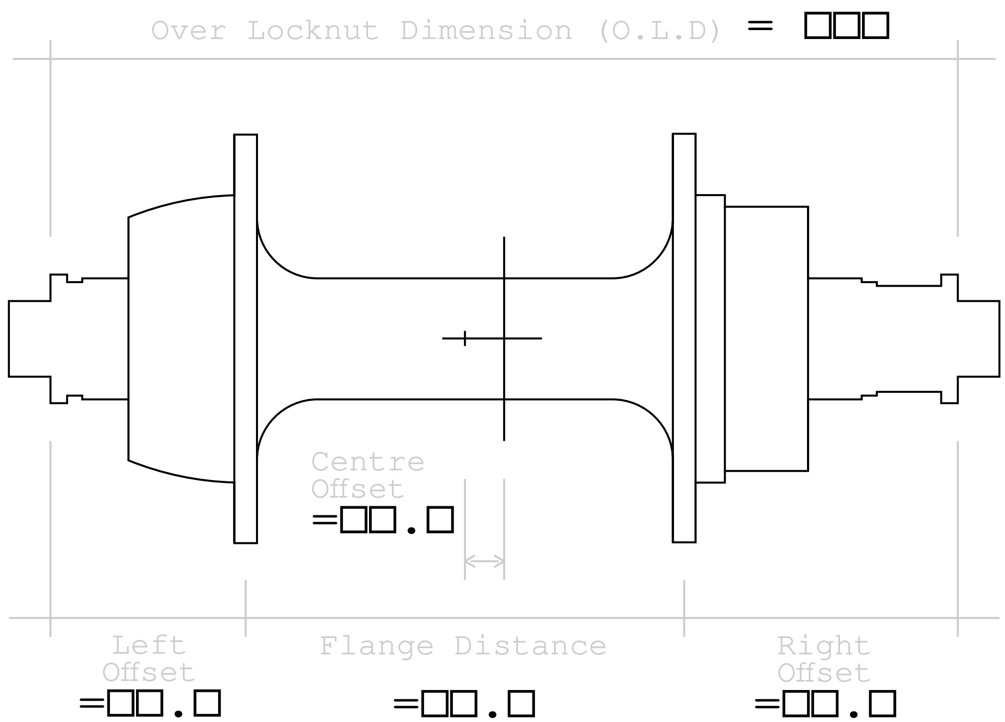
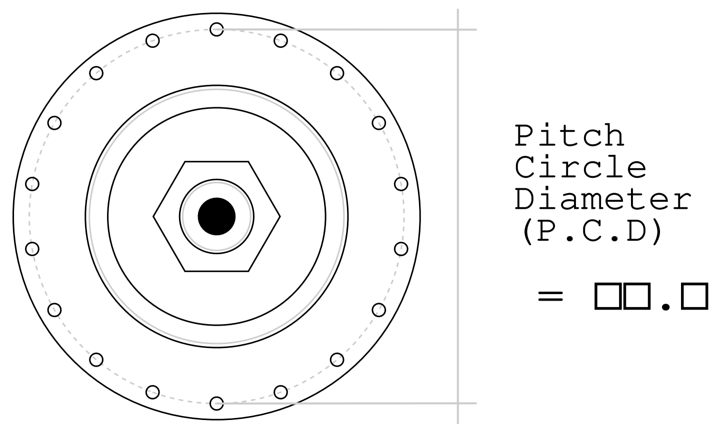
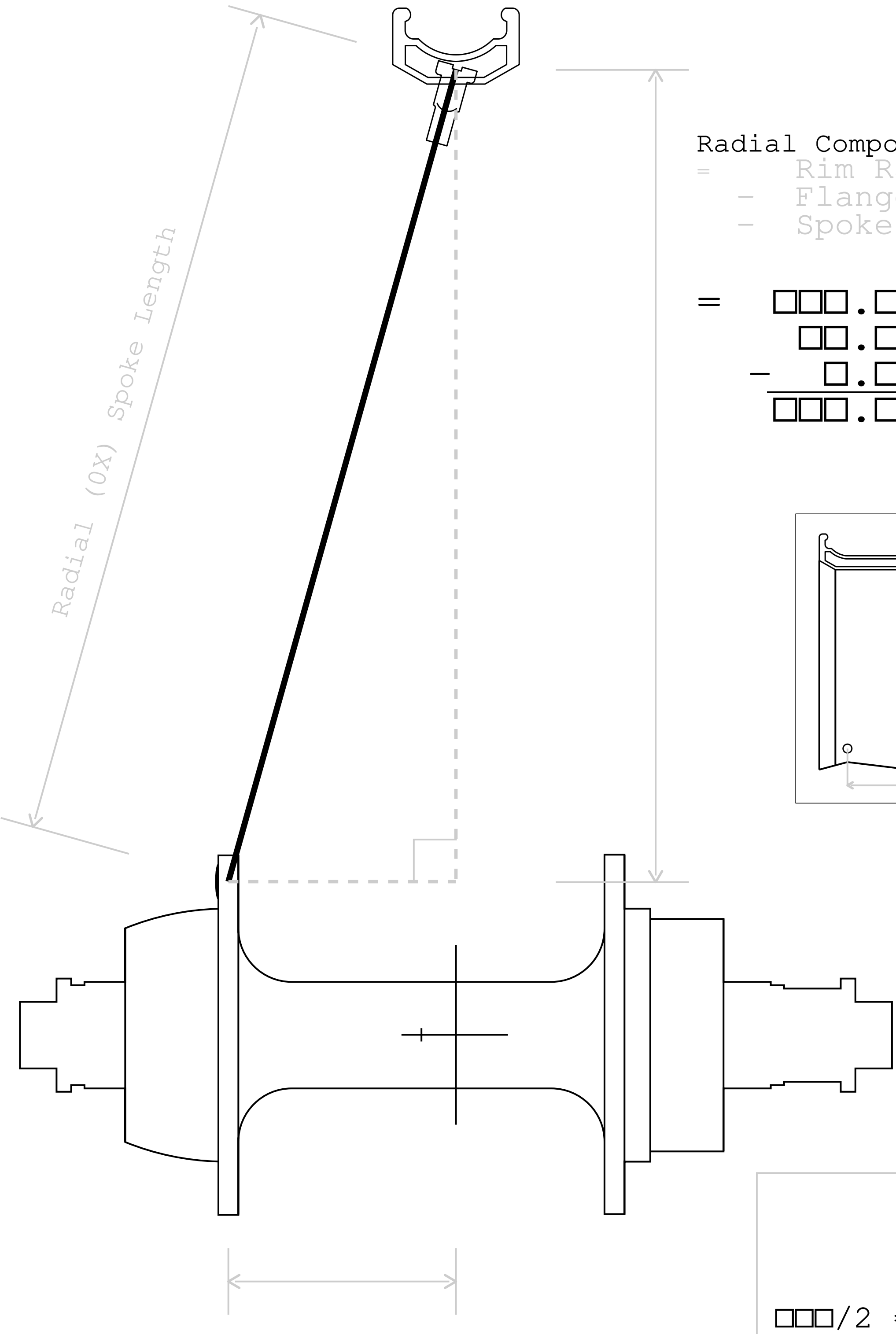
Fill in the blanks with your hub measurements:





