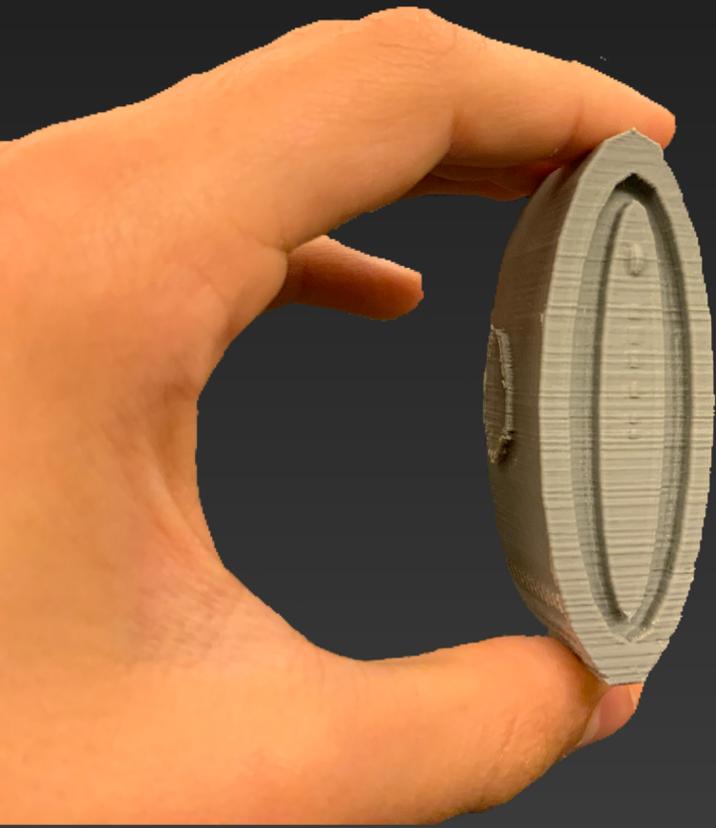


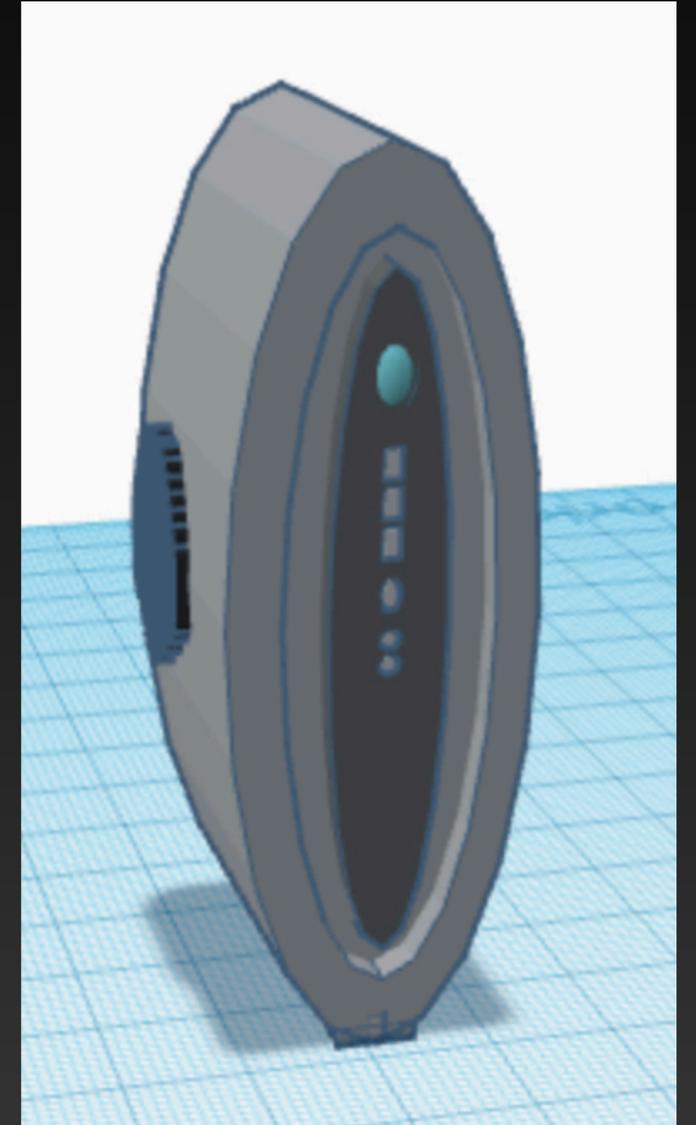
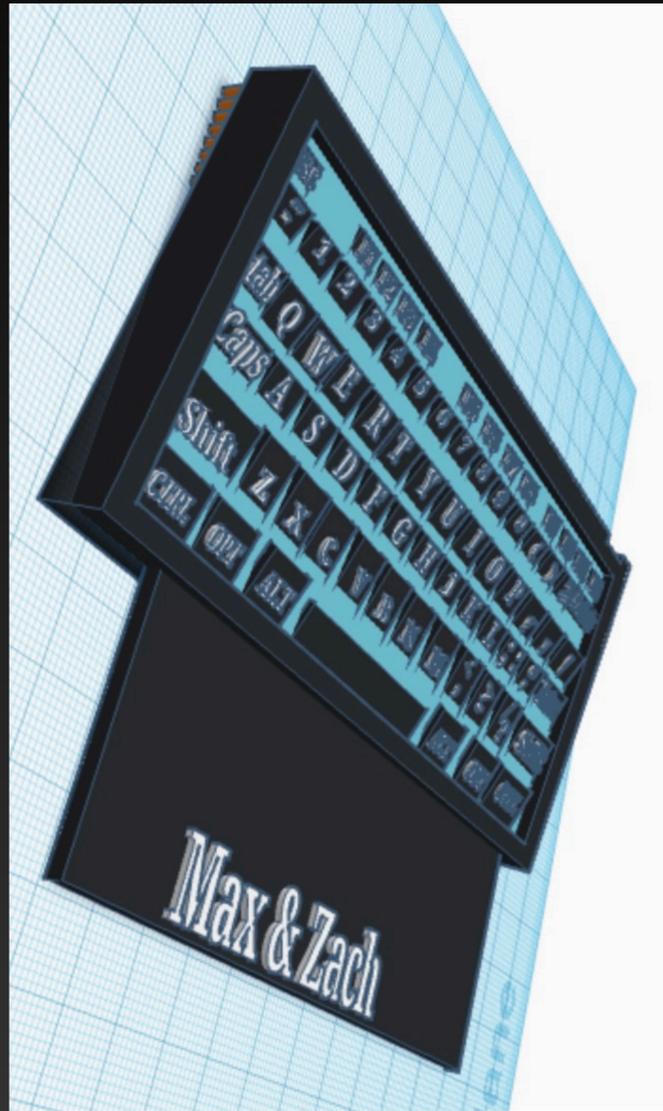
Ultimate design challenge

By: Max And Zach



What the project is

This objective for this project was to make a 3D model of a object of our choosing that either optimizes surface area or volume. We chose to make a gaming computer that optimizes surface area, and a keyboard that optimizes volume. We modelled the gaming PC after the Alienware aurora r11 and the keyboard after the steel series apex 3.



Why we chose to make what we did

We are techy people that love playing video games (mostly Zach)

We are both interested in gaming computers, keyboards and mice

We thought about doing some other things before we decided on this. Things like excavators, a mask made by a gaming company and a chair.

We also thought about making a Normal gaming computer, for example a prebuilt by NZXT but we ended up modelling it after a prebuilt by alien wear.



Max's contribution

I contributed by creating the keyboard model. At first I thought I was getting the easy job, however it was pretty hard at times. For example, Tinkercad was very difficult to use at first, however the more I tried and put effort in the easier it got.

I also contributed by making my own calculations for my model.

Zach's contribution

For this project I contributed in many ways. One of which was coming up with the ideas to make a PC and keyboard but I didn't build both of them. I made the 3D model for the alien ware Gaming PC and I also made most of the slides for this presentation. I also made all the calculations for my part of the project.

The Calculations for the PC

To make the 3D model of the PC, I used 3 different shapes that have different ways of being calculated.

