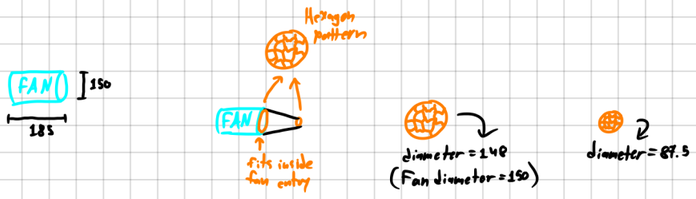
Laminar flow section

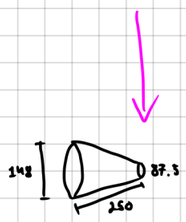
Unit of measurement = MM



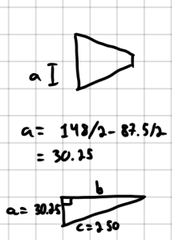
Cone

what we know:

a = diameter of cone base = 148
b = diameter of top part = 87.5
c = hypotenuse from base to top = 250



$a = 148/2 - 87.5/2$
$= 30.25$

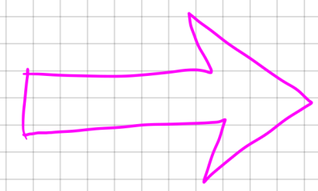


$a^2 + b^2 = c^2$
$b^2 = c^2 - a^2$
$b = \sqrt{c^2 - a^2}$
$b = \sqrt{250^2 - 30.25^2}$
$b = 248$

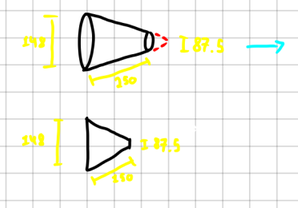
Unravelled Cone

what we want:

Find θ = ?



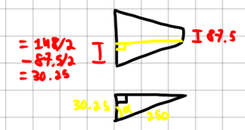
Cone → Unravelled Cone

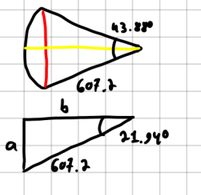


$C_1 = 2\pi r$
$= 2\pi(148/2)$
$= 465$

$C_2 = 2\pi r$
$= 2\pi(87.5/2)$
$= 275$

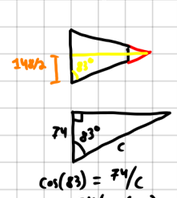
$b = 360(74/607.2)$
$b = 43.88°$





$\cos(\alpha) = 30.25/250$
$\alpha = \cos^{-1}(30.25/250)$
$\alpha = 83°$

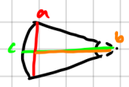
$\sin(21.94) = a/607.2$
$a = 607.2\sin(21.94)$
$a = 226.87$
$\cos(21.94) = b/607.2$
$b = 607.2\cos(21.94)$
$b = 563.22$



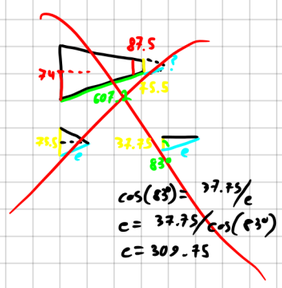
$\cos(83) = 74/c$
$c = 74/\cos(83)$
$c = 607.2$

$ax2 = 453.74$
$b = 563.22$

$a = 2\sin^{-1}(74/607.2)$
$a = 14°$

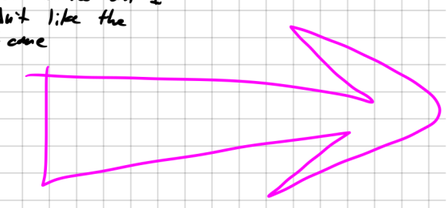


$a = 453.74$
$b = 563.22$
$c = 607.2$

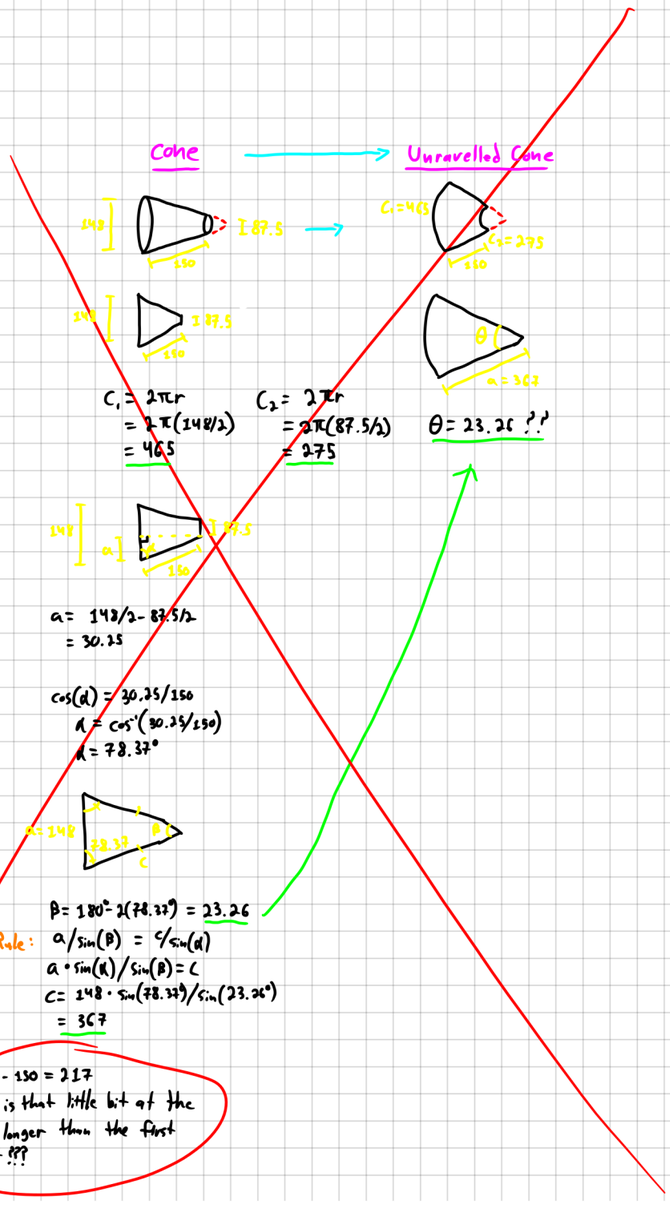


$\cos(83°) = 37.75/e$
$e = 37.75/\cos(83°)$
$e = 309.75$

this worked but I didn't like the end cone



Cone → Unravelled Cone



$C_1 = 2\pi r$
$= 2\pi(148/2)$
$= 465$

$C_2 = 2\pi r$
$= 2\pi(87.5/2)$
$= 275$

$\theta = 23.26$?!?

$a = 148/2 - 87.5/2$
$= 30.25$

$\cos(\alpha) = 30.25/250$
$\alpha = \cos^{-1}(30.25/250)$
$\alpha = 78.37°$

$\beta = 180° - 2(78.37°) = 23.26$

Sine Rule: $a/\sin(\beta) = c/\sin(\alpha)$
$a \cdot \sin(\alpha)/\sin(\beta) = c$
$c = 148 \cdot \sin(78.37°)/\sin(23.26°)$
$= 367$

$367 - 150 = 217$
how is that little bit of the end is longer than the first bit ???