Calculate the equivalent 0X (Radial) spoke length:



Radial Component
= Rim Radius
− Flange Radius
− Spoke Hole Radius

= □□□.□
□□.□
− □.□
□□□.□

Some rims (eg fat bikes or assymetric rims) may have additional offset on the spoke holes.

Factor this in to the lateral component.
(not shown below)

Lateral Component
= O.L.D/2
± Offset
− (Flange Distance)/2

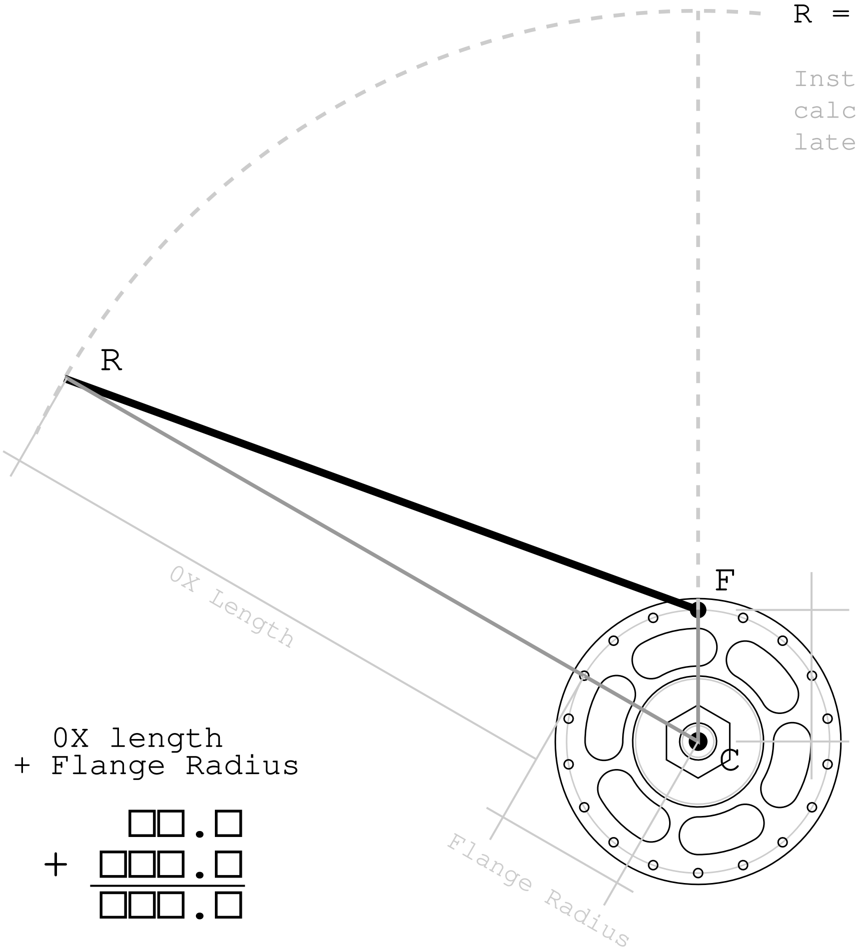
		Left (+)		Right (−)
□□□/2	=	□□.□		□□.□
	+	□□.□	−	□□.□
		□□.□		□□.□
□□/2	−	□□.□	−	□□.□
		□□.□		□□.□