The first kind of shape I calculated was the elliptical cylinder. To calculate the surface area you have to use this formula “ $a \times b \times \pi + \pi \times \text{square root of } 2 \times \frac{1}{2} a^2 \times \frac{1}{2} b^2$ ” and to calculate the volume you use this formula “ $\pi \times a \times b \times h$ ”

A= large radius
B= small radius
H= height

S.A and Volume
SA: $27.5 \times 4.5 \times 3.14 = 388.58 + 3.14 \times \text{root } 2 \times 378.12 \times 10.12 = 12404.02$
 $32 \times 8.5 \times 3.14 = 854.08 + 3.14 \times \text{root } 2 \times 512 \times 36.12 = 58923.48$
 $31.5 \times 10 \times 3.14 = 989.1 + 3.14 \times \text{root } 2 \times 496.13 \times 50 = 78881.51$
 $1 \times 0.5 \times 3.14 = 1.57 + 3.14 \times \text{root } 2 \times 0.5 \times 0.125 = 1.77$
 $12404.02 + 58923.48 + 78881.51 + 1.77 = 150210.78$
V: $3.14 \times 27.5 \times 4.5 \times 54.15 = 21041.33$
 $3.14 \times 32 \times 8.5 \times 64 = 54661.12$
 $3.14 \times 31.5 \times 10 \times 63 = 62313.3$
 $3.14 \times 1 \times 0.5 \times 2 = 3.14$
 $21041.33 + 54661.12 + 62313.3 + 3.14 = 138018.77$
SA=150,211 mm²
V=138018.77 mm³
Ratio 1.09:1

The second kind of shape that I calculated was the rectangular prism. To calculate its surface area you use this formula “ $2(l \times w) + 2(l \times h) + 2(w \times h)$ ” and to calculate its volume you use this formula “ $L \times W \times H$ ”

L= length
W= width
H= height

SA: $2 \times 28 + 2 \times 56 + 2 \times 2 \times 3 = 516$
V= $28 \times 1 \times 2 \times 3 = 168$
SA=516mm²
V=168mm³
Ratio 3.07:1

And the third kind of shape that I calculated was the cylinder. To calculate the surface area you use this formula “ $2 \pi r^2 + 2 \pi r h$ ” and to calculate its volume you use this formula “ $\pi r^2 h$ ”

r= radius
H= height

SA: $6.28 \times 0.25 + 2 \times 3.14 \times 0.5 \times 1 \times 2 = 7.85$
V: $3.14 \times 0.25 \times 1 \times 2 = 1.57$
SA=7.85mm²
V=1.57mm³
Ratio 5:1

The Calculations for the keyboard

The shapes that I used for my model were rectangular prisms and a cylinder. Something that helped me a lot while doing these calculations was our worksheets that we were working on. For example, if I was stuck I could just relate back to previous work.

Since the goal of this model was to maximize volume, the volume to surface area ratio was heavily sided on the volume.

The ratio was 4.7: 1

Here's the formulas I used to calculate my shapes 🙌

Shapes	Surface Area	Volume
Cylinder	$SA = (2\pi)r^2 + (2\pi)rh$	$V = 3.14 r^2 h$
Rectangular Prism	$SA = 2(l \times w) + 2(l \times h) + 2(w \times h)$	$V = l \times w \times h$

Shapes	Surface Area	Volume
Rectangular Prism (keyboard, wrist rest, LED lights block, and keyboard keys)	Keyboard: $SA = 2(l \times w) + 2(l \times h) + 2(w \times h)$ $SA = 132 \times 60.67 = 8,008.44$ $(8,008.44 \times 2) = 16,016.88$ $SA = 132 \times 17.77 = 2,345.64$ $(2,345.64 \times 2) = 4,691.28$ $SA = 60.67 \times 17.77 = 1,078.1$ $(1,078.1 \times 2) = 2,156.21$ Total SA= 22,470.88 cm ²	Keyboard: $V = l \times w \times h$ $V = 132 \times 60.67 \times 17.77 =$ $V = 142,309.97 \text{ cm}^3$

Final surface area and volume

In total, the surface area of the whole PC was 150,734.85 mm².

And the total volume was 138,188.34 mm³.

And the ratio for surface area to volume is 1.1:1

In total, the surface area of the whole keyboard was 55,899.53 mm².

And the total volume was 262,554.04 mm³

What we would do better next time

(Max) I would try to finish faster so I can get it 3D printed, I would use different colours for the LEDs in the keyboard and I would just make it better because I now have a lot more knowledge about the program we used (tinkercad)

(Zach) I would make my model a lot bigger because it could have been 2x bigger, I would have spent more time sanding my 3D printed model and I would made the shape of the PC more of a mix between a square and an oval

Thank you for listening!

We really appreciate it