inch wide piece of material. In order to carry a maximum amount of water, we designed the section shape of gutters can be rectangle, square, triangle and semi-circle. We set the unit length be “a inch”. The length of roof section can be 12 inch. Therefore we can solve each volume of these sections’ shape with “a unit”. However, we can contrast the volume of them easily.

Body:

- a. the shape of rectangle



We can set the wide of rectangle section be “w”. And set the length of rectangle section be L.

$$\text{Then } w+w+L=12\text{inch}$$

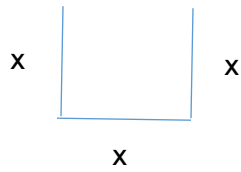
$$\text{Volume}=w*L*a=(12-2w)*w*a=$$

If we want to get the maximum volume of the rectangle roof, we can get

$$L=12-2w=12-2*3=6$$

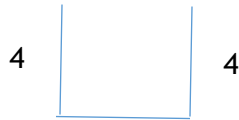


b. The shape of square

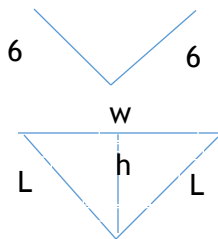


We can set the length of square be "x".

Then $x+x+x=12$



c. The shape of triangle



We can set the length triangle be 6 since two side of the triangle section can be same.

We set the angle of these two side be

$$h=L*\sin\theta$$

$$W=2*L*\cos\theta=12\cos\theta$$

$$\text{Volume}=\frac{1}{2} * W * h = 36a*\sin\theta\cos\theta$$

$$=18a*\sin2\theta$$

If we want to get maximum Volume , we have to get maximum $\sin2\theta$, which equals to 1. When

d. The shape of semi-circle



We set the length of semi-circle be 12.

So Radius $r=$

Volume= $\frac{1}{2} * \pi * r^2 * h$

Since we contrast these four volumes. So that V semi-circle. However it be

manufactured from a 12 inch wide piece of material. We will use the section shape of

semi-circle to build the of the gutters for the roofs of building. While we designed the

shape of gutters for the roofs, we just want to pull out water as soon as possible, which

need the maximum volume. After we calculate all four types of the shape of section, we

get the maximum volume of each shape. In order to carry a maximum amount of water, we designed the section shape of gutters can be semi-circle.

Reference

Technical Report Requirements

All reports submitted to Welbilt, Inc. should be written so that the forewomen and foremen of the construction unit implementing the report can understand and apply the information contained therein. Owing to Welbilt's preeminent position in the construction field all of our forepeople have degrees in engineering, and thus have had college level mathematics, including calculus---unfortunately, however, their long experience in the field precludes a ready knowledge of the same. Therefore, the reports should assume a strong precalculus and basic calculus (about half a semester of calculus I) background, but should not expect a knowledge of much more than that.

Reports should further:

- Be written in the first person plural (e.g., "We found the requisite data from the figure...").
- Include mathematical formulas in the text of the body of the report as appropriate to describe the methods and results obtained. (While the report must be typewritten, it is fine to neatly hand-write formulas if that significantly simplifies its generation.)
- Clearly explain how the mathematical formulas that are included bear on the problem being solved.
- Consist of:

o An Introduction, describing the problem to be solved, and an indication of the mathematical method used to solve it. o A Body, describing the mathematical problem that was solved to answer the question(s) posed in the introduction, and the solution to it.

o A Conclusion, summarizing the results obtained from the solution described in the body and clearly stating their relevance to the original problem as described in the introduction.

- Be 2-3 pages in length.