Beyoncé Knowles

Geometry

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Beyoncé Knowles’ Streetlight Proposal

**Part 1: Introduction & Plan**

The purpose of this project is to propose a design to help the city create new streetlight posts. My post must be at least 7.5 meters tall, at least 20 centimeters wide, and at least 2.5 centimeters thick with a hollowed-out core to contain the electrical wiring to light up the streetlights. My post will be modeled by a golden trapezoidal prism. To make my recommendation for the city, I will first need to calculate the area of the base of my post (the trapezoid) so that I can then calculate the volume. Then I will need to calculate the area of the hollowed-out core so I can get the volume of the core. Then I will subtract the volumes to get my final volume. Finally, I will use the density to calculate the mass of post according to the formula and then I will use the mass to calculate the cost of the gold it will require to build the post.

**Part 2: Information & Measurement**

My post looks like a trapezoidal prism with a hollowed out cylindrical core.

*Figure 1: 3D model Figure 2: Horizontal cross section Figure 3: Vertical cross section*

I have chosen gold to build my street posts. The density of gold[[1]](#footnote-1) is 19.32 g/cm3 and the cost of gold[[2]](#footnote-2) is $43,678.80 dollars/kg

**Part 3: Mathematical Processes & Interpretation of Results**

*Trapezoidal prism calculations for the outer post:*

Area of the Trapezoidal base:

b1=20cm

b2=18cm

h=16cm

Volume of a Prism: V = Bh

(area of the trapezoidal base)

(height of the prism)

*Cylinder calculation for hollowed out core:*

Volume of cylinder:

r = 2 centimeters

h = 750 centimeters

*Total volume of my post:*

Total post volume = prism volume – cylinder volume

Total volume = 228000 – 9424.78 = 218,575.22 cm3

*Mass of my post:*

So

*Cost of my post:*

Mass is in kilograms

It will cost the city $184,449,894 to make one of my golden street posts. I recommend my design because I think everyone should come into the city and know that we are the best city – therefore our street posts should be made from the most valuable material which is gold. My trapezoidal prism design is unique because I have never seen a trapezoidal prism before, so people will be impressed when looking at our street posts.

**Part 4: Limitations & Validity**

There are, I admit, some limitations to my project. Someone might think it is showing off too much for our city to have golden street posts. Someone might think we are way too rich and that might attract more crime into our city. Someone might be more likely to vandalize or steal some of the posts because gold is a very valuable material.

I could have saved money on the design of my post by decreasing the volume – such as increasing the hollowed core in the middle. If the volume is less, then the cost to make it will be less. If I used a different material than gold, such as aluminum, then my cost would have also been greatly reduced.

The city should consider looking at the strength of the material when building the post, not just the cost. Gold is stronger than some of the other metals, even though it is more expensive, which is why I chose it. There could be bad weather which would affect the look of the posts over time – but gold doesn’t rust so the rain would never affect it. I also believe that the visual appeal is very important, since we want our city to look good, so shiny materials looking better would be another consideration.

**Part 5: Conclusion & Reflection**

I stuck to my original plan of calculating area, volume, mass, and cost of my golden trapezoidal prism post. I was successful in carrying my design plan to the very end, and I also felt the most successful when defining my variables and spacing out my work in the calculations. I think the most challenging part was paying attention to and converting my units throughout. Next time I would think more careful about the cost of my materials and the design to save the cost, since my post ended up being over one million dollars to make, which I did not think about at the beginning. Overall, I believe I ended with a valuable project because now we know how much it would cost to make a street post made from a golden trapezoidal prism.

1. *Density Table of Various Materials*, AmBrSoft, 23 Oct. 2014, www.ambrsoft.com/CalcPhysics/Density/Table\_2.htm. [↑](#footnote-ref-1)
2. Edited by Roy Lance, *Modules in Mechanics of Materials*, MIT, 1996, web.mit.edu/course/3/3.11/www/modules/. [↑](#footnote-ref-2)