$$\text{0X Length} = \sqrt{\text{Radial Component}^2 + \text{Lateral Component}^2}$$

$$= \sqrt{\square\square\square.\square^2 + \square\square.\square^2}$$

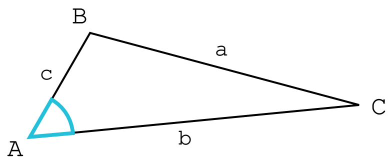
$$= \square\square\square.\square$$

Calculate final spoke length:



R = 0X Length + Flange Radius

Instead of using the E.R.D, we use the calculated 0X length. This account for the lateral component in the 3rd axis.



Cosine Rule

$a^2 = b^2 + c^2 - 2bc\cos(A)$

Flange Radius

= □□□.□

0X length
+ Flange Radius

$$\begin{array}{r} \square\square.\square \\ +\ \square\square\square.\square \\ \hline \square\square\square.\square \end{array}$$

$$\text{Angle C} = 720 * \frac{\square}{\square\square} \quad \begin{array}{l}\text{cross pattern} \\ \text{number of spokes}\end{array}$$

$$= \square\square$$

$$\text{Length}^2 = F^2 + R^2 - 2FR\cos(C)$$

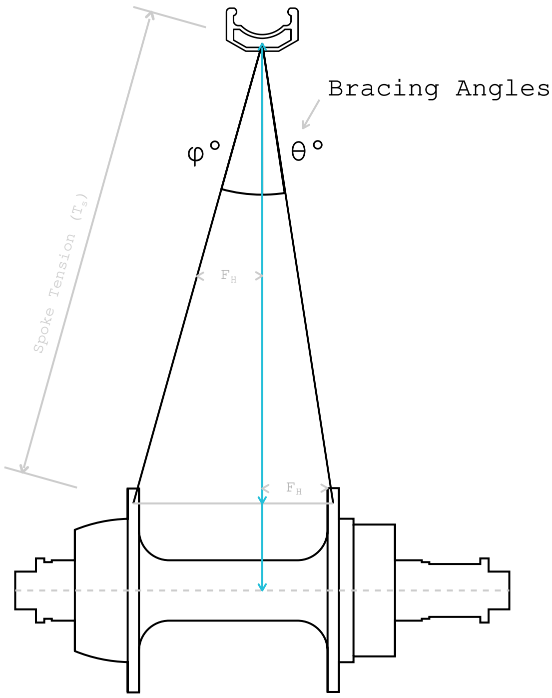
$$\text{Length} = \sqrt{\square\square\square.\square^2 + \square\square\square.\square^2 - 2\text{x}\square\square\square.\square\text{x}\square\square\square.\square\text{x}\cos(\square\square)}$$

$$= \square\square\square.\square$$

Now repeat for the other side!
.... or use a spreadsheet.

www.wheelpro.co.uk/spokecalc

Spoke tension in a dished wheel (Static force vectors):



Spoke Tension T_S
Spoke Force F_S
Horizontal Component F_H
Vertical Component F_V

$F_s = T_s$

$F_H = F_s \sin\theta$
$F_V = F_s \cos\theta$

Take some typical bracing angles:

$\varphi = 7.4°$
$\theta = 3.5°$

$F_{HL} = F_{HR}$

$F_{SL}\sin\varphi = F_{SR}\sin\theta$
$F_{SL}\sin 7.4 = F_{SR}\sin 3.5$
$\frac{\sin 7.4}{\sin 3.5} F_{SL} = F_{SR}$

$2.1F_{SL} = F_{SR}$

Since the rim is centred and static, and in absence of external forces, F_H must be balanced on both sides.

$\therefore F_{HL} = F_{HR}$

Spoke tension can be **twice as much** on the drive side as on the non-drive side!

who knew that wheels are actually triangles?